Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II

Public Comment Period & National Academies Review Annotation

The U.S. Global Change Research Program (USGCRP) released the draft Fourth National Climate Assessment (NCA4), Volume II for public comment from 03 November 2017 to 31 January 2018, concurrent with review by a special committee convened by the National Academies of Sciences, Engineering, and Medicine (NASEM, 03 November 2017 - 12 March 2018).

The NASEM panel evaluated the draft NCA4 Vol. II and published a document that captured consensus responses to questions posed within a carefully designed Statement of Task. The final report can be accessed here and an acknowledgment generated by USGCRP leadership here. This memo explains actions taken by the NCA4 Vol. II writing team to accommodate the expert judgment of the committee. In addition to the narrative review provided by the NASEM penal, each chapter writing team considered any chapter-specific line-by-line comments made by the panel, noted edits and rationale, and revise the report. The annotation to these line-by-line comments from the NASEM panel can be accessed here.

A Federal Register Notice publicized the Public Comment Period and a web-based system collected input from the general public and external disciplinary experts. Chapter writing teams considered each comment, noted edits and rationale, and revised the report. The Public Comment Period annotation can be accessed here.

Independent Review Editors (RE) were chosen by the NCA4 Federal Steering Committee from a pool of eternal experts solicited through an open call publicized via Federal Register Notice (20 July 2017 – 08 September 2017). Each chapter was assigned an RE to evaluate author responses to both the NASEM review and public comments, and the revised chapter drafts themselves, to confirm that the chapter writing teams had given due consideration to all review comments prior to submission for final agency review and clearance.

Names and affiliations of participants in the NCA4 Vol. II Public Comment Period were withheld from the authors, Review Editors, Federal Steering Committee, and staff throughout review and revisions. Anonymity helped preserve integrity of the drafting process. During registration, all reviewers consented to have their names associated with relevant comments once the report was published. The full report underwent several additional rounds of review after these responses were generated and, therefore, edits may have been made that are not part of the attributed set of comments included on the following pages.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Janet	Andersen	141644	Figure	00. Front Matter	1	12				Table 1 in the public comment document does not match the table in the download pdf. The table in the download pdf of the section "How to read this report" is much clearer about the likelihood statements and shows the percentages associated with each choice. Replace Figure 1 in this section with figure 2 from the pdf for improved clarity.	Thank you for your comment. We have added text to the caption of this figure to explain the difference.
John	Christy	141955	Whole Chapter	00. Front Matter						Half truths are nothing but lies. The oceans are not rising any faster than before. You can see all the correct science at cctruth.org	NCA4 Volume I (the Climate Science Special Report) summarizes the state of knowledge with respect to climate change. That report underwent extensive technical review - both through Federal agencies, as well as through public comment and a review by the National Academies to ensure the findings were accurate and forthcoming in the characterization of uncertainty.
Allison	Crimmins	142068	Text Region	00. Front Matter		5	5	8	8	Missing punctuation ")" after Brown 2015. May also want to consider spelling out USDA and NOO as it is the first time the acronyms are used. May also want to consider adding EPA's CIRA report as a technical input, maybe the indicators work too?	Thank you for your comment. We have revised the text to reflect these suggested revisions.
Allison	Crimmins	142069	Text Region	00. Front Matter		6	6	2	3	Suggest just saying that this report focuses on RCP8.5 and 4.5, not that the SGCR decided upon it. No one knows or cares who the SGCR is, and it is just another acronym.	Thank you for your comment. We have revised the text accordingly.
Allison	Crimmins	142070	Text Region	00. Front Matter		6	6	17	18	Cite figure from NCA3 that compares SRES and RCPs (it's also in the CHA)	As this report uses literature based on the RCPs far more extensively than literature based on the SRES (unlike NCA3 and CHA), we have not included this figure. We felt it would introduce more confusion than clarity.
Allison	Crimmins	142071	Text Region	00. Front Matter		6	6	34	34	Citation needed (O'Neill perhaps)	Thank you for your comment. We have removed the sentence in question and, due to space constraints, have chosen to remove much of the technical content from the Front Matter. Please see the Data Tools and Scenarios Appendix for further explanation and descriptions.
Allison	Crimmins	142072	Text Region	00. Front Matter		7	7	3	3	May want to spell out SLR or use the acronym on page 6 line 25 first.	Thank you for the comment. We have now defined the acronym on page 6 line 27.
Allison	Crimmins	142073	Text Region	00. Front Matter		8	8	8	10	It may be helpful to note that the confidence/likelihood scales used in volume II are not the same as those used in volume I (CSSR), and even to help provide some crosswalk or context for why that is.	Thank you for your comment. We have added text to the caption of this figure to explain the difference.
Amber	Ziegler	143402	Text Region	00. Front Matter		2	2	4	4	Suggestion to include "tribes" in the list of non-Federal experts, as a number of authors are employed/associated with a recognized tribe.	Thank you for the comment. The text has been revised.
Amber	Ziegler	143403	Text Region	00. Front Matter		9	9	14	14	Suggestion to include a brief definition of "radiatively-active species" or using a less jargon-based term.	Thank you for your comment. We have updated the text to read "particulate matter."
Union of Concerned Scientists	Union of Concerned Scientists	143680	Whole Chapter	00. Front Matter						The details on what is new since the previous NCA are very helpful, but it would also be great to note which chapters have been removed (or changed in a major way), and why. This would help readers understand if some content (such as biogeochemistry) could now be found elsewhere, or if one would need to refer to the old NCA report. As another example, for the case of Agriculture and Rural Communities, it was surprising that the chapters were combined as the former Rural Communities chapter covered more than just agricultural impacts. Providing some insight into the motivation for the shift could, again, help readers navigate the documents (especially as they shift from version to version).	Thank you for your comment. Enhanced search capabilities on the NCA4 website will assist the reader in finding the relevant material. There are certain aspects that are mandated by law to be addressed, so we have ensured those issues are adequately covered, but other revisions are based on public input/feedback, as well as author and Federal inter-agency deliberations.
Michael	MacCracken	143986	Text Region	00. Front Matter		5	5	8	8	Need to close parenthesis	Thank you for the comment. The text has been updated.
Michael	MacCracken	143987	Text Region	00. Front Matter		5	5	14	15	What is meant by "resulting temperature change". Is this the global average being talked about? And why only temperature change--what about other climate variables, what about sea level rise, ocean acidification? I don't understand what is meant.	Thank you for your comment. While the draft text was not intended to be exhaustive, we have revised the text to read, "and the resulting impacts, including temperature change or sea level rise." to help clarify this.
Michael	MacCracken	143988	Text Region	00. Front Matter		5	5	20	30	Might it be useful here for the general reader to give an indication of what changes in radiative forcing lead to by explaining that, roughly, when multiplied by the climate sensitivity, the result at equilibrium is the change in global average temperature resulting from the change in the atmospheric concentrations? There is a couple of new papers that compare model performance to observations (one with respect to radiative flux changes at the top of the atmosphere, and one with respect to the seasonal cycle) that seek to narrow the uncertainties regarding the climate sensitivity--so a range could be given. I just think expecting the average reader to understand what radiative forcing is an means may be a bit too scientific and an attempt needs to be made to give a better sense of the significance of RF changes. One could then also mention the temperature objectives of Paris Accord, again to provide some context on what large and small changes in temperature are.	Thank you for the comment. Upon further review, the authors have elected to move much of the technical detail to the Data Tools and Scenarios Products Appendix.
Michael	MacCracken	143989	Text Region	00. Front Matter		6	6	2	5	I don't like the characterization of the scenarios by saying "higher", "lower," and "very low". First of all, it is not made clear what these terms apply to--namely emissions, radiative forcing, amount of climate change, what. Second, the term choices are really implicitly policy judgments--and the report is not to be about policy--it could be that there are technological developments that make achieving "very low" easy enough to go considerably further, and indeed if climate impacts are to be avoided, there really is a need to go lower. The IPCC 1.5 Special Report first draft basically accepted that the Paris temperature objectives were acceptable stabilization levels--while this may be what present negotiators are thinking, as the Hansen et al. paper of a couple of years ago, at 1.5 C, the impacts on society would be tremendous (e.g., the paleoclimate derived sea level sensitivity is something like 15-20 METERS per degree warming--are the negotiators really accepting that as the fate for humanity; and actually they would be accepting worse as they allow for significant temperature overshoots and it is not at all clear that the ice sheet losses would be irreversible). It seems to me that the names for the scenarios need to be more meaningful, either by naming them based on the equilibrium temperature they imply by 2100 or by naming them based on key policy actions relating to them. So RCP8.5 is unrestrained use of fossil fuels during the 21st century; RCP4.5 is a gradual phasedown of fossil fuels starting in the second half of the 21st century; RCP2.6 is a gradual phaseout of fossil fuels during the second half of the 21st century. Or something like that. In any case, I don't think the particular names proposed in the report are policy neutral.	Thank you for your comment. Authors deliberated extensively on how to best label these scenarios in an accessible manner. Pinning a specific temperature on these would be misleading, as that is not what the RCPs capture; that is a model output driven by the RCPs.
Michael	MacCracken	143990	Text Region	00. Front Matter		6	6	5	7	While consistency is helpful, it might well have been helpful to encouraging action to limit emissions if the impacts associated with a RCP2.6 scenario (or an even faster phaseout of emissions) had been considered, so showing the value of taking action.	Thank you for your comment. In the interest of brevity and clarity, we have limited the number of RCPs considered, but have encouraged authors to use RCP2.6 where the literature allows and it adds sufficient new information to the assessment. The text explains this, so the authors have not made any additional revisions.
Michael	MacCracken	143991	Text Region	00. Front Matter		6	6	13	18	Again, I think referring to scenarios by, essentially, policy relevant names is unfortunate--and I think using radiative forcing as a metric for discussing scenarios with the public is rather linguistically obscure (with a paragraph this obscure in the Front Matter, I'd suggest one is likely to be turning off the general reader). I'd suggest using names more associated with what the scenario involves in terms of the ongoing dependence of the energy system on fossil fuels and when and to what degree they are phased down or out. I think this would give the reader a much better sense of how what happens to the energy system relates to what happens to them. At the very least, have a box that makes the associations clear in this document (and not through references to documents people tend not to have or won't look at) and choose names for them, so something like: "FF forever" for "higher"; "FF phasedown" for "lower", and "FF phaseout" for "very low". And it would really help to have some sort of schematic graphic or table that indicated for each scenario what would be happening over the following periods: 2020-40; 2040-2080; and 2080-and beyond or something like that for each scenario.	Thank you for your comment. Characterizing the RCPs with what they imply for, say, fossil fuel use, is limiting. For example, if CO2 removal technologies were to become pervasive, RCP2.6 could - theoretically - still be achieved under a fossil fuel-intensive future. We have inserted the following statement to direct the reader to other resources for additional information: "For additional detail on these scenarios and what they represent, please see Appendix 3 (Data Tools and Scenario Products), as well as Chapter 4 of the Climate Science Special Report (USGCRP 2017)."

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	143992	Text Region	00. Front Matter		6	6	23	27	I am a bit confused by the ordering here--it makes it seem as if the climate and sea level changes are driving the population changes--which seems strange for the demographic aspect. I also wonder if "migration" is the right word here--that makes it seem as if people are moving to some attractive location when actually I would suspect what is meant is forced relocation, so perhaps it would be better to say "dislocation" or "forced emigration" or something. And are not the land use changes also driven in part by the changes in climate? Again, a schematic chart might help here as again, this is a pretty complex paragraph for the general reader (even for the technical reader), especially given it is in the front material.	Thank you for your comment. The ordering is entirely arbitrary, but we have deleted "these" in the final bullet to avoid any internal references.
Michael	MacCracken	143993	Text Region	00. Front Matter		6	6	28	28	It needs to be explained what the basis was for this grouping. Is what is meant that these were analytical outcomes of the various emissions scenarios, so it is all sequential, or what? In any case, I think if one renamed the scenarios as I've suggested, then saying that one is associating various outcomes with FFforever, FFphasedown, and FFphaseout scenarios would be much clearer for the reader (so, much more sea level rise and dislocation associated with the FFforever scenario than the FFphaseout scenario, etc. Otherwise, I'm getting confused about all this higher and lower talk. I really don't think this whole discussion of scenarios is going to be very clear to anyone without some schematic diagrams and/or tables.	Thank you for the comment. We have moved much of this discussion to the appendix to ensure that the Front Matter is concise, providing the reader with a high-level overview of the fundamentals needed to contextualize the report. Details are provided in the Data Tools and Scenarios Products Appendix.
Michael	MacCracken	143994	Text Region	00. Front Matter		6	6	30	30	Isn't the whole analysis framed in terms of risk assessment? There are risks associated with all situations and cases, and would be with all of the proposed scenarios, both in terms of the impacts that result for the environment and society and also then for the impacts and risks associated with choosing a particular policy path or not (so phasing down FF too fast may risk high prices for energy or limited supplies, etc.)	Thank you for your comment. We have deleted "where appropriate and feasible".
Michael	MacCracken	143995	Text Region	00. Front Matter		6	6	32	34	It is for this reason that I was confused about having population and demographics (and even some of the land use aspect) included in the list of products in lines 23-27. If, as noted here, the origins of the climate and sea level products are completely different than the origins of the population, demographic and land use products, I would suggest not having them listed together on lines 23-27 and have a schematic diagram showing their different origins and then coming together for the analysis here.	Thank you for your comment. Due to space constraints we have chosen to move much of the technical materials to the Data Tools and Scenarios appendix, but have added an explicit reference to Table 32.1 (in Scenarios appendix), which provides additional detail on how these interact.
Michael	MacCracken	143996	Text Region	00. Front Matter		6	6	33	34	Were the developments really in parallel? I thought the radiative forcing profiles were done first and then the SSPs were developed to come out with that result? At least here, it is said they were done in parallel--in the State of the Carbon report, it mistakenly said the social and economic analyses led to the RCPs, which was, as I vaguely recall, true for the SRES scenarios but not the RCPs.	Thank you for your comment. We have removed the text in question and, due to space constraints, have chosen to move much of the technical materials to the Data Tools and Scenarios appendix.
Michael	MacCracken	143997	Text Region	00. Front Matter		6	6	35	35	"These" is really not very clear here--even saying "These products" would be a bit limiting. How about specifically here mentioning that, as the basis for this assessment, the climate- and sea level-related results for various scenarios for GHG-related emissions (which were developed by the physical and biological science communities) were brought together with economic- and population/demographic-related products that were the drivers of the energy technology scenarios that led to the GHG-related emissions scenarios (which were developed by the economic- and social science communities). So, basically better spell out the inputs--and then perhaps indicate that the assessment looks at how each set of products might further affect the other set of products and together they will provide plausible projections for what lies ahead given alternative policy choices. I'd suggest while the language may be complicated, showing the linkages in a schematic diagram might be the easiest way to convey all of this information.	Thank you for the comment. We have moved much of the discussion on USGCRP scenario products to the appendix to ensure that the Front Matter is concise, providing the reader with a high-level overview of the fundamentals needed to contextualize the report. Details are provided in the Data Tools and Scenarios Products Appendix.
Michael	MacCracken	143998	Text Region	00. Front Matter		7	7	3	3	I don't think the text has yet indicated what SLR stands for	Thank you for the comment. We have now defined the acronym on page 6 line 27.
Michael	MacCracken	143999	Text Region	00. Front Matter		7	7	1	5	Having some sort of schematic diagram or chart to help convey such information would really be helpful. I do want to say that referring to the different choices by what is happening in them (e.g., "lower population" and "upper bound SLR") is helpful (so please do for FF emissions). I would note, however, that you presumably mean "lower growth in population" and not literally "lower population" so maybe say "slower PG" or "faster PG" where PG is for population growth.	Thank you for your comment. Due to space constraints, much of the technical content has been relocated to the Data Tools and Scenarios Appendix, along with Table 32.1, which hopefully provides some clarity.
Michael	MacCracken	144000	Text Region	00. Front Matter		7	7	31	31	There are no "degrees of certainty"--just take the definition of certainty from a dictionary and try applying adjectives to it--they will make no sense at all. Please do not corrupt thinking in this area or in linguistics by talking about "certainty" having degrees. Uncertainty and confidence can both be spoken of as having degrees of them, but not certainty. The recent Carbon Cycle Report draft was quite inconsistent about this, as I pointed out in quite a number of comments. Here, if you want to have a word for the combination of confidence and likelihood, how about replacing "degree of certainty" with something drawn from the following: overall reliability, conviction, assurance, dependability, trustworthiness, or even certitude. But please don't create "degrees of certainty".	Thank you for your comment. We have deleted "degree of certainty" and replaced it with "overall reliability in their conclusions", as the comment suggests.
Michael	MacCracken	144001	Text Region	00. Front Matter		8	8	9	9	I like the definitions of terms here, and I want to commend you for the numerical way of expressing "likelihood", an approach much preferable to the overly precise approach that has often been used by IPCC (e.g., range from 67 to 90%, etc.), and one that I have been advocating for almost two decades. Just a couple of specific comments. I am confused by the about equal sign under "As Likely as Not"--and then nothing on the other entries. It seems to me it would be better for all of the entries to have the "approximate" sign, so "~" (and it can perhaps be combined with the greater or less than sign instead of the single bar meaning equal as that implies too much exactitude. I know such symbols exist, but could not find the keyboard sign for them).	To mainain consistency across USGCRP assessment reports throughout the NCA4 cycle (i.e., inclusive of the Climate Change and Human Health Assessment, for example), we have retained the notations as they were in the public comment draft.
Richard	Turnock	140849	Text Region	00a. Climate Science Findings		16	16	6	11	Revise paragraph: The global climate changed rapidly, compared to the pace of natural variations in climate that have occurred throughout the Earth‰Ûªs history. The global average temperature increased by about 1.7âiF from 1901 to 2016. For this amount of warming, observational evidence does not support any credible natural variations. Instead evidence supports human activities as the dominant cause, especially the emission of greenhouse gases or heat-trapping gases.	The text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.
Richard	Turnock	140850	Text Region	00a. Climate Science Findings		16	16	13	19	Replace paragraph with: Assuming emissions remain the same or increase, the Earth‰Ûªs climate will continue to change over this century and beyond. After 2050, the magnitude of climate changes will depend primarily on global emissions of greenhouse gases and on the response of Earth‰Ûªs climate system. Assuming significant reductions in emissions, the global temperature increase could be limited to 3.6âiF (2âiC) or less. Without significant reductions, annual average global temperatures could increase by 9.5âiF or more by the end of this century.	The text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Richard	Turnock	140851	Text Region	00a. Climate Science Findings		16	16	21	27	Replace whole paragraph: After the mid-20th Century, oceans absorbed 93% of the excess heat from human caused emissions of carbon dioxide. Each year, oceans absorb more than a quarter (25%) of the carbon dioxide emitted to the atmosphere annually from human activities. Heat from the atmosphere, warms the oceans and carbon dioxide absorbed by the oceans makes them more acidic. In many locations, oxygen concentrations, that sea life require to survive, decline over time as the earth‰Ûªs ocean systems respond to changes in heat and acidity.	The text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.
David	Albert	140971	Text Region	00a. Climate Science Findings		16	16	6	11	This is not correct. There are many times when temperature changed as rapidly as in this and the previous century. There are many peer reviewed papers that posit multiple possible causes for the recent warming. There is no credible empirical data that can quantify the warming to due to humans. Other parameters of climate (ie. precipitation, extreme weather, winds) are not shown by the data to be changing enough to find trends in them.	We disagree with this comment. The referenced statement represents the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapters 15 and 4, for more information on the scientific basis for this statement, including relevant citations.
David	Albert	140972	Text Region	00a. Climate Science Findings		16	16	13	19	Climate change later in this century will be dominated by declining solar activity not CO2 or human activity. Human CO2 will never exceed 20% of the atmospheric content (Harde2017). To assert that it will warm in the future and that warming will be controlled by human emissions is speculative not supported by data.	We disagree with this comment. The referenced statement represents the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapters 2 and 4, for more information on the scientific basis for this statement, including relevant citations.
David	Albert	140973	Text Region	00a. Climate Science Findings		16	16	21	27	This paragraph contains several errors. The oceans are not warmed to depth by long wave radiation from greenhouse gases. Many parts of the worlds oceans show declining heat content. There are no acidic areas in the oceans. It is possible increased atmospheric CO2 will neutralize some ocean water PH. Declining oxygen content has not been tied to changing climate.	The text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. The referenced paragraph represents the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapter 13, for more information on the scientific basis for this statement, including relevant citations.
David	Albert	140974	Text Region	00a. Climate Science Findings		16	16	29	23	Global sea level rise trend has been nearly constant since 1880 with no indication of effect of rising CO2. There are no valid data or cycle analyses that predict it will change. Most predictions of sea level rise from 2018 to 2100 are around 6 to 7 inches. 6 to 10 feet is physically impossible (reference sea level rise in early Holocene when continental ice sheets were collapsing)	We disagree with this comment. The referenced information represents the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapter 12, for more information on the scientific basis for this statement, including relevant citations.
David	Albert	140975	Text Region	00a. Climate Science Findings		16	17	35	1	These statements incorrectly imply all of the experienced warming is due to anthropogenic CO2. The projection of future temperatures ignores all the evidence of future cooling and relies entirely on models that assume a climate sensitivity of 3 which is not warranted by recent peer reviewed analysis. The final sentence is erroneous as US high temps have been declining since the 1930s and the rise in average is due to increased minimums and nighttime temperature.	We disagree with this comment. The referenced information represents the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapters 2 through 4, for more information on the scientific basis for these statements, including relevant citations.
Amanda	Babson	140976	Text Region	00a. Climate Science Findings		17	17	38	40	CO2 residence time is about 4 years. There is no anthropogenic CO2 that was emitted in 2000 left in the atmosphere now (Harde 2017). Natural cycles have the potential to counteract any human changed climate parameters and have to date prevented any quantification or even clear detection of them.	We disagree with this comment. The referenced information represents the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapters 2 through 4, for more information on the scientific basis for these statements, including relevant citations.
Robert	Kopp	141158	Text Region	00a. Climate Science Findings		16	16	31	31	"At least several inches" describes global mean sea level rise between 2000 and 2030, but not "in the next fifteen years" (where sea-level rise in the Low scenario would be 4.5 cm).	The referenced information is a direct quotation from NCA4 Volume 1, which summarizes the scientific understanding of sea level rise as presented in the peer-reviewed literature. This document has already been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapter 12, for more information on the scientific basis for this statement, including relevant citations.
Ross	McKitrick	142018	Text Region	00a. Climate Science Findings		16	16	6	8	Para 1 lines 6‰ÛÓ8. The wording in the opening sentence is imprecise and overconfident. There is little reliable information about the pace of changes on decadal and centennial time scales throughout Earth‰Ûªs history, yet you state without any qualifications that modern rates of change are unprecedented. Really? Exactly how quickly did the mid-troposphere warm between AD1140 and 1190, or from 6,000 to 6,050 years ago, or during any 50 year span in previous interglacials? Obviously you do not know, yet you are claiming you do with such precision that you can rank the modern interval as exceptional compared to the entirety of Earth‰Ûªs history. This is a ridiculous position to take. The 2006 NAS panel on paleoclimate reconstructions noted (p.113) that ‰ÛÏuncertainties of the published reconstructions have been underestimated‰Û, and the many problems they described have not gone away. They also concluded (p. 118) that ‰ÛÏvery little confidence‰Û could be placed on claims about global or hemispheric mean temperatures prior to 900AD. These limitations remain, yet you gloss over them as if they don‰Ûªt matter. Your overconfidence not only waives away the proper scientific caution in the mainstream literature but it ignores actual counter-evidence. Only this month (i.e. after this report was drafted) there was a new study by Bereiter et al. in Nature reporting that global mean ocean temperatures rose at a faster rate over a 700 year interval during the Younger Dryas event than is observed in the modern era. Quoting that paper: ‰ÛÏThe warming from 12,750‰Ûäyr BP to 12,050 yr BP (referred to as YD1) within the Younger Dryas represents the strongest global ocean warming phase within our record. The MOT [global Mean Ocean Temperature] change rate is 2.5‰Ûää±‰Ûä0.53 mK yr‰ôÕ1 and the corresponding energy uptake (13.8‰Ûää±‰Ûä2.9)‰ÛälÑ‰Ûä1021 J yr‰ôÕ1. This unprecedented natural MOT warming rate is comparable to the strong warming since 1997 estimated in ref. 1, but clearly surpasses the estimate therein for the multidecadal trend from 1971 to 2005‰Û Ref: Bereiter et al. (2018) Mean global ocean temperatures during the last glacial transition. Nature 553, pages 39‰ÛÒ44 (04 January 2018) doi:10.1038/nature25152 This finding (and their discussion of the lack of ability of GCMs to explain the sustained YD warming rate) contradicts both the specific assertion of the opening sentence and the over-confident mindset behind it. A better opening sentence would be ‰ÛÏThe global climate system is dynamic and ever-changing and there is still	The referenced information is a direct quotation from NCA4 Volume 1, which summarizes the scientific understanding of the information on past climate changes represented in the paleoclimate record, as presented in the peer-reviewed literature that appeared in print prior to the literature cut-off date. As this document has already been approved and was published in November 2017, we are not able to add new citations to this summary. We refer the reviewer to Volume 1, including Chapters 15 and 4, for more information on the scientific basis for this statement, including relevant citations.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Ross	McKitrick	142019	Text Region	00a. Climate Science Findings		16	16	8	11	Para 1 lines 8‰ÛÓ11. I am surprised such imprecise wording has survived into the 3rd draft. (It doesn‰Ûªt speak well for the diligence of previous reviewers.) You are conflating observation and attribution. ‰ÛÏObservational evidence‰Ûª on its own does not provide any explanation one way or the other for attribution of climate change. Attribution is done through modeling studies, principally by using GCM-generated forcing series to decompose observed data into additive components (solar, GHG, etc). Later in the report you show, and rely on, the results of such an exercize. A line on a graph that shows the purported GHG contribution to temperature increase is not ‰ÛÏobservational‰Ûª, it is the output of a statistical model that takes as inputs observed data plus forcing measures derived from climate models. The best you can say at this point in the report is ‰ÛÏGlobal average temperature as measured using surface thermometers increased by about 1.7 oF from 1901 to 2016. Climate models typically reconstruct this specific trend by assuming a dominant role for greenhouse gases.‰Ûª	We disagree with this comment. The referenced information represents the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapters 2 and 3, for more information on the scientific basis for these statements, including relevant citations.
Ross	McKitrick	142020	Text Region	00a. Climate Science Findings		16	16	11	11	Para 1 line 11. The whole point of a report like this is to export from the scientific community to journalists the proper language to describe the phenomena in question, not to import from them the wrong language. If you wish to add an explanatory parenthesis for ‰Û÷greenhouse gases‰Ûª you can surely do better than the inaccurate phrase ‰Û÷heat-trapping‰Ûª. The gases in question absorb and emit infrared radiation, they don‰Ûªt block hot air from circulating. You would be better to omit the parenthesis and simply refer to ‰Û÷greenhouse gases like CO2 and methane‰Ûª and then in a later section explain the action of the gases using correct concepts rather than journalistic slogans.	We appreciate the suggestion; however, the text in this summary is a direct quotation from NCA4 Volume 1. This document was published in November 2017 and its text is not subject to change.
Ross	McKitrick	142021	Text Region	00a. Climate Science Findings		16	16	13	19	Para 2 lines 13‰ÛÓ19. This paragraph treats model projections as established facts and omits any caveats. The authors are obviously trying to write their own headlines but I can‰Ûªt see any scientific justification for putting material like this up front. It announces without any qualification that warming rates over the rest of the century conditional on emission paths can be known with great precision, without acknowledging that these are model-based forecasts, let alone that (as even the IPCC acknowledged) GCMs have overstated warming trends over the past 15-20 years. Wording that aims to inform the reader without venturing into fearmongering would go along the following lines: ‰ÛÏClimate models project continued warming over the rest of the century. Known sources of uncertainty include the rate at which greenhouse gases will continue to be emitted and the overall climate sensitivity to their accumulation in the atmosphere. Unknown sources of uncertainty include many forms of natural variability. The central tendency of current climate models under business-as-usual emission scenarios is to project warming of about x oF by 2100, with a slight reduction if the emission reductions under the Paris Accord are implemented. The range of uncertainty includes lower trends as well as possible acceleration to exceptionally high levels (9.5F or more), with probabilities sharply dropping either way.‰Ûª	The referenced statement is a brief summary of the scientific understanding of climate as summarized in the peer-reviewed literature found in NCA4 Volume 1, in particular Chapter 4. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapter 4, for a much longer discussion of the scientific basis for this statement, including relevant citations.
Ross	McKitrick	142022	Text Region	00a. Climate Science Findings		16	16	24	24	The oceans are not acidic. This sentence should say ‰ÛÏmaking the oceans warmer and less alkaline‰Ûª or ‰ÛÏmore neutral‰Ûª. Normally we don‰Ûªt describe a move towards a qualitative boundary as if it were an increase on the other side. When we change the setting on the stove we talk about turning down the heat, not making the element colder. If the temperature outside goes from -10C to -9C we might say the snow became less solid but we don‰Ûªt say it is melting faster. Likewise additional CO2 is not ‰ÛÏacidifying‰Ûª the oceans it is ‰ÛÏneutralizing‰Ûª them.	The referenced information is a direct quotation from NCA4 Volume 1, which summarizes the scientific understanding of ocean acidification as presented in the peer-reviewed literature. This document has already been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapter 13, for more information on the scientific basis for this statement, including a definition and description of ocean acidification, which is a scientific term commonly used in the literature, as well as relevant citations.
Ross	McKitrick	142023	Text Region	00a. Climate Science Findings		16	16	32	33	What is the point of the last sentence? It just suggests, or rather reveals, that the authors are exceptionally alert for the most alarmist findings possible and are willing to elevate them to prominence irrespective of their plausibility. Recent studies suggest some horrible disaster is possible. So what? Lots of things are possible. You should reserve space in the summary for the findings that you have the best evidence for, not the ones you think are the most lurid.	We disagree with this comment. The referenced information represents the scientific understanding of the risks associated with human-induced climate change as summarized in the peer-reviewed literature found in NCA4 Volume 1. The text in this summary is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, particularly Chapter 15, for more information on the scientific basis for this statement, including relevant citations.
Ross	McKitrick	142024	Text Region	00a. Climate Science Findings		16	16	35	37	You say that US average temperatures have risen by 1.2 oF ‰ÛÏover the last few decades.‰Ûª Can‰Ûªt you be more precise? Name the start date and end date of your comparison, and if a slight variation on either end would be influential on the comparison you should report that and justify your choice of end dates.	This information is provided in NCA4 Volume 1, which was published in November 2017 and can be accessed at science2017.globalchange.gov. On this topic, we refer the reviewer to Chapter 6.
Ross	McKitrick	142025	Text Region	00a. Climate Science Findings		17	17	16	16	In making this projection do you have an explanation why it should be considered ‰ÛÏvery likely‰Ûª in light of all the past failed predictions of an ice-free summer in the Arctic?	All citations and references for the information contained in this statement are provided in NCA4 Volume 1, which was published in November 2017 and can be accessed at science2017.globalchange.gov. On this topic, we refer the reviewer to Chapter 11.
Ross	McKitrick	142026	Text Region	00a. Climate Science Findings		17	17	21	27	National Hurricane Center going back to the 1800‰Ûªs data clearly indicate a drop in the decadal rate of US landfalling hurricanes since the 1960s. The current decade is on the low end of hurricane frequency even with last summer‰Ûªs busy season. Yet you don‰Ûªt mention this, instead you spin the topic to make it sound like the trends are all towards more cyclone activity. This paragraph is one-sided and misleading.	We disagree with the reviewer's assertion that information on a sub-set of data, consisting of landfalling storms, is more relevant to a high-level summary such as this than information on the entire dataset, which includes all basin-wide storms. All citations and references for the information contained in this statement are provided in NCA4 Volume 1, which was published in November 2017. We particularly refer to the reviewer to Chapter 9, which discusses both basin-wide and landfalling storms.
Ross	McKitrick	142027	Text Region	00a. Climate Science Findings		17	17	29	36	The opening sentence makes an assertion about past observations, then purports to substantiate it with reference to model projections about the future rather than historical data. The next sentence, by referring to large increases in flooding frequency for ‰ÛÏseveral‰Ûª communities sounds like cherry-picking. Does ‰ÛÏseveral‰Ûª mean three or four out of a thousand? And has there been *less* flooding in ‰ÛÏseveral‰Ûª places as well?	A much longer and more detailed discussion of observed and projected future changes in flood characteristics, as well as all citations and references for the information contained in this statement, are provided in NCA4 Volume 1, which was published in November 2017 and can be accessed at science2017.globalchange.gov. On this topic, we refer the reviewer to Chapter 8.

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Jim	Bouldin	142028	Text Region	00a. Climate Science Findings		17	18	38	5	Paragraph 10. Regarding ‰ÛÏself-reinforcing cycles within the climate system‰ÛÒ, in Paragraph 1 your argument depends on the claim that natural variability is known to be minimal on all time scales because it doesn‰Ût manifest itself in climate models, therefore modern warming can only be anthropogenic. Yet in this paragraph you claim the climate is prone to large, persistent natural swings that models can‰Ût reproduce, which contradicts your earlier claim. You state that models have a ‰ÛÏsystematic tendency to underestimate temperature change during past warm periods‰ÛÒ which obviously implies that they could systematically underestimate natural warming during the present period as well; yet nine paragraphs earlier your assertion required you to assume this could not be the case. You can‰Ût have it both ways. You treat the failure of models to reproduce past warming as evidence that future anthropogenic warming may be worse than expected. But if models could be made to account for past variability through improvements that yield a greater tendency to exhibit natural warming trends, it might require a revision of the attribution of modern warming in such a way as to imply a lower greenhouse gas sensitivity, which would imply that future (anthropogenic) warming will be less than currently expected. In other words, the information in this paragraph can support two opposite conclusions. By emphasising only one you exhibit bias. I can‰Ût suggest how to reword this paragraph. It is likely true that models suppress natural variability in order to prevent drift and low-frequency instability (see, for instance, the discussion in Bereiter et al. Nature 2018 about the inability of climate models to reproduce the large swings in the Younger Dryas event). But acknowledging that fact will require you to acknowledge the weakness of your attribution arguments, which presuppose that GCMs provide a valid representation of natural variability on all time scales.	We disagree with the reviewer's comment as it conflates natural variability over decadal timescales, which is the topic of NCA4 Vol. 1 Chapter 2, with the response of the Earth's climate system to long-term warming over centuries to millennia, which is the topic of NCA4 Vol. 1 Chapter 15. For a comprehensive discussion of natural influences on climate, we refer the reader to these chapters of NCA4 Volume 1, which is available at science2017.globalchange.gov.
Felix	Guerrero	142064	Whole Chapter	00a. Climate Science Findings						These findings are of critical importance to the entirety of American society. These must be publicized and distributed in as many ways as possible. Distribute through newspapers, Television outlets, social media. This is very important!	We appreciate the reviewer's comment and will be sure USGCRP is aware of it.
Allison	Crimmins	142074	Text Region	00a. Climate Science Findings		16	16	6	39	Please be consistent when showing degrees in both F and C. Sometimes the C is shown in parentheses after the F, but not always (e.g. on line 17 you show the C conversion, but on line 18 for the comparable sentence, you do not. See also lines 8 and 36)). This two pager is really great, by the way. It would be particularly interesting to see how these 10 messages have changed over the course of the NCAs (in terms of confidence and likelihood) and how they will change in future reports.	We appreciate this suggestion and will synchronize the references to C/F accordingly. We also appreciate the suggestion to compare messages over the history of NCA4. Although it is beyond the scope of this summary, which pertains to NCA4 Vol. 1 only, we will refer it to the USGCRP for future reference.
Union of Concerned Scientists	Union of Concerned Scientists	143799	Text Region	00a. Climate Science Findings		16	16	29	33	The faster rate since 1993 should be mentioned here. It is an important development, as it affects the future projections as well as adaptation/resilience measures and decisionmaking. The role of ice sheets could be raised briefly. Also, the link between emissions reduction and lower SLR rates in the second half of the century would be a nice highlight (like it was mentioned in finding 2).	The text in the high-level climate science summary is a high-level, verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. However, we refer the reviewer to Vol. 1 Chapter 12, which specifically mentions this point.
Michael	MacCracken	144002	Text Region	00a. Climate Science Findings		16	16	14	14	Regarding the phrase "magnitude of climate changes", it seems to me this needs to be changed. We are actually pretty clear on the "magnitude"--it will be degrees--and that is actually of the change in global average temperature, and this is pretty much for all scenarios. If in referring to "climate" it is meant to include more variables than temperature, then "magnitude"--if this term is used, needs to be plural. And I am confused why "changes" is plural here. I'd suggest changing this phrase to "the amounts and patterns of changes in temperature, sea level, and other climate variables"	We appreciate the suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.
Michael	MacCracken	144003	Text Region	00a. Climate Science Findings		16	16	15	15	I'd suggest saying "cumulative global emissions of greenhouse gases in the decades ahead" in order to get across the point that just bringing down future emissions is not what matters, but the path also matters.	We appreciate the suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. We refer the reviewer to Vol. 1 Chapter 14, which discusses cumulative emissions in detail.
Michael	MacCracken	144004	Text Region	00a. Climate Science Findings		16	16	13	19	While I presume the "primarily" on line 14 is intended to cover natural influences and changes in aerosol amounts, I'd just note that apparently any chance of either carbon dioxide removal or climate intervention playing a role is also implicit in this term. I do wonder if this is appropriate--might it be that at least the possibility of carbon dioxide removal needs to be mentioned here, or perhaps saying somewhere something quite generic with a phrase such as "without the development of as yet unproven interventions that might attempt to offset some of the forcings or responses" or something similar. It seems to me that given the increasing discussion about potential interventions, including proposed federal legislation and even some state actions, that something might need to be said somewhere.	We appreciate the suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. We refer the reviewer to Vol. 1 Chapter 14, which discusses mitigation in detail.
Michael	MacCracken	144005	Text Region	00a. Climate Science Findings		16	16	16	16	An alternative or additional opportunity to say "cumulative global emissions"	We appreciate the suggestion and have incorporated this into the text where appropriate.
Michael	MacCracken	144006	Text Region	00a. Climate Science Findings		16	16	16	19	This is another/alternative location where mention could be made of the potential for interventions. There are really growing indications that carbon dioxide removal may well be possible and significant (by either direct air capture and/or ocean farming/fertilization that uses various waste products to pull carbon into the ocean and then sinking it) assuming global emissions are brought down be a reasonable percentage by changes in technology. None of the approaches is yet proven or proven as possible at sufficient scale and low enough price, but quite a number of ideas and early experiments are being done or planned, so it is fair to say the approaches are not yet proven, but I think it would be a bit narrow to not be at least mentioning that the potential for such approaches is starting to be looked at. Also fair to say that the balance of benefits and adverse impacts would be expected to be beneficial, but has not yet been comprehensively assessed.	We appreciate the suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change, nor are we able to add information to this summary that was not contained in that report.
Michael	MacCracken	144007	Text Region	00a. Climate Science Findings		16	16	21	21	Saying "93%" is quite precise given uncertainties of a range of kinds. How about saying "over 90%"? This would also be more consistent with the sentence then saying "more than a quarter" which seems much less precise than "93%" and so indicating there is a good deal of uncertainty.	We appreciate and acknowledge this suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.

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Michael	MacCracken	144008	Text Region	00a. Climate Science Findings		16	16	23	23	I'd suggest deleting "annually" as this implies every year is more than a quarter, and I'm not sure that is true. The statement is true on average, but is it the case every year? I don't think that is directly established.	We appreciate the recommendation; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.
Michael	MacCracken	144009	Text Region	00a. Climate Science Findings		16	16	27	27	I'd suggest changing "locations" to something like "coastal regions" or something not implying very specific places--this result is for regional size areas and not specific sites.	We appreciate the suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.
Michael	MacCracken	144010	Text Region	00a. Climate Science Findings		16	16	29	29	There is one "Global Sea Level"--the global average. So, the global average is rising (I'd note the subject of the first sentence of this point is singular, and the bold font part also needs to be singular. Also, I thought the 7-8 inches was the amount during the 20th century, and it has risen more since.	We appreciate the reviewer's suggestion; however, we feel the wording is accurate and grammatically correct, and in addition the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.
Michael	MacCracken	144011	Text Region	00a. Climate Science Findings		16	16	32	33	It seems to me that associating this possibility with a cause would make it more clear that this could happen. So perhaps say, "Recent accelerated loss of ice from the Greenland and Antarctic ice sheets suggest that a rise là" Generally, I think it really helps in communicating to the public if one can link the point to something specific that is happening and that is in the news.	We appreciate the reviewer's suggestion; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. We refer the reviewer to Vol. 1 Chapter 12 for more detail.
Michael	MacCracken	144012	Text Region	00a. Climate Science Findings		16	16	35	35	The heading is plural ("Temperatures") but the whole paragraph is given in the singular. Perhaps change heading to "Increasing Temperatures Across the U.S." and then somehow say that these would contribute to the rise in the average temperature across the US.	As the paragraph addresses changes in both average and extreme temperatures, we believe the plural is acceptable.
Michael	MacCracken	144013	Text Region	00a. Climate Science Findings		17	17	13	13	Again, need to think about singular and plural. "Annual average temperature across the Arctic has increased …	Annual average temperature is singular. Average plus extreme temperature is plural.
Michael	MacCracken	144014	Text Region	00a. Climate Science Findings		17	17	16	16	I'd suggest changing "in late summer" to "for most of the summer" as this change is occurring quite rapidly and the quality of ice in mid-summer now is really getting quite poor (thin and breaking up). In making this change, perhaps change "Arctic" to "most of the Arctic Ocean"--so talking about most of the area and also about the Arctic Ocean and not also referring to the land area.	We appreciate the reviewer's suggestion. The text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. However, we agree that adding "Ocean" would not alter the meaning of this sentence, but rather would improve the clarity of this paragraph. To that end, we will seek USGCRP input on whether it is possible to add this word.
Michael	MacCracken	144015	Text Region	00a. Climate Science Findings		17	17	18	19	Change "carbon" to "carbon dioxide" and change "has" to "have". Also perhaps say "global warming" instead of just "warming"--or even better, say "global warming and associated climate-induced impacts"	We appreciate the reviewer's suggestion; however, we feel the wording is accurate and in addition the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.
Michael	MacCracken	144016	Text Region	00a. Climate Science Findings		17	17	21	23	Don't you mean "subtropics" instead of "tropics"? And perhaps, for clarity, say "the dry subtropics". I don't know of any significant discussion of the tropics expanding.	We disagree with the reviewer on this comment. This text refers to the following statement from NCA4 Vol. 1 Chapter 5, which reads: "Evidence continues to mount for an expansion of the tropics over the past several decades, with a poleward expansion of the Hadley cell and an associated poleward shift of the sub-tropical dry zones." We refer the reviewer to Vol. 1 Chapter 5 for further discussion, as well as citations and references for this statement.
Michael	MacCracken	144017	Text Region	00a. Climate Science Findings		17	17	23	23	I'd suggest changing "Increases in greenhouse gases" to "Ocean warming caused by the rising concentrations of greenhouse gases là" as it is not the greenhouse gases (or the air pollution) that are directly causing the increase. And is there really a trend in activity, or the occurrence of especially high intensity hurricanes?	The text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. Regarding hurricane activity, we refer the reviewer to Vol. 1, Chapter 9 which describes the state of scientific knowledge on hurricane frequency and intensity in the observational record, including citations and references.
Michael	MacCracken	144018	Text Region	00a. Climate Science Findings		17	17	31	31	I'd suggest changing "Northeast" to "coastlines of northeastern North America", the plural to account for the western Gulf of Mexico as well.	We appreciate the reviewer's suggestion; however, we feel the wording is clear (the context of tidal flooding makes it obvious that it is the coastal areas that are being discussed), and in addition the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change.
Michael	MacCracken	144019	Text Region	00a. Climate Science Findings		17	17	32	34	This sentence would make more sense and be more convincing if it were explained somewhere in a box that the statistical distribution for most climate variables is a bell-shaped curve and that a shifting of the average toward a greater likelihood or intensity tends to lead to a seemingly disproportional increase in extreme conditions/outcomes.	We appreciate the reviewer's suggestion and are familiar with the graphic they describe; however, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change, nor is it possible to add boxes containing new content to this summary.
Michael	MacCracken	144020	Text Region	00a. Climate Science Findings		17	17	39	39	The word "decades" needs to be deleted, or at least changed to "centuries" or even "many centuries". It might be useful to say with respect to mid-20th century conditions.	We appreciate the reviewer's suggestion; however, we feel the wording is accurate. NCA4 Vol. 1 Chapter 4 describes a commitment scenario where equilibrium temperature stabilizes over decades (recognizing of course that other impacts continue to play out over centuries to millennia). In addition, the text in the high-level climate science summary is a verbatim extract from the Climate Science Special Report which serves as Volume 1 of the Fourth National Climate Assessment. This document was published in November 2017 and its text is not subject to change. We refer the reader to Vol. 1 Chapters 4 and 15 for more information on the origin of "decades to millennia".

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Angelica	Marchi	144769	Whole Chapter	00a. Climate Science Findings						The report should remove the unsupported major claim in that "… emissions of greenhouse gases, are the dominant cause of the observed warming…" The claim (that CO2 causes global warming) is unsupported by any valid method that has been properly published and peer reviewed. If report authors believe that there is a valid method published anywhere to support this claim, then please put the citation/reference number for that method at end of the key sentence, so the supporting logic/method can be easily and unambiguously located, and properly checked. If no proper reference can be located, then the claim (that CO2 causes global warming) should be removed from the Executive Summary and throughout the report text. The report's key claim -- that CO2 increase causes global warming -- is so important that it should be covered by its own chapter in the report, which should clearly state the method used to support the claim. What method was used (to show that CO2 causes global warming), who did the research, where is this documented (clear citation), who did the review? Does this alleged supporting document actually state the conclusion and describe the method and analysis used to reach the conclusion about CO2? What method was used? To my knowledge, no one (not IPCC, EPA, NSF, NOAA, NAS, etc) has ever cited the proper reference for this key claim because the proper scientific research has never been done -- no funding agency ever sought to fund research using the scientific method to test (ie., attempt to falsify) the hypothesis that CO2 causes warming.… because that would be political heresy. So, the correct method for testing the hypothesis has been ignored, and instead an undocumented or unvalidated method has been used. Despite these multiple federal agencies spending over $7billion/year of the public's money on research… none of their so-called scientists had the good sense to actually apply the scientific method or to ever ask: What is the best way to test this hypothesis? https://www.gao.gov/key_issues/climate_change_funding_management/issue_summary. Although the Report is not clear about what method the authors believe justifies their major statement that "… emission of greenhouse gases, are the dominant cause of the observed warming…" the reader can make a guess. The chapter texts hint at two possible reasons (both invalid) for why the authors would believe in their claim that CO2 increase causes global warming: (a) "It's just physics" and (b) The models say so. "It's Just Physics." The authors' belief is shown by this sentence at end of CSSR Chapter 4: "The first statement regarding additional warming and its dependence on human emissions and climate sensitivity has high confidence, as understanding of the radiative properties of greenhouse gases and the existence of both positive and negative	The reviewer appears to be unaware of the vast body of literature on detection and attribution that has been published to date. The reviewer also appears to be unaware that this document is a summary of the Fourth National Climate Assessment Volume 1, which was published in November 2017 and can be accessed at science2017.globalchange.gov. The text in this summary is a direct quotation from that document, which summarizes the state of scientific understanding on this topic based on the peer-reviewed literature. We refer the reviewer to Volume 1, in particular Chapters 2 and 3, for more information on the scientific understanding of climate forcing and the scientific basis for the attribution of observed climate change, including relevant citations and references.
Sally	Sims	141563	Whole Page	00b. Report Findings		22				Include national security as an impact category in this summary (and in the NCA4 Report) (add on page 22, line 29, as a new numbered section). Suggested text: The US Department of Defense (DOD) Natural Resources Program has been proactive on coordinating management actions to protect endangered and threatened species on DOD-owned lands and incorporating climate change into natural resource management. DOD expects national security to be compromised or threatened by a variety of climate impacts, which also intersect with natural resource management. These impacts include physical impacts on infrastructure on US military bases, disrupted food security, and increases in terrorism and domestic and international climate refugees (Citation: U.S. Department of Defense, Quadrennial Defense Review 2014).	We do not believe that the level of coverage of national security in the underlying report warrants its own category. However, it is mentioned in the "Interconnected Impacts" finding. There is also reference to DoD vulnerability assessment and adaptation activities in sections 1.3 and 1.4 of the Overview.
Louis	Iverson	141564	Whole Page	00b. Report Findings		20				Add text (already in the report in Ch 1, page 34, lines 5-12) to the report findings section. Add the following text at Ch 00b, page 20, line 4 before "Where changes". Start "Where changes" in a new paragraph following. Climate change has already had observable impacts on biodiversity and ecosystems throughout the United States, including changes in the characteristics of species that affect how humans interact with them and the benefits they provide to society. Climate change is producing large scale shifts in the distribution and abundance of species and is altering ecosystems on land and in the oceans. Many species are shifting their ranges in response to climate change, and changes in the timing of important biological events are occurring. Climate change is also aiding the spread of invasive species, which is recognized as a major driver of biodiversity loss and produces substantial ecological and economic costs globally (Ch. 7: Ecosystems).	We have revised the text in the first part of the paragraph to reflect the revisions suggested here, including reference to invasive species and shifts in native species migration. However, we retained most of the existing paragraph as it was because we want to bring forward a more human / societal element to these Report Findings than is presented in the proposed text in this comment, which focuses squarely on the ecosystems themselves - and not the human relationship to them.
Kathy	Lynn	141866	Text Region	00b. Report Findings		19	19	7	9	1. Weather is not climate. Unless it is shown that the extreme events being referred to herein are due, not to weather, but a change in the climate, reference to what may be weather events do not belong in this document.	We disagree. Extreme weather events reveal the vulnerabilities communities face. As such their inclusion in this document that "assesses the science of climate change and variability and its impacts across the United States, now and throughout this century" is appropriate. As such, we have not revised the text.
Sean	Birkel	142060	Whole Chapter	00b. Report Findings						pp 19-23, Paragraphs 1-12: If these claims were true then how is it that the US has grown so prosperous since the 1900s? You have just finished stating that massive, historically unprecedented climate changes occurred in the past century, especially in the past few decades. It is a matter of historical record that throughout this period the quality of life in the US just kept going up and up. Now you say that the next increment of warming will be completely different and will lead to ruin across the land. No exceptions, no caveats, no qualifications: you are asking the reader to forget the pattern that held up to now and take your word for it that disaster is coming. If you really believe that, then you owe it to the readers to be convincing, not cartoonish and apocalyptic. As one example, the opening phrase "cascading disruptions and damages in interdependent networks of infrastructure, ecosystems and social systems" reads like a Hollywood disaster flick - i.e. fiction. You have a very evocative style, but it sets a tone at odds with the expectation that this is a serious scientific document. Additionally, you are making unsupported assumptions about the costs and benefits of policy. You say that (paragraph 2) "without efforts to reduce carbon emissions and adapt to climate impacts, climate change is projected to cause substantial damage to the U.S. economy." But the models that tell you this also tell you that *with* efforts to reduce carbon emissions, climate change is projected to cause substantial damage to the U.S. economy: in other words, the policy measures will not prevent or even mitigate the damages. So, you should not refer to them as if their enactment would make any difference. The only policy measures that would appreciably change the warming trajectory involve very extreme reductions in carbon emissions that, on any mainstream reckoning, would cost far more than the value of the avoided damages. If you are prepared to point that out then you can discuss policy, but otherwise stick to the science.	The text has been edited to clarify levels of damage expected under different emissions levels. The comment about the affect of policy measures on the warming trajectory and associated costs is inconsistent with findings in the Mitigation chapter and elsewhere in the report; therefore, no revisions were made.

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Allison	Crimmins	142075	Text Region	00b. Report Findings		19	19	5	5	This sentence says that risks are projected to intensify without adaptation, but it could be argued that the risks will intensify with or without adaptation. Yes, mitigation could mitigate these risks. But adaptation is in part about what you do after the fact, after the risk is imminent. There are, of course, adaptation measures that could be made in preparation for the risks, but I worry that this phrasing makes it sound like we can adapt our way out of risks. We can't- we can adapt our way out of damages, but not out of the risk. And adaptation comes with it's own set of costs. Suggest rewording to: "Climate change exacerbates existing vulnerability and creates new risks in communities across the United States. " I would also alter the end of the following paragraph to drop this toss-away mention of adaptation or mitigation. It is already better characterized in finding 2 and 12.	We have revised the Report Finding so it now reads: "Climate change creates new risks and exacerbates existing vulnerabilities in communities across the United States, jeopardizing economic growth, human health and safety, and quality of life." We have also deleted the last sentence of the supporting paragraph and replaced it with "Prioritizing adaptation actions for the most vulnerable populations would contribute to a more equitable future within and across communities, and global action to mitigate greenhouse gas emissions will substantially reduce climate-related risks for these populations."
Allison	Crimmins	142076	Text Region	00b. Report Findings		19	19	7	14	This text is rather vague and jargon-filled (e.g. "interdependent networks" -what even is that?). I would recommend using bolder, more concise language. For example: "More intense weather and climate extremes will continue to damage the infrastructure, ecosystems, and social systems that provide essential goods and services to communities". That is 10 words shorter, much easier to understand, and doesn't sound like you're quibbling or unsure about whether weather extremes will happen . Note that you mention "new risks" in the italicized text, but do not explain what those are in this underlying paragraph. Because #12 is on adaptation and mitigation, suggest not including it here. The way it is phrased in #1 seems to be contradicted by the #2 finding.	We have revised the first sentence of this supporting paragraph to read: "More frequent and intense extreme events will continue to damage infrastructure, ecosystems, and social systems that provide essential goods and services to communities." We have replaced the last sentence of the paragraph with "Prioritizing adaptation actions for the most vulnerable populations would contribute to a more equitable future within and across communities, and global action to mitigate greenhouse gas emissions will substantially reduce climate-related risks for these populations." We have maintained the reference to "new risks" because we feel that these are covered well in the remaining report findings. We have made edits to ensure that text in the #1 finding is consistent with phrasing in the #2 finding.
Allison	Crimmins	142077	Text Region	00b. Report Findings		19	19	20	22	Simplify by deleting "many of which are expected to.... over the coming century". First of all, you just told us that in the CSSR overview. Second, you say it already by saying "increasingly disrupted" and "increasingly affected" in the sentence before and after this one. Keep these sentences short and to the point.	We have deleted the text, as suggested in this comment.
Allison	Crimmins	142078	Text Region	00b. Report Findings		19	19	26	26	Why just "carbon emissions" and not GHG emissions? I've noticed this in a few places.	We have replaced "carbon" with "greenhouse gas" here and the three other instances in the Report Findings section, where it was appropriate to do so.
Allison	Crimmins	142079	Text Region	00b. Report Findings		20	20	1	2	Delete everything after the semi-colon. This is not a key finding. I could replace the word "water" with literally every other sector in this report and this sentence would remain the same. Adaptation is already covered in #12.	We have deleted the text, as suggested in this comment, and have added text reading "Water management strategies that account for changing climate conditions can help prepare the Nation for present and future risks to water security, but implementation of such practices remains limited." This text is consistent with findings of the Water chapter, and offers a perspective on adaptation that is specific to the water sector.
Allison	Crimmins	142080	Text Region	00b. Report Findings		20	20	9	10	Suggest: "Changes in temperature and precipitation drive by climate change increase air quality risks from wildfire, ground-level ozone (smog), and allergens."	We have revised the text to read: "Changes in temperature and precipitation are increasing air quality and health risks from wildfire and ground-level ozone (smog)." We have added a separate sentence to address allergens: "The frequency and severity of allergic illnesses, including asthma and hay fever, are expected to increase as a result of a changing climate."
Allison	Crimmins	142081	Text Region	00b. Report Findings		20	20	15	16	Any reason the other populations of concern were omitted here? People with disabilities, people with pre-exiting health conditions, certain occupations, tribal communities, etc.?	The existing text reflects Key Message 2 in the Health chapter. The full list of populations of concern in that chapter is a full paragraph and is too long for inclusion here; we have chosen to include those reflected in their high level messaging. We have changed the text to read "populations including..." to better indicate that the list is not intended to be exhaustive.
Allison	Crimmins	142082	Text Region	00b. Report Findings		20	20	9	19	There is no mention of mental health in this section, though it was an entire chapter of the health assessment. Consider adding that in. Would also recommend moving the sentence on adaptation to the key finding on adaptation. It is too redundant here for a high level overview of report findings.	A sentence on mental health has been added: "Extreme weather and climate events can have lasting mental health consequences in affected communities, particularly if they result in degradation of livelihoods or community relocation." More specific text on mitigation and adaptation has also been added: "Adaptation and mitigation policies and programs that help individuals, communities, and states prepare for the risks of a changing climate reduce the number of injuries, illnesses, and deaths from climate-related health outcomes. Many emission sources of greenhouse gases also emit air pollutants that harm human health. Addressing these common emission sources will both mitigate climate change and immediately improve air quality, benefiting human health."
Allison	Crimmins	142083	Text Region	00b. Report Findings		21	21	10	11	So, my take-away from this last sentence is that this problem is already being handled and I don't need to worry about it. This clashes with the strong, bold sentence above that says transformative impacts cannot be avoided without reductions in carbon (not all GHGs?) emissions. Many of these report findings have these vague statements about adaptation options existing, with no real quantitative substance or evaluation of their impact or reason for their being in a key finding. This does not seem responsive to NAS suggestions for inclusion of adaptation. Rather it is confusing to the reader. There seems to be an effort to stick the word "adaptation" in where possible, without scientific research to back it up, and at the expense of talking about mitigation. In this finding, the reader isn't even told what kind of adaptation strategies the literature has found that addresses emerging ecosystem impacts, or how they do so. Just that there are strategies. Suggest deleting this sentence as it is redundant to #12.	This section has been edited to read: "Adaptation strategies, including prescribed burning to reduce fuel for wildfire, creation of safe havens for important species, and control of invasive species, are being implemented to address emerging impacts of climate change on valued ecosystems and natural resources. However, many impacts, including losses of unique coral reef and sea ice ecosystems, can only be avoided by significantly reducing carbon dioxide emissions." We have also added more specificity to the adaptation statements in other report findings.
Allison	Crimmins	142084	Text Region	00b. Report Findings		21	21	17	28	Suggest including wildfire. Also on line 23, you may want to put the word "crop" outside the parentheses. Also, why mention adaptation strategies and not mitigation strategies? What are these adaptation strategies? How do they work? Could I put this exact sentence at the end of every single one of these key findings? So, then, is it really a key finding of agriculture?	Wildfire has been added and parentheses have been removed. More specifics on adaptation strategies have been included as well as a reference to their relationship to levels of mitigation.
Allison	Crimmins	142085	Text Region	00b. Report Findings		21	22	30	2	This is the best key finding yet. Well written, clear, examples provided, bold statements, no vague mention that some sort of adaptation strategy exists somewhere.	The authors appreciate this comment.
Allison	Crimmins	142086	Text Region	00b. Report Findings		22	22	6	7	Again, why just carbon emissions? Again, I could take everything after the semi-colon and put it in any of these key findings and it would make perfect sense. How is this a finding specific to ocean and coasts?	"Carbon emissions" has been changed to "greenhouse gas." The Coastal Effects chapter specifically addresses the potential for coastal impacts to have cascading impacts on the rest of the country. More specifics on impacts on coastal energy and transportation infrastructure and cascading impacts to the larger economy have been added to the underlying paragraph.
Allison	Crimmins	142087	Text Region	00b. Report Findings		22	22	9	16	This paragraph is very well-written and, unlike many other findings, has more specifics about mitigation and adaptation that help me understand why these topics are addressed in the oceans and coasts section. This tells me what will happen even under a low emissions scenario- great! It tells me about the sort of economic impacts I'll expect- not just that economic impacts will happen generally. Great! And it tells me that specific adaption measures (to guard against coastal flooding) will have an impact on economic losses, instead of just saying that adaptation strategies exist and can generally help. Great! Suggest using this as an example to edit other key findings.	The authors appreciate this comment and have edited other report findings based in part on this model.
Allison	Crimmins	142088	Text Region	00b. Report Findings		22	22	33	34	Suggest rewording "added stressor". This is a bit jargon-y and begs the question "added to what?". In the second sentence you say "additional risks". Additional to what?	This phrasing has been removed.
Allison	Crimmins	142089	Text Region	00b. Report Findings		22	22	35	36	This sentence reads "Events that lead to disruption and damage can result in more frequent and longer-lasting disruptions". What?	This text has been removed.

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Allison	Crimmins	142090	Text Region	00b. Report Findings		22	22	33	40	This paragraph needs substantial revision. It is very unclear what the message is meant to be- it seems as if the authors are confused themselves. It makes me wonder if this even rises to the level of a report finding. A phrase that gets across "it's complicated" in key finding #1 would cover this. At least, suggest picking "interconnected" and drop "interdependent". Suggest dropping the last throw-away sentence about some vague sort of efforts to address the problem (you never say what they are or how they'd address the problem). Suggest making this paragraph about the fact that much of the climate research focuses on impacts on one sector/impact/area at a time, when in the real world that's not how it works. AND definitely let me know why I should care about that. Does it mean that our efforts to understand the impacts of climate change are underestimating the potential impact by missing these connections? While we catalog the individual impacts of climate change, are the true impacts greater than the sum of the parts- and therefore there is even more urgent a need to take action?	This paragraph has been rewritten to address these and other comments: "Climate change presents added risks to interconnected systems that are already exposed to a range of stressors such as aging infrastructure, land-use changes, and population growth. Extreme weather and climate impacts on one system can result in increased risks or failures in other critical systems, including water resources, food production, energy and transportation, public health, international trade, and national security. The full extent of climate change risks to interconnected systems, many of which span regional and national boundaries, are greater than the sum of risks to individual sectors and cannot be understood in isolation. Failure to anticipate interconnected impacts can lead to missed opportunities for managing the risks of climate change and can also lead to management responses that increase risks to other sectors. Joint planning with stakeholders across sectors, regions, and jurisdictions can help identify critical risks arising from interaction among systems ahead of time."
Allison	Crimmins	142091	Text Region	00b. Report Findings		23	23	1	3	This key finding says it is about adaptation and mitigation. But then it only talks about adaptation in the italicized text. And that text only tells me that someone is working on the problem somewhere- not how they're doing it or whether it will be effective. Just that strategies exist. Is that really a finding that is key? Can you take some of the better (less vague) adaptation sentences from the above findings to rebuild this key finding?	This finding has been edited to reflect both adaptation and mitigation findings and includes more specifics on adaptation to date. Greater specificity has been added to mention of adaptation activities in the other findings.
Allison	Crimmins	142092	Text Region	00b. Report Findings		23	23	5	10	This paragraph needs substantial revision. Delete the second sentence- it tells me nothing. Make the last sentence the first sentence. Then, explain to me what sorts of adaptation strategies the literature found to be effective and how. What impacts are we avoiding, what ones can we not avoid? Tell me something about the timing and cost of adaptation strategies. Importantly, there is nothing in this paragraph about mitigation. Either add it to this paragraph or separate it out into it's own key finding, which seems like it would come before adaptation.	This finding has been rewritten completely and now includes this language: "While adaptation can reduce damages in a number of sectors, early and substantial global greenhouse gas emissions reductions are essential to avoid more severe consequences in the long term. Current actions do not yet approach this scale. " Greater detail on effective adaptation strategies has been added to the other report findings.
Juanita	Constible	142445	Text Region	00b. Report Findings		19	19	25	29	The last sentence in this paragraph is a bit hard to follow. Recommend breaking into two sections.	We broke this long sentence into two sentences.
Juanita	Constible	142446	Text Region	00b. Report Findings		20	20	9	19	Please consider mentioning mitigation in this paragraph along with adaptation, given the combined effects of traditional air pollutants (e.g., NOx and SOx) and climate change on air quality. Furthermore, efforts to cut emissions over the long-term will have near-term health benefits.	Text responding to this comment has been added: "Many emission sources of greenhouse gases also emit air pollutants that harm human health. Addressing these common emission sources will both mitigate climate change and immediately improve air quality, benefiting human health."
Social Science	Coordinating Committee	143248	Whole Chapter	00b. Report Findings						This section should also provide a summary of key findings for the 'urban areas'.	This issue is broadly covered in the Health, Infrastructure, and Oceans & Coasts findings.
Union of Concerned Scientists	Union of Concerned Scientists	143682	Whole Chapter	00b. Report Findings						It was somewhat surprising and confusing that the overall "NCA4 Report Findings" did not align with the sector chapters fully.	The intent was to provide a more synthetic summary of what the entirety of the underlying report concludes - not just a one-to-one distillation of the sectoral issues. Moreover, the assessment revealed that cross-cutting issues that do not have a singular home in the report warrant greater visibility.
Union of Concerned Scientists	Union of Concerned Scientists	143683	Text Region	00b. Report Findings		21	21	13	15	Other key things worth emphasizing at this level could be: changing seasonality, decreasing resilience to extreme events, increasing loss of natural resources that farms and ranches depend on in the longterm (soil, clean water, clear air)	Soil erosion and changes in water availability are mentioned in the text. Wildfire on rangelands is mentioned in the finding itself. In the Agriculture chapter, longer growing seasons are discussed in the context of effects on pollen allergies, which are covered in the Health finding.
Union of Concerned Scientists	Union of Concerned Scientists	143684	Text Region	00b. Report Findings		21	21	18	18	Health of rural communities doesn't seem to fit here	This has been changed to "economic health."
Union of Concerned Scientists	Union of Concerned Scientists	143685	Text Region	00b. Report Findings		21	21	25	26	These changes threaten more than just commodity grain production, and also put individual farmers and ranchers at risk. Consider rephrasing to acknowledge this "These changes threaten the livelihoods of farms and ranches across the U.S. Furthermore, they threaten major components of the current agricultural sector, including commodity grain production, putting the economics of agriculture regions at risk. These impacts will affect farms of all sizes. Levels of food security may also rise as a result of these impacts.	The following text has been added: "These changes threaten future gains in commodity crop production and put rural livelihoods at risk." The text on food security and small versus larger farms is not covered in the underlying chapters; no change.
Union of Concerned Scientists	Union of Concerned Scientists	143686	Text Region	00b. Report Findings		21	21	26	28	This statement may give the impression that adaptation is well on its way, and also doesn't mention what the scope of the strategies could be. Consider reframing to highlight some potential strategies, risks and levels of change and needed investment to acheive widespread adaptation.	The following text has been added to address this and other comments: "Numerous adaptation strategies are available to cope with adverse impacts of climate variability and change. These include altering what is produced, modifying the inputs used for production, adopting new technologies, and adjusting management strategies. However, these strategies have limits under severe climate change impacts and require sufficient long- and short-term investment in changing practices. In some regions, adapting to longer-term climate changes will likely require long-term changes and proactive investment in management, including regional shifts of agricultural practices and enterprises."
Michael	MacCracken	144021	Text Region	00b. Report Findings		19	19	11	14	Actually, "mitigation" will, for quite along period, only reduce the rate of increase of these problems. While adaptation can reduce or possibly even eliminate vulnerability, this is not the case for mitigation--and I think this needs to be made clearer here (i.e., that we cannot avoid at least some more change, even if we went to zero emissions).	We have deleted this sentence entirely based on other comments noting the lack of clarity in the sentence and the fact that the intent appeared to be captured better in other Report Findings.
Michael	MacCracken	144022	Text Region	00b. Report Findings		19	19	17	18	The phrasing here makes it seem adaptation and mitigation won't be of any use at all--giving the impression that there is no reason to do them. The phrasing needs to be changed to something like "even though mitigation and adaptation efforts can moderate impacts and their future growth"	We have revised this finding to read: "Without aggressive global mitigation and regional adaptation efforts, climate change will increasingly cause losses to American infrastructure and property and impede our economic growth over this century."
Michael	MacCracken	144023	Text Region	00b. Report Findings		19	19	20	20	It would read smoother if this said "being disrupted"	We disagree; the phrase "expected to increasingly disrupt" relays a finding based on projections while "being disrupted" refers to something occurring in the present. As a result, the suggested modification would change the sentiment of the Report Finding and we have, therefore, not changed the text.
Michael	MacCracken	144024	Text Region	00b. Report Findings		19	19	23	23	On the use of "will", this is making the assumption that there is nothing that cannot be done to adapt and reduce vulnerability, etc. I'd suggest adding a caveat here in some way indicating that the impacts can possibly be moderated in some ways. And, if the US is being less affected than many developing countries, is the sign of the competitiveness really clear? I would also suggest mentioning that it is not just the weather/climate related changes themselves that are the issue, but also the associated impacts. For example, it may well be that climate-related impacts on agriculture in multiple regions may well put the global economy at risk--so associated impacts really do need to be mentioned.	We have revised this finding to read: "Without aggressive global mitigation and regional adaptation efforts, climate change will increasingly cause losses to American infrastructure and property and impede our economic growth over this century." We have removed the reference to competitiveness. Finally, the point regarding "associated impacts" is implicitly addressed already in the last sentence, so no change to the text has been made.
Michael	MacCracken	144025	Text Region	00b. Report Findings		19	19	27	27	I'd suggest changing "climate impacts" to "the changing climate conditions and sea level rise" as it is these one tends to adapt to. One might account for (or reduce vulnerability to) various types of impacts, but it is the changes themselves that one tries to adapt to.	The existing text is more concise and consistent with how this is addressed throguhout the report, so we have not revised the text in light of this comment.
Michael	MacCracken	144026	Text Region	00b. Report Findings		19	19	29	29	How about adding an "unless" phrase, indicating the types of steps that could be taken to reduce these amounts. Also, after inflation, "hundreds of billions of dollars" may not be worth much in the future--might it be useful to refer to percentage of GDP or indicate "in today's dollars" or something.	To address this and other comments, this finding has been changed to "Without aggressive global mitigation and regional adaptation efforts, climate change will increasingly cause losses to American infrastructure and property and impede our economic growth over this century." Regarding the relative value of "hundreds of billions of dollars", the Front Matter has been modified to reflect the fact that all dollar values are given in $2015, where possible, and in the interest of keeping the text concise, we have not revised the text.

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Michael	MacCracken	144027	Text Region	00b. Report Findings		19	19	31	31	Might it also be helpful here to also mention "agriculture and industries" and not leave those uses implicitly in "humans"	In an effort to keep these high-level statements as concise as possible, we have not changed the text and trust the reader will understand that "humans" here includes human systems such as agriculture and industry.
Michael	MacCracken	144028	Text Region	00b. Report Findings		19	19	32	32	Change "is being" to "are being"	We have revised the text to reflect this suggestion.
Michael	MacCracken	144029	Text Region	00b. Report Findings		19	19	33	33	How about changing "risk" to "costs and risks"? It is not just risk being affected. It might even be mentioned that changes in traditional uses are being impacted--such as changing over from lawns to xeric landscaping, recycling of water, and more. Indeed, even the need for desalination plants.	We have added "and costs" to the text to address the first part of the comment, but in the interest of keeping this high-level Report Finding concise, we did not include mention of some of the examples given at the end of this comment.
Michael	MacCracken	144030	Text Region	00b. Report Findings		19	19	36	36	It is not just "risk of drought" but "likelihood and occurrence of drought"--things are happening now, not just presenting a risk of occurrence.	We have not changed the text. The use of "risk" here captures both current and future in a concise way. Moreover, it's not just the "likelihood" or "occurrence" of drought, but also the extent, severity, duration, etc. "Risk" captures all of these elements.
Michael	MacCracken	144031	Text Region	00b. Report Findings		19	19	35	35	I'd suggest changing "interaction ... is" to "interactions ... are"	We have revised the text to reflect this suggestion.
Michael	MacCracken	144032	Text Region	00b. Report Findings		20	20	28	28	I'd suggest changing "increasingly disrupt" to "are projected to increasingly disrupt" and somewhere here introduce an "unless" phrase indicating what needs to be done to reduce the risks and occurrences. It seems to me that at least some hope has to be given to indicate that taking action can make a difference (and this applies throughout this section).	This change has been implemented.
Michael	MacCracken	144033	Text Region	00b. Report Findings		20	20	34	36	Good type of concluding sentence for each of the various points--indicate what can be done, give some hope and reason to act.	The authors are grateful for this comment.
Michael	MacCracken	144034	Text Region	00b. Report Findings		20	20	39	41	Transformative changes are already occurring--for example, the western pine forests in the West are dying (or already mostly dead) and change is already happening. It would be useful to somehow here indicate that these changes are already underway, not just a prospect for the future, as "will" implies. The first sentence of the supporting paragraph on the next page indicates changes are already underway, so it is really a question of revising the summary statement to match the text.	This text has been edited and now reads: "Without aggressive reductions in global greenhouse gas emissions, transformative impacts on some ecosystems will occur. Some ecosystems, such as coral reef and sea ice ecosystems, are already experiencing transformational changes."
Michael	MacCracken	144035	Text Region	00b. Report Findings		21	21	13	14	I'd suggest "disrupt" to "are increasingly disrupting"--the present text is just sort of a statement of a sensitivity, not really clearly indicating that it is going on.	This text has been changed to "expected to increasingly disrupt" to reflect the findings of the Agriculture chapter.
Michael	MacCracken	144036	Text Region	00b. Report Findings		21	21	14	14	Are crop yields really going down? Is not what is happening that various adaptation measures and technological improvements are keeping crop yields up and that what the issue is and is going to be whether such efforts can keep up with climate change. When such changes have been occurring on local to variability and regional changes, adaptation has been able to moderate and overcome adverse impacts, but with change going on everywhere, this is going to become increasingly difficult.	The existing text does not state that crop yields are growing down now. However, for greater clarity about future impacts this sentence has been edited to read "Climate change presents numerous challenges to sustaining and enhancing crop productivity, livestock health, and the economic health of rural communities."
Michael	MacCracken	144037	Text Region	00b. Report Findings		21	21	15	15	Is not the agricultural economy in the US really booming? What is threatened are the small farmers who are increasingly facing conditions that they cannot, as individuals, really deal with. So, the overall economy does well, but individual farmers suffer. I think this is what we came up with in the first national assessment--and it is a real distinction to be made. When individual farmers tend to keep to their practices, they end up becoming too poor (through successive bad years) to have the resources to change to new practices, so they go broke and suffer and some newcomer comes (perhaps for a big company) and takes over and starts up with different practices until they too get overcome by the changes. So, the economy does okay, but the individual farmers suffer. [Given IPCC sometimes has said that productivity of US agriculture is projected to increase, one has to explain how climate change can be bad for at least some of those involved and the communities they live in.] Also, climate change modifies competitive relationships among regions, and who can grow each crop most cost efficiently and reliably, and so adaptation is not just to the particular situation for a particular farm, but also has to consider the national and international farm economies and changing cost and other advantages and disadvantages, requiring ongoing evaluation of all sorts of information that can really complicate the situations faced by farmers and is sure to lead to more and more challenges and failures (and if all farmers in a region happen to make the same bad decision, then overall performance can be affected, etc.). Really important to be clear on difference between overall economy and the well-being and success of particular farmers and particular regional agricultural economies.	We have added text on changes in the viability of particular agricultural enterprises in regions. While the Agriculture chapter discusses the higher vulnerability of rural communities due to limited infrastructure and social services, neither the Agriculture chapter nor the applicable regional chapters address relative economic effects on individual farmers versus the larger sector.
Michael	MacCracken	144038	Text Region	00b. Report Findings		21	21	17	18	Suggest changing "to crop" to "to sustaining and enhancing crop"--more literally correct. I'd also suggest changing "health" to something like "economic health" or "economic viability" or something to indicate this is about the well-being and economic strength of rural communities and not about individual health (of course, depression about the worsening situation may lead to opiod use and declining physical health, but I don't think that is what is meant here).	This change has been implemented.
Michael	MacCracken	144039	Text Region	00b. Report Findings		21	21	23	23	Care needs to be taken here with use of the word "yields", which usually refers to production per acre, and often for good conditions, etc. Yes, yield in particular regions for particular crops can be affected due to a particular weather situation (that happens all the time due to variability, etc.), but this problem is usually overcome by each farmer planting the crop likely to return the best investment for the particular situation they face. What I understand is more seriously threatened is likely overall production of the collective agriculture industry rather than yield (it will likely be good in some locations and situations and not in others). And the difference between effects on yield versus overall production needs to be clearly made because how one responds to each type of challenge is different.	The agriculture chapter finds that "yields from major U.S. commodity crops are expected to decline as a consequence of higher temperatures," so no change has been made. However, the first sentence of the supporting paragraph now reads: "Climate change presents numerous challenges to sustaining and enhancing crop productivity, livestock health, and the economic health of rural communities."
Michael	MacCracken	144040	Text Region	00b. Report Findings		21	21	26	28	I'd suggest changing "There are" to "There potentially are"--the on-the-ground real situation really can matter. Theoretically, universities and agricultural centers can develop need strains of a seed, etc.--but that doesn't mean they can do it fast enough for everyone so that real adaptation can occur. And, if we don't as a country invest in this, it won't happen. So, do add "potentially" and then add a phrase at the end of the sentence something like, "assuming that sufficient long-and short-term investment is made in transforming possibilities into practice."	The following text has been added to address this and other comments: "Numerous adaptation strategies are available to cope with adverse impacts of climate variability and change. These include altering what is produced, modifying the inputs used for production, adopting new technologies, and adjusting management strategies. However, these strategies have limits under severe climate change impacts and require sufficient long- and short-term investment in changing practices. In some regions, adapting to longer-term climate changes will likely require long-term changes and proactive investment in management, including regional shifts of agricultural practices and enterprises."
Michael	MacCracken	144041	Text Region	00b. Report Findings		21	21	30	30	I think "services" here is insider jargon. How about for the public saying something like "benefits and functions"?	This text has been changed: "Outdoor recreation, tourist economies, and quality of life are reliant on benefits provided by our natural environment that will, in many ways, be degraded by the impacts of climate change."
Michael	MacCracken	144042	Text Region	00b. Report Findings		21	21	34	34	Why not use "and" instead of "or"?	This change has been implemented.
Michael	MacCracken	144043	Text Region	00b. Report Findings		21	21	35	36	It is not obvious how the "health" of these people is directly affected, and that does not seem to be mentioned in the paragraph (well, except of "loss of identity", but given how fast the whole world is changing, this seems a pretty general problem. It also might be said here (as is then explained later) that such changes can affect the economic well-being of the communities and not just the individuals.	"Health" has been removed.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144044	Text Region	00b. Report Findings		21	21	36	38	I would think that winter recreation (e.g., skiing) merits special mention as an example.	A reference to winter recreation with regional detail has been addedd.
Michael	MacCracken	144045	Text Region	00b. Report Findings		22	22	5	5	Just to note that for a parallel structured comment in point 6, the second phrase was made into an independent point. Being consistent would likely be helpful and I think having two sentences rather than one would be helpful to the reader.	This change has been implemented.
Michael	MacCracken	144046	Text Region	00b. Report Findings		22	22	9	10	Might higher waves due to more powerful storms and the melting back of sea ice also be worth mentioning?	"Retreating arctic sea ice" has been added.
Michael	MacCracken	144047	Text Region	00b. Report Findings		22	22	10	13	Very strange punctuation and phrasing of this sentence.	This sentence has been edited to read: "Rising water temperatures, ocean acidification, retreating arctic sea ice, sea level rise, high tide flooding, coastal erosion, higher storm surge, and heavier precipitation events threaten our oceans and coasts."
Michael	MacCracken	144048	Text Region	00b. Report Findings		22	22	14	14	Change "is expected" to "are expected"	The existing sentence is grammatically correct -- "is" refers to "lasting damage." No change.
Michael	MacCracken	144049	Text Region	00b. Report Findings		22	22	14	15	Why only to "personal financial loss"? There are lots of businesses, big and small, along coasts, and then investments in/services for them by banks and insurance carriers can also put whole companies at risk (or in Florida given they self insure hurricane damage, the economies of whole states).	"Businesses" has been added to this sentence.
Michael	MacCracken	144051	Text Region	00b. Report Findings		22	22	18	20	It might also be noted that their adaptive potential is limited by the small extent of their communities such that they cannot, as communities, easily relocate, and also that the ecological ranges of natural flora and fauna on which they have traditionally and culturally been dependent on and tied to, and shift to well beyond the locations of reservations to which they are tied by cultural affinities, etc. So, the notion of moving to adapt is much less an option open to them and changing what they do disrupts the cultural traditions and societal interactions that anchor their lives. So, I think a sentence needs to be added about how at least some adaptation approaches would require a level of disruption to their societies that is greater than for those from the western cultures that don't nearly as closely tie individuals to their natural environment as do Indigenous communities.	The first sentence of the underlying paragraph has been changed to: "Many Indigenous peoples are reliant on natural resources for their economic, social, and physical well-being, and are often uniquely affected by climate change," and another sentence has been added that addresses this issue: "In many parts of the United States, Indigenous peoples are considering or actively pursuing community relocation in response to climate-related impacts, presenting challenges to maintaining cultural and community continuity."
Michael	MacCracken	144052	Text Region	00b. Report Findings		22	22	22	22	Needs a period after "tourism"--or maybe say "tourism and more." Then start a new sentence.	This text region has been edited and now reads: "Many Indigenous peoples are reliant on natural resources for their economic, social, and physical well-being, and are often uniquely affected by climate change. The impacts of climate change on water, land, coastal areas, and other natural resources, as well as infrastructure and related services, are expected to increasingly disrupt Indigenous peoples' livelihoods and economies, including agriculture and agroforestry, fishing, recreation, and tourism."
Michael	MacCracken	144053	Text Region	00b. Report Findings		22	22	23	24	I'd suggest changing this to read: "Indigenous communities, which rely proportionately more on these resources and economic sector to support their economic, social, and physical well being, will face more difficult challenges than other communities as …" I think this would help to more clearly indicate the special problems that such communities face.	This text region has been edited and now reads: "Many Indigenous peoples are reliant on natural resources for their economic, social, and physical well-being, and are often uniquely affected by climate change. The impacts of climate change on water, land, coastal areas, and other natural resources, as well as infrastructure and related services, are expected to increasingly disrupt Indigenous peoples' livelihoods and economies, including agriculture and agroforestry, fishing, recreation, and tourism."
Michael	MacCracken	144054	Text Region	00b. Report Findings		22	22	30	30	I'd suggest changing "are vulnerable" to "will become increasingly vulnerable"	This finding now reads: "Climate change affects the natural, built, and social systems we rely on individually and through their connections to one another. These interconnected systems are increasingly vulnerable to cascading impacts that are often difficult to predict, threatening essential services within and beyond the Nation's borders. "
Michael	MacCracken	144055	Text Region	00b. Report Findings		22	22	37	38	That this is the only place that "national security" (meaning military considerations) is mentioned suggests that it would be useful adding another finding relating to what the military leaders are saying about the significance to their mission of climate change--which has generally been more clearly recognized and being taken on as a challenge than for many other communities and sectors across the United States. There is plenty of documentation of what the military's concerns and challenges are--mention, or at least reference, needs to be made, including by having a separate point in this summary.	We do not believe that the level of coverage of national security in the underlying report warrants its own category. However, it is mentioned in the "Interconnected Impacts" finding. There is also reference to DoD vulnerability assessment and adaptation activities in sections 1.3 and 1.4 of the Overview.
Michael	MacCracken	144056	Text Region	00b. Report Findings		23	23	5	9	And no mention of the national security challenges here, where they could also be mentioned, including highlighting the types of efforts of the defense community.	National security is mentioned in the "Interconnected Impacts" finding. There is also reference to DoD vulnerability assessment and adaptation activities in sections 1.3 and 1.4 of the Overview. No change.
Michael	MacCracken	144057	Whole Chapter	00b. Report Findings						I was surprised to see virtually no mention about how what is happening out in the rest of the world will affect the US, so areas covered by national security community, environmental refugees, spread of infectious diseases through international travel, impacts on US investments and interests overseas, and more. I would think that some sort of summary point is needed with respect to such impacts, changing relative well-being and environmental threats to some nations, etc. Pretty clearly, the press of advancing society will be seen as the cause of the problems, and the U.S. is likely to be seen as the leading force driving such changes through its major companies and expansive economic footprint. So, at least a point is needed that all of this is not really covered here, or if it is, it merits a point.	KF #2 (Economy) and #3 (Interconnected Impacts) include references to the effects on the United States from the impacts of climate change abroad.
Don	Bain	140832	Text Region	01. Overview / Executive Summary		45	45	7	7	The sentence states we may expect 1 to 4 feet of sea level rise but does not provide the corresponding time reference, for example "by 2100."	This text has been removed and we have added a map on U.S. sea level rise projections.
Elizaveta Barrett	Ristroph	140901	Text Region	01. Overview / Executive Summary		25	25	23	23	Relocation is not being "forced," unlike past forced relocations by the US government of Native peoples. Some people can and will remain at Isle de Jean Charles and Kivalina until they die. Suggest deleting the word "forced"	We have deleted this sentence as the content is covered elsewhere and other comments urged us to cut content that is redundant.
Elizaveta Barrett	Ristroph	140902	Text Region	01. Overview / Executive Summary		26	26	12	12	typo--"remains" should be "remain"	This correction has been made, though much of this content has been moved to the Front Matter or deleted in an effort to minimize redundancy, pare back the length of the Overview, and focus on the main findings.
Elizaveta Barrett	Ristroph	140903	Text Region	01. Overview / Executive Summary		33	33	32	33	Because Celsius and Fahrenheit are not ratio variables (there is no true "zero," unlike for distance and age) it does not make sense to say that the Arctic is warming twice as fast as the rest of the planet. Suggest deleting "more than twice as fast as" and inserting "much faster than"	This statement is not accurate. The scientific literature refers to this change occurring "more than twice as fast..." See https://science2017.globalchange.gov/chapter/11/. No change to the text has been made.
Elizaveta Barrett	Ristroph	140904	Text Region	01. Overview / Executive Summary		34	34	2	2	It seems to be over-romanticizing to suggest that all Native communities in the north use ice cellars.….at this point some families, often whaling captains, are using them. Suggest replacing "native" with "some Native."	This suggestion has been implemented.
Elizaveta Barrett	Ristroph	140906	Text Region	01. Overview / Executive Summary		47	47	37	37	it may be an overstatement to suggest that Indigenous peoples are considering relocation in every region of the USA--I am only familiar with planned relocation in Louisiana, the Pacific Northwest, and Alaska. Suggest deleting the phrase "In nearly every region of the United States"	This text has been removed.
Robert	Kopp	141159	Text Region	01. Overview / Executive Summary		41	41	20	21	What wage is assumed here? Are these numbers for the current economy with RCP 8.5, or a future economy? These numbers imply an average wage of $80/hour.	The metric is not purely lost wages, but lost economic productivity. For more detail on the methodology underpinning this analysis, please see: https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=335095
Robert	Kopp	141160	Text Region	01. Overview / Executive Summary		45	45	6	6	"At least several inches" describes global mean sea level rise between 2000 and 2030, but not "in the next fifteen years" (where sea-level rise in the Low scenario would be 4.5 cm).	This text is consistent with Key Message 4 of Our Changing Climate and the Climate Science Special Report. However, this text has been deleted in an effort to shorten this section.
Robert	Kopp	141161	Text Region	01. Overview / Executive Summary		49	49	25	26	I suggest giving an example of a permanent change, such as species extinction.	We have included "..., such as species extinction" at the end of this statement.

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Sally	Sims	141561	Whole Page	01. Overview / Executive Summary		24				Line 28: Delete reliably true and replace it with valid. Insert from between collected and around. Delete em dash and of and replace with include: Line 31: After species and the add timing of periodic or seasonal biological phenomena (i.e., phenology) Line 32: Add a . after seasons. Start next sentence with These observations	We have revised the text to reflect the first and third suggested changes. The remaining text has been deleted or changed so that the comments no longer apply.
Sally	Sims	141566	Whole Page	01. Overview / Executive Summary		42		33		Line 33: After environmental risks to add marine habitats and species, including	The relevant text has been removed.
Sally	Sims	141567	Whole Page	01. Overview / Executive Summary		43				Line 2 should read: such as invasive aquatic and terrestrial (plant) species.	This text has been removed.
Louis	Iverson	141568	Whole Page	01. Overview / Executive Summary		44				Line 29: Add terrestrial between with and species. Line 31: Sentence should read: species to adapt, local extinctions will occur unless adaptation, including identifying and protecting climate refugia, or relocation measures are taken.	The first sentence referenced has been deleted. This text has been added: "Where changes occur too quickly for species to adapt, local extinctions can happen."
Holly	Mallinson	141631	Whole Chapter	01. Overview / Executive Summary						As a private citizen and a retired science teacher who dabbles in climate activism I find this report captivating! Some of the more technical information in this document eludes me but the absolute importance of it does not. This report is extremely comprehensive and fact filled. With so many of the points made regarding the symptoms of a changing climate the report includes a confidence level. So many of these potential problems are stated with the utmost confidence making them terrifying. The data for this report have been collected from far and wide. Many government agencies have worked very hard to produce this invaluable report. The inclusion of the financial assessment for so many of these outcomes of climate change are an important facet. For so many individuals this figure is the bottom line that may get their attention. I am so thankful to all of the individuals involved with this document. They have done a wonderful job of reporting both accurately and thoroughly. My only suggestion is that a very readable or watered down version of this report be "pushed" onto the American people by governments, media, teachers, pulpits and the general public. All Americans need to be knowledgeable about this most important concern.	We appreciate this feedback and continue to explore what derivative products may be most valuable and feasible to ensure the messages are able to be delviered to and digested by as wide an audience as possible.
Jeremy	Martinich	141645	Whole Chapter	01. Overview / Executive Summary						Many people will only read the executive summary. It is critically important to give those readers an understanding of the confidence level and likelihood statements that are used throughout this report. Please consider inserting a figure with the confidence level comments and likelihood in percentages into the executive summary, with a reference to the front matter for the more extensive discussion of those terms.	We made a conscious decision not to include the claibrated uncertainty and confidence language in the Overview as it is intended for a very wide, general audience - not those necessarily versed in reading scientific assessments where such lexicon is commonplace. We include a description of the ncertainty and confidence language in the Front Matter and each chapter contains "Traceable Accounts" that include this calibrated language for those 'specialists' who are versed in digesting such language. Moreover, we have made a concerted effort to ensure that appropriate cveats and context are included wherever necessary to minimize the opportunity for a mischracterization or misinterpretation of a given finding - even without this confidence/uncertainty language given explicitly.
Neha	Gupta	141771	Text Region	01. Overview / Executive Summary		35	35	17	29	The extreme events listed here appear outdated given the intense hurricanes, fires, and winters of late 2017 (and early 2018). It would be more timely and impactful to discuss impacts of Hurricane Maria upon the infrastructure of Puerto Rico (US territory), of Hurricane Harvey upon Houston, of extreme winter temperatures and snowfall experienced in the northeastern and southeastern United States, and intense wildfires of Western United States.	Text on the 2017 hurricane season has been added in the rewritten section 1.3.
Neha	Gupta	141772	Text Region	01. Overview / Executive Summary		39	39	2	4	The phrase "climate models have proven remarkably accurate" is a strong, confident statement and should be moved to earlier in the report, such as the first or second paragraph of the entire chapter, to set the stage for confidence in models and climate science	This text has been added to the projections section in the rewritten 1.2.
Neha	Gupta	141773	Text Region	01. Overview / Executive Summary		39	39	17	19	It would be beneficial to be more specific about the average lifetime of carbon dioxide in the atmosphere, as it is not common knowledge and "long lifetime" is a subjective number that could range from 6 months to centuries. Narrowing in on the range of time of carbon dioxide would be helpful for people of different backgrounds.	Text clarifying the relationship between CO2 emissions, CO2 atmospheric residence time, and natural CO2 removal processes has been added.
Neha	Gupta	141774	Figure	01. Overview / Executive Summary	1	28				This figure is very busy and difficult to understand. The scale of the figure does not merge well with the nature of information presented, particularly the graphs. It would be better if this figure could be broken up by applicable section (e.g. weather and climate), and the information moved to the area in which the topic is discussed more in depth.	This figure has been re-developed into a full 2-page spread for greater accessibility, and the text sections that follow have been reorganized around the Report Findings (rather than indicators). Discussion of these "indicators of change" are now more integrated throughout the rest of the Overview.
Neha	Gupta	141775	Text Region	01. Overview / Executive Summary		37	37	33	35	The wristwatch analogy helps visualize uncertainty in our daily lives quite well and is appreciated. However, due to the nature of technological advancement, other analogies may be more relevant.	We have removed this example and have added the example of a GPS-based phone application that estimates travel time.
Neha	Gupta	141776	Text Region	01. Overview / Executive Summary		43	43	31	31	There is a double-period at the end of the sentence.	This has been corrected.
Neha	Gupta	141777	Text Region	01. Overview / Executive Summary		52	52	27	32	The sentences in this section feel awkwardly worded, and there appears to be an overuse of the semi-colon. Simply breaking up the long sentences into shorter, complete sentences would increase the overall strength and readability of this section.	This text has been shortened and edited for readability.
Jennifer	Jones	141778	Whole Page	01. Overview / Executive Summary		27				The call-out box described on this page does not need to be highlighted within the earlier pages of the overview, where valuable space can be used to highlight the compelling messages included later in the chapter. This call-out box would be better towards the end of the chapter for people who have made it further into the text, as the methodology of the assessment is not as important as the messages of the assessment for the larger public.	This content has been removed.

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David	Iinouye	141781	Text Region	01. Overview / Executive Summary		24	25	36	2	24-36 The long-term warming trend observed over the past century, and accelerated these last decades, can only be explained by the effect that 25-1 all human activities linked to fossil energies and especially emissions of greenhouse gases and aerosols from burning fossil fuels and clearing 25-2 forests, have had on the climate. In accordance with the physical principle of superposition, the range of natural variability becomes more and more negligible in the face of the contribution of human activity of negative flavour. XXXX

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Sarah	Davidson	141987	Text Region	01. Overview / Executive Summary		49	49	30	35	Please add a reference to economic growth since 2014, e.g. "…annual growth in global emissions has slowed while the global economy has grown by X…" to support the statement that "economic growth has been largely decoupled from greenhouse gas emissions".	This text has been removed.
Erica	Brown	142031	Figure	01. Overview / Executive Summary	2	31				It's unclear from how this figure is set up that the text on page 32 is the explanation for the figure; in the final it should be a shaded box to set it apart. The detailed explanation is very helpful.	In the final, laid-out version, the distinction between the figure (and its caption) and the chapter text will be made clearer.
Erica	Brown	142032	Table	01. Overview / Executive Summary	1	33				This will be a useful table for the ES.	We appreciate this feedback and have created a new Fig. 1.1 that illustrates a key, illustrative climate-related impact for each region alongside an existing / ongoing response action to address the risks posed by that impact.
Erica	Brown	142033	Text Region	01. Overview / Executive Summary		55	55	12	36	The NCA is an important document as an evolving, sustained assessment. The new chapters are appropriate and important, particularly the ones on multiple stressors and complex systems. Improvements in how this document can be more useful in decisionmaking are also welcomed. It should be clarified whether NCA4 is a stand alone document that is replacing NCA3, or if it complements and adds to NCA3.	Text clarifying this has been added, including a stand-alone box on "Evaluating Risks to Inform Decisions"
Erica	Brown	142034	Text Region	01. Overview / Executive Summary		25	25	19	20	Should this sentence instead read, "economic gains will be surpassed by cumulative losses by the end of the century unless there are adequate response measures", rather than without adequate response measures?	We have deleted this sentence as the content is covered elsewhere and other comments urged us to cut content that is redundant.
Allison	Crimmins	142093	Text Region	01. Overview / Executive Summary		24	24	3	15	This is a nice paragraph, though it is a little rosy. Sounds like everyone is getting by and doing ok, adapting along to these changes. Nothing to worry about here. As the last sentence says 'sure there are risks, but Americans are doing swell'. Is that the message this report finds from the literature it assessed? There is no mention of mitigation anywhere- just adaptation. Why? There is also no mention of Hawaii or Caribbean or other islands. While I appreciate the sea-to-shining-sea text, I strongly urge the authors to consider what the general reading public should take away from this, and whether you want that message to be "everything is fine". This is a scientific assessment, so to make this statement, there better be scientific citations that show everything is hunky dory. Do you think the native Alaskans would appreciate this report saying they're "coping with infrastructure damaged by thawing ground and heightened coastal erosion" (lines 11-12)? Or are they struggling to relocate their villages and maintain their dwindling heritage, hoping for help from the US government? Are the northeast fishermen (not women I guess) "adjusting" to the hits to their wallet (lines 12-13)? Or are they upset about losing their way of life? Are the people in Houston and Puerto Rico who lost their home this year "adapting to more frequent flooding" (lines 6-8)? Or are they still desperate for federal aid, clean water, and electricity? I can understand the desire to avoid gloom and doom, but this verges on irresponsible and insulting. Of all the paragraphs in this 1500 page report, this is one of the most important and it needs to be better.	This paragraph and the surrounding text have been edited to provide a better sense of scale of the response efforts underway, including references to mitigation, relative to the risks that are being faced. Reference to impacts and actions in all ten NCA4 regions has been added.
Allison	Crimmins	142094	Text Region	01. Overview / Executive Summary		25	25	6	9	Bam! Now that is a sentence. Add in a human element (say, "…intensifying across the country, threats to people's physical, social, and economic well-being are rising, and that these trends…" and then make this thing big and bold.	We have revised the sentence to incorporate these aspects: "It concludes that the evidence of human-caused climate change is overwhelming and continues to strengthen, that the impacts of climate change are intensifying across the country, and that climate-related threats to Americans' physical, social, and economic well-being are rising."
Allison	Crimmins	142095	Whole Chapter	01. Overview / Executive Summary						Chapter 1.1 is, on a whole, very well written. I would suggest completely revamping the first paragraph (see earlier comment on the appropriateness of saying everything is fine) and deleting the last paragraph of 1.1 (it is not needed and the last sentence of the previous paragraph on mitigation and adaptation is much stronger). But everything in between is golden. I particularly appreciated the paragraph on social inequities. Well done.	We appreciate this feedback, have revised the first paragraph, and deleted the last paragraph (moving some of its content to the Front Matter).
Allison	Crimmins	142096	Text Region	01. Overview / Executive Summary		27	27	4	4	Readers do not know what you mean by "downstream", nor is this an important point to make. Too inside baseball.	This content has been removed.
Allison	Crimmins	142097	Text Region	01. Overview / Executive Summary		28	30	6	16	Section 1.2 rambles a bit. This would be more effective if it conveyed fewer points. For example, drop the mention of NCA3 and all the temperature records in the first paragraph. That is redundant to chapter 2 and not depicting a long-term climate change, which could confuse readers already confused about the difference between weather and climate. Then drop all the greenhouse effect stuff- that is also redundant. The real beauty of this box is the figure, so let it shine. I do think you need to think more about the title- it says it is global, but most of these indicators are national. I would also suggest cutting the El Nino part on page 30 and thinking harder about that paragraph (lines 1-8). For instance, you say "year-to-year variability in climate", but year-to-year variability is WEATHER, not climate. The last paragraph on page 30 does a better job, so I'm wondering if you could eliminate most of this paragraph (lines 1-8). Some of it is redundant (e.g. first sentence on lines 1-2 is captured by next paragraph).	Section 1.2 has been rewritten and condensed. The mention of NCA3 and temperature records since its publication has been removed. The reference to El Nino has been removed. The paragraphs on page 30 have been condensed. The figure title has been changed to "Climate Change Indicators."

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142098	Whole Chapter	01. Overview / Executive Summary						While section 1.1 was good, I am overall baffled by this entire chapter. It is extremely redundant to chapter 2. It is literally 31 pages long!!! I think it could be 5 pages easily. Section 1.2 could be deleted almost completely (maybe save the indicators figure for box 2.2). The page on how this assessment was conducted is redundant to the front matter and would make a better appendix than here in the overview. Section 1.3 can be deleted almost wholesale: Page 33 line 6 through page 37 line 31 should be deleted as it is completely redundant. I have serious concerns over the first uncertainty section (see separate comment) and probably most of this should be in an appendix or FAQ. Page 39 line 17 through page 40 line 24 should be deleted as it is redundant. Now, finally, on page 41, we get to the overview of the findings of this report and not the CSSR (though there are still repetitions of the CSSR findings in here, at least if you delete the above sections I've noted, you'll only be saying them twice-- once in this chapter and then once again in the next chapter-- instead of three times). Section 1.5 (starting on page 46 line 28) should be reduced from two pages to two paragraphs (one saying "it's complicated" and one on social/cultural impacts). The second call out box explains uncertainty much better, and more accurately than the first call out box. You certainly don't need both in the same chapter. Keep the first paragraph of this call out box (page 48 lines 4-10) and delete or move lines 11-21 to an appendix on technical process. No reader cares about this and no one understands what "risk-based framework" means, nor do they need to. Only the authors of this report would care about this jargon, not the intended audience. Text on page 48 line 22 through page 49 lines 8 is redundant to the earlier section on "it's complicated" interdependencies. Delete. Section 1.6 seems redundant to text you already said in this chapter about how impacts differ under different mitigation scenarios. For example, the text on page 50 lines 10-18 is completely redundant to text on page 41 lines 7-19. Pick one place to say it in the chapter and delete the other. Delete text from page 52 lines 14-21: these stages are silly (not academic) and this paragraph is very much about the NCA and very little about the scientific literature. The following paragraphs do a better job explaining adaptation limitations. Then cut down at least two paragraphs in this adaptation section- why is it so long? The list of 'business operations, resource management, and investments' is repeated several times in this section. Delete paragraph on page 53 lines 28-35. It is vague and says little that isn't said multiple times elsewhere, including in the paragraph directly above and below it. In summary, keep most of section 1.1, some of 1.4, make section 1.5 two paragraphs long, make the mitigation and adaptation sections of 1.6 each two paragraphs long and cut redundancies, and keep the	We appreciate the feedback and have made significant revisions to the Overview to reduce redundancy and focus on the main conclusions from this volume of the assessment, resulting in a more targeted summary with more graphics from the underlying report. -As the underlying climate science is essential to understand what is driving the observed and projected changes, we have retained the climate science section to provide a summary of what is Volume I of the 4th National Climate Assessment - the Climate Science Special Report. That said, we have pared back the section and provided balance between: observations, attribution, and future projections. Section 1.4 (future projections) has been combined with section 1.2 (observations and attribution), and some climate science content represented in Chapter 2 has been removed. - We have removed the text on how the assessment was conducted. - We have completely reworked the middle part of the Overview to pivot away from the "current risk" and "future risk" construct from the public comment draft to something that more closely mirrors the Report Findings. -Section 1.5 has been eliminated and content on sectoral interdependencies, multiple stressors, complex systems, and vulnerable populations has been integrated throughout the revised Section 1.3. A short box on "interconnected impacts" has been added. -Based on comments from the National Academies of Sciences, Engineering, and Medicine as well, the risk-framing box has been rewritten in more accessible language, and some of the more technical content referring to risk framing has been moved to the Front Matter. -Text referring to extreme heat and labor impacts that is redundant to text in the revised section 1.3 has been removed from the Response section. -The mitigation and adaptation sections have been rewritten to reduce redundancies.
Allison	Crimmins	142099	Text Region	01. Overview / Executive Summary		37	37	32	35	This is a very bad and misleading example of uncertainty. This implies that we just need to tweak the watch, or adjust it, or make it better and then we'll have the "right" answer. This is not an appropriate analogy, but a dangerous one. Please use another example- we make decisions in our life under uncertainty all the time- deciding who to be friends with or marry, deciding what school to go to or what job to take, even who to vote for. This watch is a representation of imprecision, not uncertainty.	We have removed this example and have added the example of a GPS-based phone application that estimates travel time.
Allison	Crimmins	142100	Text Region	01. Overview / Executive Summary		37	39	32	14	This text box would be greatly strengthened by deleting everything from page 37 line 32 through page 38 line 21, as well as the last sentence on page 39 lines 11-13. Keep the text box on one subject- computer modeling- and don't confuse the reader with a lot of redundant information on uncertainty (and definitely not an inappropriate analogy of uncertainty). This information on uncertainty is repeated in a later text box in this same chapter. But the computer model paragraphs are well-written and stand on their own. And they are actually the size of a text box.	Much of the climate modeling information has been moved into the rewritten section on climate projections in the main chapter text. This box has been shortened. For readers interested in learning more about our confidence in climate models, please see Chapter 4.3 of NCA4 Vol. I - the Climate Science Special Report (https://science2017.globalchange.gov/chapter/4/)
Allison	Crimmins	142101	Text Region	01. Overview / Executive Summary		42	42	8	9	This sentence says that frequency and severity of ALLERGIC illnesses will increase. The authors may want to be more careful with their wording. It may not be that more people who never had allergies before now have allergies. Maybe, but maybe not- that is still emerging science. It is more likely that people who already have allergies (and other respiratory issues!) will experience symptoms. I'd also be curious to see the literature that the severity of those illnesses increases. I can see more people needing medication, or more people needing to go to the hospital, especially as allergen seasons lengthen or higher concentrations push someone over a tipping point. But I'm wondering if there is any scientific literature that measures how the severity of a person's allergic response has changed because of climate change.	This text has been removed.
Allison	Crimmins	142102	Text Region	01. Overview / Executive Summary		42	46	24	27	Why are there quantified values and economic dollar signs in the weather and climate section, but none in these other sections?	This section has been reorganized around core impact areas rather than indicators; valuation is now more evenly dispersed.
Allison	Crimmins	142103	Text Region	01. Overview / Executive Summary		48	49	3	11	I don't understand this call out box. It says it is about why risk framing is a useful tool for decision-makers, but then it doesn't explain that in the actual text. I don't know what risk framing is, or how it is a tool, or how it used, or how it is useful to decision makers. This text box is mostly an ego trip for the NCA. The first paragraph is great, but the rest just talks about the NCA process. I'm not sure why that is in here. The paragraph on page 48 lines 22-34 seems completely incongruent- now we're suddenly talking about complex systems- how is that relevant at all? Telling me what "NCA considers" is not helpful. Telling me what you found when you considered this would be, but that is missing. Why would telling me there are case studies in this report help me understand the usefulness of risk-based frameworks (whatever that is)? This just seems like a lot of back-patting for the authors who are familiar with this jargon, but not a text box that actually describes something for the intended audience. Suggest deleting this text box. The paragraph on page 55 lines 21-35 does a better job explaining this than this entire text box, and it would be better to say it just once in this chapter, rather than both places.	We have retained this box based on other comments and input from review of the National Academies of Science, Engineering, and Medicine. However, the text that was in this box has been greatly simplified and details about the NCA4 process have been removed. We have moved some of the more technical/process information from this box to the Front Matter, while other elements have been re-written and included ina new Box 1.2 -Evaluating Risks to Inform Decisions.
Allison	Crimmins	142104	Text Region	01. Overview / Executive Summary		54	54	12	12	Please do not use these "upstream" and "downstream" terms. They may mean something to the USGCRP people who designed these two reports, but they mean nothing to the reader, and they are a jargon-y distraction. Also note that much of the information on page 54 lines 10-29 is redundant to the front matter.	This language has been removed.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142105	Whole Chapter	01. Overview / Executive Summary						I'm guessing this is intentional, since this chapter is meant to summarize other chapters, but there were almost zero citations in all 31 pages of this chapter. I think I counted two, though there was no reference section at the end of the chapter. I'm not convinced that having zero citations in this chapter is a good move. I do think the chapter needs to be chopped down considerably, and if by doing so it becomes an actual overview chapter, I may agree that citations aren't needed. But as is, this chapter is long, jargon-filled, redundant, rambling, and focuses too much on the NCA process and not enough on the NCA findings, for which there should be citations (you do have citations to the chapters, which is good). I strongly suggest the authors of this chapter read the front matter, chapter 2, and maybe some appendixes, give some careful thought about the key messages they want to convey in this chapter, and then get themselves a brutal copyeditor to cut out the pages and pages of redundancies. This overview could be much more like the NCA3 overview, but right now its got several kitchen sinks in there gumming it up.	We have undertaken a substantial re-write of the Overview to reduce redundancies and really focus on the main findings of the assessment. As far as the aspect of this comment relating to references, it was, indeed, a conscious decision not to include them throughout the text. Rather, we intend to add appropriate references to the underlying chapters. Including direct references to the literature in the Overview would detract from its readability and is in keeping with common practice for such "Executive Summaries" for major assessment reports.
David	Peterson	142403	Whole Chapter	01. Overview / Executive Summary						This chapter was an overall great depiction of the consequences climate change has had and is having on the planet and the human race. The inclusion of economic impacts of different regions was very informative.	We appreciate this feedback.
Juanita	Constible	142447	Text Region	01. Overview / Executive Summary		24	24	1	1	Recommend adding the word "modern" to the comparison with human history. Human history dates back about 5,000 years, but the finding in the CSSR about the rate of warming only compares to the last 2,000 years. From page 53 of the CSSR: "For context, global annual averaged temperatures for 1986--2015 are likely much higher, and appear to have risen at a more rapid rate during the last 3 decades, than any similar period possibly over the past 2,000 years or longer."	This suggestion has been implemented.
Juanita	Constible	142448	Text Region	01. Overview / Executive Summary		24	24	3	15	This paragraph presents a rather rosy view of the state of adaptation in the U.S., particularly in light of the intense hurricane and wildfire seasons of 2017. For example, the statement about NE fisheries ("fishermen in the Northeast are adjusting to more frequent ocean heat waves that harm valuable fisheries") seems to be contradicted by the first paragraph on page 37 (lines 2-6). Further, by failing to even mention limits on greenhouse gases, the paragraph gives the impression that we can adapt our way out of the worst effects of climate change. Recommend making the tone more closely reflect the perils laid out on page 25 and this sentence on page 52: "This Fourth National Climate Assessment finds that many adaptation planning and implementation activities are taking place across the United States by organizations, communities, businesses, and others; however, implementation is not yet commonplace---and evaluation is even more limited."	Our point in giving these regional examples is to illustrate to the reader that adaptation action is being taken and could be emulated. We do not imply that *all* fishermen or *all* farmers, etc have taken sufficient adaptation action to eliminate all climate-related risk. However, we have added some context to the end of this paragraph to acknowledge that response actions, including mitigation, are not yet adequate to substantially reduce risks from climate change.
Juanita	Constible	142449	Whole Page	01. Overview / Executive Summary		27				This is helpful background, and should be retained in the final report.	We appreciate the feedback, but in light of other comments on this box - as well as the consistent feedback to find places to cut the Overview's length, we have moved some of this content to the Front Matter and Process Appendix.
Juanita	Constible	142450	Figure	01. Overview / Executive Summary	1	29				This is a great figure! Even though the caption has date ranges for the three maps (U.S. Temperature, Western U.S. Snowpack, and U.S. Growing Season Days), it would be helpful to also include the date ranges on the figure itself.	We have improved the readability of the figure significantly, including through more clear labels on axes, dates ranges, etc.
Juanita	Constible	142451	Figure	01. Overview / Executive Summary	2	31				Recommend choosing different colors to help improve the visibility of the different drivers, particularly in panel (a). The red hatching used to show the uncertainty bands makes it difficult to see the non-bolded lines.	Due to Federal regulations, certain color palettes must be used to assist those with visual impairments.
Juanita	Constible	142452	Text Region	01. Overview / Executive Summary		32	32	2	4	The sentence starting "In all three panels …" is a little hard to understand. Recommended edit: In all three panels of this figure, the black line shows the difference in observed annual average global surface temperature between 1880--2016 and 1880-1910.	This sugestion has been implemented.
Juanita	Constible	142453	Text Region	01. Overview / Executive Summary		35	35	17	29	Recommend adding a sentence about Hurricanes Harvey, Irma, and Maria, with a focus on the infrastructure failures in Puerto Rico.	This text has been added in the rewritten section 1.3.
Juanita	Constible	142454	Text Region	01. Overview / Executive Summary		37	38	32	36	[NOTE: This comment extends to the end of the call out box on line 13, page 39.] This call out box is good, but a little on the long side. Recommend including a statement somewhere near the top about how the uncertainty inherent in climate science doesn't change the fundamental understanding of the greenhouse effect and that human activity is changing the climate. Also, please consider moving up the statement on pg 39 about the accuracy of climate models (lines 2-4), so readers see it near the beginning of the subsection starting on pg 38 (line 21).	We have shortened this box and added a statement to the effect that the uncertainty inherent in climate science doesn't change the fundamental understanding of the greenhouse effect and that human activity is changing the climate. The statement on the accuracy of climate models has been moved into the main section of 1.2 on projections.
Ross	McKitrick	143108	Text Region	01. Overview / Executive Summary		24	24	3	3	How do you know that the climate is changing faster than at any point in human history? Ocean temperature data goes back a couple of decades and only measures the top layers. Tropospheric temperature records go back to 1958. Land surface records go back to the late 1800s, but quality is poor in most regions especially prior to WWII. Human history goes back 10,000 years or more. You are making statements you cannot possibly know to be true.	This statement is based on the extensive assessment of the peer-reviewed literature presented in NCA4 Volume I (Climate Science Special Report) and sumamrized here in NCA4 Vol. II in Chapter 2.
Ross	McKitrick	143109	Text Region	01. Overview / Executive Summary		25	25	15	18	You say: "While the American economy has continued to grow and some measures of human well-being have improved over the past several decades, many communities, ecosystems, and economic sectors have already experienced negative impacts and they remain at great risk as warming trends continue." *Some* measures have improved? Can you name any important measures that haven't, especially in the US? In this sentence you are asking people to believe that the extraordinary technological, scientific and economic advances of the past several decades are at best moderate and debatable, whereas the damages from climate change have already swamped them and will make everything worse in the future. What I take away from it is that the authors are not very good at measuring economic and social welfare, and they have little insight into the things that matter to people when they assess their standard of living.	We deleted this entire paragraph as the first part was redundant with other parts of the Overview. And, upon further review, the second part (the focus of this comment) isn't actually derived from the underlying assessment content and what is asked to be addressed here is beyond the scope of this report.
Ross	McKitrick	143110	Text Region	01. Overview / Executive Summary		30	30	1	2	You claim that natural factors cannot explain the observed rapid changes. Yet a few pages earlier (p. 17 para 10) you said that models underestimate natural variability. If you cannot explain the mechanisms and dimensions of natural variability how can you say that it doesn't account for recent changes? I'm not asserting that it does, I am just reiterating the point that you keep making unqualified assertions about things you do not actually know to be true. Your language needs to reflect the actual state of knowledge and a realistic assessment of your own uncertainty.	The uncertainty in the climate's multicentennial response to past externally imposed changes does not invalidate the conclusion that no known natural forcing factors could be responsible for the observed warming. In order for solar, volcanic, or orbital changes to explain current temperature trends, we would need to have underestimated the climate's response to such changes by orders of magnitude and, in some cases, have gotten the sign wrong. This conclusion is at odds with paleoclimate evidence. While this section has been significantly re-written, the fundamental conclusions have not changed.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Ross	McKitrick	143111	Text Region	01. Overview / Executive Summary		30	30	11	16	It is misleading to say "No combination of natural factors is found in the observational record that would account for the current warming trend." You are referring to Figure 1.2 which does not show observations (except for the pink line), it shows model-generated outputs. You can claim that this model decomposes observed changes in such-and-such a way based on the way forcings are represented in the model and the way natural variability is represented, and that this decomposition implies that greenhouse gases play such-and-such a role. But you should acknowledge that the validity of the decomposition rests on the assumed validity of the climate model. You cannot claim that the colored lines are "observational"because they are not. Doing so conflates observation and attribution.	It is true that we have no observations of the climate's response to natural and anthropogenic forcing agents in isolation. Thus, we must rely on models to separate the effects of different forcings. These climate models, however, incorporate the current scientific understanding of how the climate responds to external forcings. Far from being misleading, this sentence reflects the current state of the science. It does not imply the non-black lines in Figure 1.2 are observations. For more detail on climate model performance and evaluation, the reader is directed to Chapter 2 and NCA4 Volume I - Climate Science Special Report (specifically Chapter 4.3). Figure 1.2 has been moved to Ch. 2 as it is more technical than the desired level of the Overview.
Ross	McKitrick	143112	Text Region	01. Overview / Executive Summary		31	32	1	27	Why does the red shading end 7 years before the black line? You are placing a great deal of weight on this diagram which is a very weak form of argumentation. While it is a superficially persuasive picture, there are at least three problems with the argument. First, you have assumed that the models are accurate representations of climate processes, which is an unsafe assumption. There is a large literature on climate model testing which you have completely ignored. A recent example is Beenstock, Reingewertz and Paldor (2016) "Testing the historical tracking of climate models" International Journal of Forecasting http://www.sciencedirect.com/science/article/pii/S016920701630053X. This paper points out that if a model's match to target observations is genuine rather than spurious, hindcast errors must be stationary and exhibit a mean-reversion property. But the difference between climate model estimates of the global mean surface temperature and the observed GMST values (from GISS) is in all cases nonstationary and non-mean reverting. That paper also reviews related literature on this question from a variety of authors applying a variety of methods, with the recurring result that climate models fail to reproduce key statistical features of target observations, which means they are not suitable as forecasting tools. The implication is that you cannot boast about how good your models are when the expert modeling literature has shown that they have systematic problems reproducing essential properties of the target variables. Another important study in this regard is Swanson, K.L., 2013. Emerging selection bias in large-scale climate change simulations. Geophysical Research Letters, 40, DOI: 10.1002/grl.50562, which shows that between CMIP3 and CMIP5, GCMs became more like each other but less like the observations. That they no longer overlap with key metrics of surface temperature trends and temperature extremes, and to the extent they yield improved fit with some metrics (like Arctic temperatures) they are likely getting that metric right for the wrong reasons. Second, the corresponding Figure would fail dramatically in the lower and mid-troposphere, even though the influence of GHGs is supposedly amplified there. We know this because the figure showing it is in IPCC 2013 Ch 10 Fig 10SM.1 (see http://ipcc.ch/pdf/assessment-report/ar5/wg1/supplementary/WG1AR5_Ch10SM_FINAL.pdf). The same sort of decomposition is shown as in your Figure 1.2, except in more detail by showing vertical layers by latitude band. In most cases the observational line rests outside (i.e. below) the GHG-only and combined forcings range and within the ‰ûÏno-	Climate models have been extensively tested and evaluated (the reader is directed to Chapter 2 of the report, as well as NCA4 Volume I - Climate Science Special Report, particularly Chapter 4.3), and while they are not perfect, they are the best research tools currently available. There is no unique metric of model performance, and the binary "good/bad" distinction fails to evaluate whether models are fit for a particular purpose. A vast literature on model evaluation and diagnosis, the coordinated framework provided by the Coupled Model Intercomparison Project, and a large body of observations can guide decision-making and model selection. It is simply not true that the research literature has shown that models are not "good". Biases and errors in many variables have been identified by multiple studies, and model improvement is an ongoing process. Climate models will never be exact reproductions of reality, but they incorporate the basic physics and chemistry that dictate climate response. There is high confidence that models produce credible estimates of future change; IPCC WG1 AR5 Ch 8 as well as Chapter 2 of this report and NCA4 Vol I (Climate Science Special Report) discuss the reasons why.
Ross	McKitrick	143113	Text Region	01. Overview / Executive Summary		39	39	1	4	You say: "Climate models have proven remarkably accurate in projecting and evaluating the climate change we've experienced to date, particularly in the past 60 years or so, when we have greater confidence in the observations (see Figure 1.1)." This is promotional hype. You provide no evidence of the "remarkable accuracy" of climate models, and ignore the many publications showing how bad they are. For example: Koutsoyiannis, D., A. Efstratadis, N. Namassis and A. Christofides (2008) "On the credibility of climate predictions" Hydrological Sciences, 53(4) August 2008 Anagnostopoulos, G. G., D. Koutsoyiannis, A. Christofides, A. Efstratiadis & N. Mamassis (2010). "A comparison of local and aggregated climate model outputs with observed data." Hydrological Sciences Journal, 55(7) 2010. Fildes, Robert and Nikolaos Kourentzes (2011) "Validation and Forecasting Accuracy in Models of Climate Change" International Journal of Forecasting 27 968-995. McKitrick, Ross R. and Lise Tole (2012) Evaluating Explanatory Models of the Spatial Pattern of Surface Climate Trends using Model Selection and Bayesian Averaging Methods. Climate Dynamics, DOI 10.1007/s00382-012-1418-9. Koutsoyiannis et al. (2008) and Anagnostopoulos et al. (2010) compared long term (100-year) temperature and precipitation trends in a total of 55 locations around the world to model projections. The models performed quite poorly at the annual level, but they also did poorly even when averaged up to the 30-year scale, even though you say this is the level GCMs work best at. They also did no better over larger and larger regional scales. The authors concluded that there is no basis for the claim that climate models are well-suited for long term predictions over large regions. Fildes et al. (2011) took the same data set and compared model predictions against a "random walk" alternative, consisting simply of using the last period's value in each location as the forecast for the next period's value in that location. The test measures the sum of errors relative to the random walk. A perfect model gets a score of zero, meaning it made no errors. A model that does no better than a random walk gets a score of 1. A model receiving a score above 1 did worse than uninformed guesses. Simple statistical forecast models that have no climatology or physics in them typically got scores between 0.8 and 1, indicating slight improvements on the random walk, though in some cases their scores went as high as 1.8. The CMIP3 climate models got scores ranging from 2.4 to 3.7, indicating a complete failure to provide valid forecast information at the regional	This statement about model accuracy is based on an extensive assessment of the literature, most recently summarized in Chapter 2 of this assessment, as well as in the entire Volume I of NCA4 (Climate Science Special Report). In particular, Chapter 4.3 of NCA4 Vol I reads: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid (e.g., IPCC 1990). They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large-scale modes of natural variability, and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013). There is no better framework for integrating our knowledge of the physical processes in a complex coupled system like Earth's climate." See https://science2017.globalchange.gov/chapter/4/ for more detail.
Ross	McKitrick	143114	Text Region	01. Overview / Executive Summary		39	39	4	8	You say "It's important to note that climate model projections are, broadly speaking, not designed to directly capture every annual or even decadal variation in a historical record. Rather, since "climate" is defined as weather conditions over multiple decades (for example, over periods of 30 years), climate model projections are aimed more towards capturing long-term changes." Then why do you so often focus on short term weather phenomena in this report, such as the 2017 hurricane season? You seem ready to invoke short term weather phenomena when it furnishes examples of "harmful" or "damaging" events, but when short-term events run counter to expectations you dismiss their importance by saying you are only concerned with long term trends.	Extreme weather events expose vulnerabilities and present similar hazards to those we can expect in a warmer world.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Karin	Bumbaco	143115	Text Region	01. Overview / Executive Summary		50	50	17	18	After listing valuations of impacts (ignoring for a moment that they seem to be tweaked towards the high end), you conclude "Each of these avoided impacts represent domestic economic benefits of mitigation on the order of tens to hundreds of billions of dollars per year." No they don't. Domestic mitigation and even global mitigation on a scale like the Kyoto and Paris treaties would not affect the time path of warming. There are no policy proposals on the table that would substantially change the rate of accumulation of GHG's in the atmosphere. You need to point out that your figures are, at best, *gross* benefits since you are not taking account of the costs of the policies necessary to achieve the mitigation. Neither are you discounting those benefits to the present, which is important since the impacts warned of in the 1st NCA have unfolded far more slowly than forecast and this will likely be true of your edition as well, meaning the effects of GHG emissions won't be incurred until a century or more down the road. Hence the discounted gross benefits you describe are tiny and far in the future, and (to put them in perspective) are dwarfed many times over by recent annual variations in the US federal budget deficit, and stock market fluctuations.	The reviewer did not provide supporting information or literature to support their comments regarding the adequacy of domestic or global mitigation efforts in affecting long-term changes in warming or atmospheric concentrations of GHGs. We therefore are unable to substantiate their comment, and note that the Mitigation chapters of the CSSR and NCA4 assess and review peer reviewed studies on these topics. No changes have been made to the text in response to this comment. Regarding the comment on discounting, the results described in the Overview text are presented in nominal terms, as they are annual values. Discounted values may be important when presenting a timeseries of values, but that is not the case here.
Social Science	Coordinating Committee	143375	Text Region	01. Overview / Executive Summary		30	30	9	16	The discussion of drivers of climate change in this section reflects contributions from natural science research (such as observations, modeling). The discussion can also consider to incorporate understanding of anthropogenic drivers of climate change from the social science perspectives. For example, the IPCC AR5 WGIII has a chapter on drivers of climate change (Blanco et al. 2014). More recently, the USGCRP Social Science Coordinating Committee has coordinated three White Papers Social Science Perspectives on Climate Change which includes one paper on "Drivers of and Responses to Climate Change" (USGCRP 2018 - upcoming). The paper discusses the underlying drivers of climate change, including demography, economy, politics, social stratification and inequality, technology, infrastructure, and land use, and how these factors interact dynamically over space and time.	The intent of this section of the Overview is to describe the more physical (vs societal) drivers of climate change. The human-component sought in this comment is captured later on in the Overview in much greater detail.
Shaye	Wolf	143626	Text Region	01. Overview / Executive Summary		24	24	3	15	The opening paragraph of the Introduction fails to appropriately convey the magnitude of current and projected damage caused by climate change, and fails to convey an appropriate sense of urgency and seriousness about the need for action. The first sentence "Earth's climate is now changing faster than at any point in human history" uses the neutral word "change" and fails to attribute this change to its primary cause: greenhouse gas pollution from the burning of fossil fuels. The opening sentences must make clear that the primary cause of climate change is human activities, primarily burning oil, gas, and coal, rather than a vague statement. Similarly, the second sentence uses the neutral words "impacts" and "affect" rather than "damage" or "harm" or "negative impacts." It is also unclear what "Americans are responding" means. Many Americans are limited in their ability to "respond"or cope with climate change - especially the elderly, young, sick, poor, and some communities of color. The final sentence of the opening paragraph implies that Americans are handling climate change and that everything will be okay at current response levels:"Americans are responding to change in ways that can reduce climate-related risks, bolster resilience to change, and improve livelihoods." Nothing could be farther from the truth. Although some states and local communities are undertaking mitigation and adaptation actions, current US climate policy is completely inadequate to avoid dangerous levels of atmospheric GHG concentrations and associated dangerous impacts from warming, extreme weather events, sea level rise, ocean acidification, species extinction, glacier/ice sheet/sea ice loss and the like. The US must take much stronger, bold, and urgent action to reduce GHG gas pollution to avoid unacceptable damage, and this message should be clear from the very first paragraph onward. We strongly recommend that you change the opening paragraph so that it accurately represents the current state of the science on climate change damage and risks, for example: "Earth's climate is now changing faster than at any point in human history, and the primary cause is greenhouse gas pollution created by burning oil, coal, and natural gas. Negative impacts of global climate change are underway across the United States and are disrupting people's lives, their communities, natural systems, and the economy…"	We revised the first sentence to reflect the fact that the oberved changes are being driven primarily by human activities.We did not revise the second sentence because - as the assessment shows - not all impacts in the U.S. are negative. We have also revised the final sentence to reflect the conclusion that while Americans are responding, much of what we care about is still at serious risk without additional action.
Union of Concerned Scientists	Union of Concerned Scientists	143872	Text Region	01. Overview / Executive Summary		24	24	3	5	Presumably when the authors say, "responding to rapid changes" they are referring to changes in climate - it would be helpful to say this more clearly.	We have revised this sentence so it now reads: "Americans increasingly recognize the risks climate change poses to their everyday lives and livelihoods and are beginning to respond."
Union of Concerned Scientists	Union of Concerned Scientists	143873	Whole Page	01. Overview / Executive Summary		27				It would be helpful in the "Call Out Box" to further emphasize that through the public comment process, the NCA provides a platform for diverse perspectives to engage in the assessment, and in light of the evidence base and the points raised by the diverse reviewer base, provides the scientific consensus on the topics explored in the report. The NCA provides an opportunity for the entire American public to weigh-in.	We have moved much of the content from this box to the Front Matter and Process Appendix,. The specific suggestion made in this comment has been incorporated into the Process Appendix.
Union of Concerned Scientists	Union of Concerned Scientists	143875	Text Region	01. Overview / Executive Summary		28	28	12	12	Do the authors plan to update this with the latest report on 2017 temperatures from NASA and NOAA? Otherwise, it should be made very clear at the outside of this Executive Summary which period the report covers, as well as the baselines that are used for the assessments. Otherwise, the public could be confused by what has been said recently about 2017 (e.g. that 17 of the last 18 years have been the warmest on record).	We have undertaken a large rewrite of this section, which has resulted in this specific text being deleted. However, we have made great efforts to present the most up-to-date data in Fig 1.1.
Union of Concerned Scientists	Union of Concerned Scientists	143876	Whole Page	01. Overview / Executive Summary		29				The arrows could be a little bit confusing, especially the one for drought that has two arrow-heads. It would be helpful to explain the arrows briefly in the figure text.	We have re-worked this figure, drawing inspiration from NOAA's 10 Signs of a Warming World (https://cpo.noaa.gov/warmingworld/index.html), which should help make the content more accessible.
Union of Concerned Scientists	Union of Concerned Scientists	143878	Text Region	01. Overview / Executive Summary		30	30	9	16	It would be helpful to re-state this key finding in the body of the text from Figure 1.2 that, "the long-term global warming trend observed over the past century can only be explained by the effect that human activities have had on the climate."	We have included the following text in the revised Section 1.2: "Greenhouse gas emissions from human activities are the only factors that can account for the observed warming over the last century; there are no credible alternative human or natural explanations supported by the observational evidence. Without human activities, the influence of natural factors alone would actually have had a slight cooling effect on global climate over the last fifty years."
Union of Concerned Scientists	Union of Concerned Scientists	143880	Text Region	01. Overview / Executive Summary		35	35	10	11	This point could be a bit confusing when paired with the point about the Dust Bowl being the period of peak heat since records have been kept a few pages back. The authors should clarify or distinguish this point.	This text has been removed.
Union of Concerned Scientists	Union of Concerned Scientists	143881	Text Region	01. Overview / Executive Summary		36	36	5	9	Any limits to benefits to NPP should also be mentioned here as well.	This text has been removed.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Union of Concerned Scientists	Union of Concerned Scientists	143893	Text Region	01. Overview / Executive Summary		29	29	28	30	The authors should make it clear in this sentence that the uncertainties in emissions have to do with us and the decisions we make, not with computer models or climate science.	We believe this comment refers to p. 39, lines 28-30 in the public comment draft (not p. 29). We have revised this sentence so it reads, "…reflect a range of emissions levels throughout the 21st century driven primarily by the choices society makes in the coming decades ."
Susan	Ask	143976	Text Region	01. Overview / Executive Summary		39	39	8	10	To aid clarity and syntax, please consider revising this sentence to read: "Today, the largest uncertainty in understanding the future behavior of the climate system is the level of greenhouse gas emissions going forward."	This change has been made.
Susan	Ask	143979	Text Region	01. Overview / Executive Summary		53		38		Please omit "ancillary" to avoid diminishing the importance of these benefits. The word "additional" would be better here.	This language has been removed.
Susan	Ask	143981	Text Region	01. Overview / Executive Summary		50		33		Please consider adding a statement that reflects the significant efforts made by individuals and communities to reduce their own climate footprints. Here's a possible addition: "Communities and community-based organizations are also working to mitigate climate change. And large numbers of individuals make voluntary choices every day to reduce their own emissions."	In its current form, the paragraph lists a number of activities at various levels of jurisdiction (i.e., Federal, State, County, City, etc.) as well as within the private sector, but the comment raises a valid point about the role of civl society and individuals, so we have included a final concluding sentence that reads: "Individuals and other organizations are also making choices every day to reduce their carbon footprints."
Michael	MacCracken	144058	Text Region	01. Overview / Executive Summary		24	24	7	7	It would be clearer if one changed "surge driven" to "surges, driven"	We have revised the text to reflect the suggested change.
Michael	MacCracken	144059	Text Region	01. Overview / Executive Summary		24	24	11	11	I'd suggest changing "heightened" to "more impactful"	This text has been removed.
Michael	MacCracken	144060	Text Region	01. Overview / Executive Summary		24	24	12	13	Perhaps change "more frequent" to "more frequent and prolonged"--and it is not just fisheries that are affected (they tend to move), but also the lobsters, crabs, and mussels that populate the estuaries and coastal shelves.	We have included "and prolonged" and added "and related ecosystems" to the end of the sentence to address both of the suggestions.
Michael	MacCracken	144061	Text Region	01. Overview / Executive Summary		24	24	13	15	I don't at all like the "but" here. It seems to me the point to be made is that Americans are being and will be forced to respond, and the key point to make clear here is whether communities and individuals (etc.) will be reactive to what is happening or proactive, perhaps making the point that those being proactive are generally better off than those being reactive. Also perhaps make the point that while national and international mitigation efforts can slow the pace of future change--and this will be very important given limited abilities to adapt (e.g., to sea level rise in Boston), there will in the meantime need to be adaptation to those changes our past emissions and inevitable future emissions will lead to.	This statement has been edited and now reads: "While Americans are responding in ways that can bolster resilience and improve livelihoods, neither global efforts to mitigate the causes of climate change nor regional efforts to adapt to the impacts currently approach the scales needed to avoid substantial damages to the U.S. economy, environment, and human health over the coming decades."
Michael	MacCracken	144062	Text Region	01. Overview / Executive Summary		24	24	19	19	For context, it might be worth having a footnote to indicate what is meant by "fairly stable global climate" (and note that "global" should be added). The footnote could indicate that over the past several thousand years, global average temperature, reconstructed from a number of proxy variables, has likely not changed by more than plus or minus half a degree Celsius. Yes, regionally, somewhat more, but then mostly as relatively gradual excursions that have then returned over decades/centuries to the longer term average for that latitude. It also important to add that "sea level" has also been quite stable--indeed, this stability has likely been more important than temperature stability.	We are not using footnotes in the Overview to allow for easier reading. However, the text referred to here has been removed in an effort to shorten and simplify this section.
Michael	MacCracken	144063	Text Region	01. Overview / Executive Summary		24	24	27	28	Just to note that this was the primary message/conclusion from the 1985 Villach meeting, so something first raised over 30 years ago.	We appreciate the context provided by this comment.
Michael	MacCracken	144064	Text Region	01. Overview / Executive Summary		24	24	32	32	Should this be "is pushing" or are we really now in a situation of "has pushed"?	We have revised the text so it now reads: "... trend that exceeds the range of natural..."
Michael	MacCracken	144065	Text Region	01. Overview / Executive Summary		24	24	35	35	I'd suggest changing "allow" to "have allowed" to make clearer that this has already been done.	This text has been removed.
Michael	MacCracken	144066	Text Region	01. Overview / Executive Summary		24	24	36	36	Change "effect" to "effects"--the verb in the sentence as well as logic wants plural here.	This text has been removed.
Michael	MacCracken	144067	Text Region	01. Overview / Executive Summary		25	25	11	11	On line 11, this needs to say "impacts" and not just "risks". Also, it would help to identify the types of possible actions.	This text has been removed.
Michael	MacCracken	144068	Text Region	01. Overview / Executive Summary		25	25	30	30	Perhaps change "these" to "the"	We deleted "these" altogether and made no replacement, so the sentence now reads: "...threatens to exacerbate existing inequalities..."
Michael	MacCracken	144069	Text Region	01. Overview / Executive Summary		25	25	32	32	Might a better phrasing be "if equity is not considered in policy development and implementation"?	This sentence has been edited to read: "Marginalized populations may also be affected disproportionately by actions to address the underlying causes and impacts of climate change, if they are not implemented under policies that consider existing social inequities."
Michael	MacCracken	144070	Text Region	01. Overview / Executive Summary		28	28	12	12	Now 2017 can be added as joining this group, making the past four nations the warmest.	We have undertaken a large rewrite of this section, which has resulted in this specific text being deleted. However, we have made great efforts to present the most up-to-date data in Fig 1.1.
Michael	MacCracken	144071	Text Region	01. Overview / Executive Summary		28	28	21	21	I wonder if the paragraph might be made even more convincing by adding a phrase/sentence to the effect that without the effect of the natural greenhouse effect, calculations indicate that the global average temperature would be of order 33 C (~60 F) colder than at present--basically so cold that life would not be likely/possible.	We have revised the text to reflect this suggestion.
Michael	MacCracken	144072	Text Region	01. Overview / Executive Summary		30	30	2	2	I'd suggest adding a phrase to the end of the sentence saying "since the mid-20th century."	This sentence has been removed, but "over the last century" has been added to a similar sentence.
Michael	MacCracken	144073	Text Region	01. Overview / Executive Summary		30	30	6	6	It would be good to change "periodic" to "cyclical" or "cyclic"	We have deleted "periodic" and replaced it with "natural climate cycles"
Michael	MacCracken	144074	Text Region	01. Overview / Executive Summary		32	32	1	1	Rather than saying "Sophisticated", which is a bit off-putting, how about saying "Extensively tested"--the real point is that the models have been tested and evaluated, not that they are "elitist", as the present word choice can imply.	The authors agree with this suggestion; "sophisticated" has been removed. In addition, this figure has been moved to Ch. 2.
Michael	MacCracken	144075	Text Region	01. Overview / Executive Summary		32	32	21	21	How about adding a phrase at the start of the sentence saying "As a result of the inherent chaotic nature of atmospheric and oceanic flows, …" Just saying that scientists do not expect does not seem an adequate explanation to me. It might also be worth mentioning the effect of limited coverage of observations.	We have added a sentence that reads, "On short time scales, movements of air in the atmosphere and water in the oceans are inherently chaotic." However, this figure and caption have been moved to chapter 2.
Michael	MacCracken	144076	Text Region	01. Overview / Executive Summary		33	33	7	7	Would be clearer if changed "in" to "across" and "has increased" to "has, on average, increased"--there are two averages occurring, across the area of the US and duration of the seasons.	This specific sentence has been removed, but similar information is included in a new sentence elsewhere, and the "in" has been changed to "across." "Annual average temperatuers" is standard usage and this has not been changed. The reference to growing season length has been changed to "Average growing season length across the United States…"
Michael	MacCracken	144077	Text Region	01. Overview / Executive Summary		34	34	17	17	Would be appropriate to change "has declined" to "has, on average, declined"	While true that Arctic sea ice extent has not monotonically declined over the specified period, the Climate Science Special Report Chapter 11, Key Finding 3 includes this statement: "September sea ice extent has decreased between 10.7% and 15.9% per decade (very high confidence)." This is not an average; it's a range that encompasses loss rates per decade. No change to the text has been made.
Michael	MacCracken	144078	Text Region	01. Overview / Executive Summary		34	34	21	21	I'd suggest changing the word "animals" to "marine mammals"--which is more specific and also hopefully informative.	This suggestion has been implemented.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144079	Text Region	01. Overview / Executive Summary		35	35	12	14	A phrase very much like "no detectable change", which really means we don't have evidence yet that gives us 20 to 1 confidence that a change has occurred, was at the root of the extensive controversy over the statement in the IPCC Second Assessment Report regarding detection of a discernible human influence. Basically, the phrase is obscuring how there has been a choice (traditional in the statistical and physical science community, but not generally in the public or in government decision-making arenas). This "choice" is really a value-based decision (indicating that there is a predilection of scientists in making decisions to not being wrong) that needs to be made apparent to the public/reader. To really convey what is understood, I'd suggest re-wording the sentence here to say: "Because the observational record is limited to only ~150 years and because the occurrence of drought is irregular, high statistical confidence that droughts are becoming more likely has not yet been possible to achieve, but there is strong evidence that the higher temperatures resulting from human influences are leading to deeper surface moisture deficits, which is a closely related indicator of drought-like conditions."	While the intent behind this comment has merit, the proposed revision to the text is quite lengthy and it provides a level of technical detail that is not consistent with the rest of the Overview. We have retained the text as it was and direct readers interested in more detail to see Chapter 8 of NCA4, Vol I: The Climate Science Special Report (https://science2017.globalchange.gov/chapter/8/), which covers "Droughts, Floods, and Wildfires."
Michael	MacCracken	144080	Text Region	01. Overview / Executive Summary		35	35	17	17	I'd suggest changing "around" to "depending on"	This text has been removed.
Michael	MacCracken	144081	Text Region	01. Overview / Executive Summary		35	35	30	30	I'd suggest changing this to plural, so "Interactions là. are" as there is a lot more than one type of interaction.	This text has been removed.
Michael	MacCracken	144082	Text Region	01. Overview / Executive Summary		36	36	26	26	Rather than "about 93%", which is two figure precision, I'd suggest saying "over 90%"	This suggestion has been implemented.
Michael	MacCracken	144083	Text Region	01. Overview / Executive Summary		37	37	18	31	It might be useful in this paragraph to make the point that as bell-shaped distribution changes (so sea level rising) shift, this leads to a disproportionate increase in the likelihood of events that exceed a particular ocean level, so a quite large increase in the likelihood of flooding even if the increase in sea level is not that large.	While the intent behind this comment has merit, the proposed suggestion would have required a somewhat legnthy addition to the text and would provide a level of technical detail that is not consistent with the rest of the Overview. We have retained the text as it was and direct readers interested in this topic to Chapter 12 of the NCA4 Vol. I, Climate Science Special Report (https://science2017.globalchange.gov/chapter/12/) "Sea Level Rise."
Michael	MacCracken	144084	Text Region	01. Overview / Executive Summary		37	37	33	35	I think this example of wrist watches is a poor one--watches are generally better, even mechanical ones, if those under 30 or so even know what such a watch is. In any case, the example really indicates a bias, not really uncertainty. How about using a GPS travel-time estimate, where can be more or less, depending on conditions, etc.	We have removed this example and have added the example of a GPS-based phone application that estimates travel time.
Michael	MacCracken	144085	Text Region	01. Overview / Executive Summary		39	39	1	10	I think it would be useful that the models have proved accurate in looking at decadal to multi-decadal shifts and changes in response to changes in climate forcing. They also show skill in predicting the weather out to a week or so--so to the very detailed evolution of the weather. They do not show skill in predicting seasonal to internal variability of natural cycles that are related to such aspects as El Nino events, but do show some skill in predicting the system response on these time scales in response to major volcanic eruptions.	This text has been added to the projections section in the rewritten 1.2: "Climate models representing our understanding of historical and current climate conditions are often used to project how our world will change under future conditions (see Box 2.7). "Climate" is defined as weather conditions over multiple decades, and climate model projections are generally not designed to capture annual or even decadal variation in climate conditions. Instead, climate model projections are intended to capture long-term changes, such as how the climate system will respond to changes in greenhouse gas levels over this century. Scientists test climate models by comparing them to current observations and historical changes. Confidence in these models is based, in part, on how well they reproduce these observed changes. Climate models have proven remarkably accurate in simulating the climate change we have experienced to date, particularly in the past 60 years or so when we have greater confidence in observations (see CSSR 4.3.1). The observed signals of a changing climate continue to become stronger and clearer over time, giving scientists increased confidence in their findings even since the Third National Climate Assessment was released in 2014."
Michael	MacCracken	144086	Text Region	01. Overview / Executive Summary		39	39	17	17	It is not the long lifetime of a CO2 molecule in the atmosphere that is the problem, which is how some will read this sentence. What is long-lasting is the perturbation to the long-term atmospheric concentration because, while air-sea and air-land processes exchange a lot of carbon among the active reservoirs, the processes that ultimately move the injected CO2 to the ocean sediments and for long-term storage in carbon held long-term in the ground are very slow compared to the rate of CO2 injection.	Text clarifying the relationship between CO2 emissions, CO2 atmospheric residence time, and natural CO2 removal processes has been added.
Michael	MacCracken	144087	Text Region	01. Overview / Executive Summary		39	39	26	27	I'd urge also showing the amount of warming in Celsius.	Since this is the U.S. National Climate Assessment and Fahrenheit is the standard unit for temperature in the U.S., we use Fahrenheit as the default temperature metric throughout this report. In some instances (i.e., where relevant for policymaking such as by invoking commonly-cited international goals, like 2 deg C), we do use Celsius.
Michael	MacCracken	144088	Text Region	01. Overview / Executive Summary		39	39	34	37	As I have noted in other comments, I think using these scenario names is too "inside the Beltway", and I would urge using more informative names about what they involve, so FFforever for RCP8.5 and FFphasedown for RCP4.5--and then maybe FFphaseout for RCP2.6. Higher and lower is just not helpful, and is tied what current technology and policy might allow one to do.	We had extensive internal discussions over how best to name the RCPs in a manner that would provide sufficient context to the reader, while remaining true to the science. Calling any of them something pegged to a particular policy pathway (e.g., Fossil Fuels forever or Fossil Fuels pahasedown) would be misleading as those RCPs could result from scenarios that are completly independent of future FF use (i.e., if carbon dioxide removal technologies were to be come widespread, for example). As a result, we have retained "higher scenario" for RCP8.5 and "lower scenario" for RCP4.5 and direct the reader to the Front Matter and Appendix 3 (Data Tools and Scenario Products) for additional information.
Michael	MacCracken	144089	Text Region	01. Overview / Executive Summary		40	40	1	2	That this is the case for the temperature is the result of an overly simple analysis (improperly using only GWP-100 and not accounting separately for the radiative forcing of methane and other short-lived species that tend not to persist more than a decade or two. IT IS IMPORTANT TO MENTION THAT THIS RESULT IS DUE TO OVER-SIMPLIFICATION OF THE ANALYSIS.	We have revised the text to acknowledge the role that short-lived forcers such as methane, can play in driving near-term temperature reductions through heavy mitigation of those substances. However, it remains fundamentally true that we are locked in to decades of additional warming even if all GHG (short-lived and otherwise) were to go to zero tomorrow given the long-lifetime of CO2.
Michael	MacCracken	144090	Text Region	01. Overview / Executive Summary		40	40	3	3	Why here use a separate baseline period? This gives a quite misleading (and different) message about what the amount of warming is that is of concern.	The sentence referred to has been removed.
Michael	MacCracken	144091	Text Region	01. Overview / Executive Summary		40	40	4	5	This is just not correct if one were to focus much of the attention on limiting methane emissions, etc.	This sentence has been edited to read "The effects of potential carbon dioxide emissions reductions on global climate become evident around 2050, when temperature."
Michael	MacCracken	144092	Text Region	01. Overview / Executive Summary		40	40	1	10	I think it is really important to explain that cutting emissions of short-lived species can significantly change this point--aggressive cutting of emissions of short-lived species can cut the projected warming from 2010 to 2050 in half if the long-and short lived species are treated separately.	Text addressing emissions of short-lived species has been added.
Michael	MacCracken	144093	Text Region	01. Overview / Executive Summary		45	45	6	9	The sentence does not give a time when the rise might reach 4-6 feet. If it is 2100, this needs to be said.	This text has been removed and we have added a map on U.S. sea level rise projections.
Michael	MacCracken	144094	Text Region	01. Overview / Executive Summary		49	49	15	15	Is "mitigation" reduction of emissions, and/or reduction of concentrations as indicated here. If the latter, then this means that mitigation would include all forms of carbon dioxide removal, including planting more forests, fertilizing the oceans, scrubbing CO2 from the ocean. Is this the choice? If not, the wording here needs to be changed.	To be consistent with the Mitigation chapter (Chapter 29) as well as the USGCRP Glossary (globalchangegov/glossary), we have clarified the text so it now reads: "… in terms of mitigation to reduce emissions of greenhouse gases or remove carbon dioxide from the atmosphere and adaptation…"
Michael	MacCracken	144095	Text Region	01. Overview / Executive Summary		50	50	10	10	I'd suggest changing "concludes" to "indicates"	We have reviesd the text to reflect this proposed change.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144096	Figure	01. Overview / Executive Summary	5	51				Where did the Caribbean/Gulf of Mexico islands go?	At the time of publication of the public comment draft, we did not have information to include the US Caribbean region; this was mentioned in the caption of the figure. We continue to try obtaining this information and hope to have been able to obtain that data in time for inclusion in the final version of the report.
Michael	MacCracken	144097	Text Region	01. Overview / Executive Summary		52	52	7	13	I think it would be helpful to make the point that response will occur, and it can be either proactive or reactive. So, a lack of awareness does not mean one will not have to adapt--it will just be reactive rather than proactive, and that type of response is usually much more expensive.	Text addressing this has been added.
Michael	MacCracken	144098	Text Region	01. Overview / Executive Summary		54	54	20	24	I've commented on the earlier presentation of this list, which I think is not of commensurate points, etc. I would favor a diagram, as indicated in earlier comments.	This text has been removed.
Alessandra	Jerolleman	144778	Whole Chapter	01. Overview / Executive Summary						Overall, the organization of the chapter is not structured effectively. Looking at the audience of interest for an overview, the majority of the audience will be looking for the strongest points in beginning section. This paper appears to garner this interest by posing the issue of climate change as a threat to economic stability and a risk to human health and safety. The tone of the overview gives the impression that this is one of the primary reasons for national and international concern and action. However, the beginning section begins with a synp[sis of the status and extent of climate change. These facts are not irrelevant and should most definitely remain in the overview. However, because of the primary argument being risk assessment based, this should be placed at the forefront of the overview. The structured choice of repeating the main titles of "Weather and Climate", "Snow and Ice", "Land and Water", and "Oceans and Coasts" is not helpful to the reader. The overview should instead include major headings that indicate the argument and not the region of interest. Much of the information in the first and second section of these chapters feels repetitive because of the structure. It also gives the impression to the reader that there is less evidence then in actuality if the same information and style of presentation are repetitive in this manner. Overall, the language is very strong and the information is well pieced together. The real issue in this overview is structure and organization. In the overview, it is critical that the language, arguments, and factual information are well constructed and contain minimal tangents. Breaking up the walls of text with more visuals would be extremely beneficial to extending the reach of this paper to a wider audience.	We have completely re-worked the middle sections of the Overview based on this and other comments - and included a number of new graphics, as well. The Overview now provides an Introduction, a summary of climate science (as presented in NCA4 Vol. I - Climate Science Special Report) as observations, attribution, and projections before pivoting to a more societally-focused middle section that now mirrors the human-focused Report Findings before concluding with the sections of Responses (i.e., Adaptation and Mitigation). This structure more closely mirrors the assessment as a whole and responds to this comment's call for greater clarity in purpose and less redundancy.
Mira	Theilmann	144779	Table	01. Overview / Executive Summary		29				The graphs in many of the tables are too small and contain differences in color that will be difficult for those with color blindness to distinguish. The set-up of this table, in particular, contains too much information in too small of a space. This table is also referenced several pages past this point, which reduces the effectiveness of the information. The full analysis of the importance of the information in these graphs should immediately follow the graphs in order for the audience to fully grasp the concepts presented. The information in the graphs is incredibly important and interesting. Making this information accessible to the audience will greatly improve the likelihood that they will continue on in their active comprehension of the overview and following chapters of the assessment.	The figure has been reworked into a full 2-page spread to be more accessible and more clearly illustrate how the indicators fit together.
Mira	Theilmann	144780	Whole Chapter	01. Overview / Executive Summary						A suggestion for a follow-up after the assessment is published; track the research that is published following the assessment. This would be useful to ensure the next assessment is even more effective to encourage new research.	We agree with this comment and are exploring how we can most efficiently do this as a Program.
Mira	Theilmann	144781	Text Region	01. Overview / Executive Summary		32	32	22	25	Equity is missing from the summary of the two main advances in this NCA. Consider including summary information on how economic impacts and risk vary by population, especially the often disproportionate effects and risks on populations who are historically disadvantaged or underserved.	It's not clear where this comment is intended to be directed at in the Overview as the cited page and line numbers do not address "two main advances in this NCA." That said, we have built upon the strong coverage of "vulnrable populations" presented in NCA3 and have made a concerted effort int he re-write of the Overview to integrate equity / vulnerable population considerations throguhout the text.
Andreas	Schmittner	140857	Text Region	02. Our Changing Climate		76		14		Collins et al. (2013) do not include Greenland ice sheet meltwater fluxes. A more recent study that does include meltwater fluxes from the Greenland ice sheet is Bakker et al. (2016), however, comes to a similar conclusion. I'd suggest to either replace the Collins et al. (2013) reference with Bakker et al. (2016) or to add the Bakker et al. (2016) reference. I also suggest to add text describing the important findings from Bakker et al. (2016) such that melting from the Greenland ice sheet, although of secondary importance compared with warming and intensification of the atmospheric hydrological cycle, may increase the probability of an AMOC shutdown. An AMOC shutdown becomes much more likely for a high-emission scenario (RCP8.5) compared to an intermediate-emission scenario (RCP4.5). Bakker, P., Schmittner, A., Lenaerts, J. T. M., Abe-Ouchi, A., Bi, D., van den Broeke, M. R., Chan, W.-L., Beadling, R. L., Marsland, S. J., Mernild, S. H., Saenko, O. A., Swingedouw, D., Sullivan, A. and J. Jin (2016) Fate of the Atlantic Meridional Overturning Circulation - Strong decline under continued warming and Greenland melting, Geophysical Research Letters, 43(23), 12,252-12,260, doi:10.1002/2016GL070457.	This reference has been added and the text revised as suggested.
Andreas	Schmittner	140858	Text Region	02. Our Changing Climate		77		24		I don't agree that AMOC changes cannot be quantified. Bakker et al. (2016) does exactly that.	We have added a reference to Bakker but note that this is only one study
Andreas	Schmittner	140859	Text Region	02. Our Changing Climate		78	78	19	22	I suggest to include a discussion of the following point here. It is known that climate models underestimate natural climate variability on long (centennial to millennial) timescales (e.g. Laepple and Huybers, 2014). The recent study by Bakker et al. (2016b) suggests that missing ice sheet-ocean interactions are an important reason for this underestimation. This may bias attribution and predictability studies to be overly confident. Bakker, P., Clark, P. U., Golledge, N. R., Schmittner, A., and M. E. Weber (2016b) Centennial-scale Holocene climate variations amplified by Antarctic Ice Sheet discharge, Nature, 541, 72‰ÛÒ76, doi:10.1038/nature20582. Laepple, T., and P. Huybers (2014), Ocean surface temperature variability: Large model‰ÛÒdata differences at decadal and longer periods, Proceedings of the National Academy of Sciences, 111(47), 16682-16687, doi: 10.1073/pnas.1412077111.	This box on short-term natural variability is not the appropriate place to comment on long-term change; this exact point is already made earlier, on page 77 line 28. A reference to Bakker has been added on page 77.
Robert	Kopp	141162	Text Region	02. Our Changing Climate		62	62	38	38	"At least several inches" describes global mean sea level rise between 2000 and 2030, but not "in the next fifteen years" (where sea-level rise in the Low scenario would be 4.5 cm).	This has been revised to state that global sea level is very likely continue at current rates (3 mm/yr) and upwards to 1-4.3 feet by 2100.
Robert	Kopp	141163	Text Region	02. Our Changing Climate		62	62	37	37	Note that the meaning of the probability language in CSSR Chapter 12, which is softened by confidence language ("very high confidence in lower bounds; medium confidence in upper bounds for 2030 and 2050; low confidence in upper bounds for 2100"), is a bit different than the unalloyed language here.	As written, "global mean sea level is very likely..." refers to the 1 - 4.3 feet rise by 2100 relative to 2000, which represents the low and high end of the 5th and 95th confidence interval of the RCP2.6 and 8.5 scenarios, respectively.

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Robert	Kopp	141164	Text Region	02. Our Changing Climate		63	63	19	29	Note that the probability language in CSSR chapter 12 has clearer caveats than the language here. For example: "Emerging science suggests that these projections may understate the probability of faster-than-expected ice sheet melt, particularly for high-end warming scenarios. While these probability estimates are consistent with the assumption that the relationship between global temperature and GMSL in the coming century will be similar to that observed over the last two millennia,32, 85 emerging positive feedbacks (self-amplifying cycles) in the Antarctic Ice Sheet especially86, 87 may invalidate that assumption. Physical feedbacks that until recently were not incor- porated into ice sheet models88 could add about 0â€¢10 cm (0â€¢0.3 feet), 20â€¢50 cm (0.7â€¢1.6 feet) and 60â€¢110 cm (2.0â€¢3.6 feet) to central estimates of current century sea level rise under even lower, lower, and higher scenarios (RCP2.6, RCP4.5 and RCP8.5, respectively).77" Without this softening language, the probability language may be read as excluding or giving de minimis probability to the High and Extreme scenarios.	The text has been revised to incorporate more of this specific wording.
Robert	Kopp	141165	Text Region	02. Our Changing Climate		80	80	20	22	Unfortunately, this flattening appears to have ended in 2017; see LeQuere et al 2017, https://www.icos-cp.eu/GCP/2017	Indeed; the text has been updated with a reference to Le Quere et al. 2018.
Robert	Kopp	141166	Text Region	02. Our Changing Climate		81	81	15	15	As written, there is only one case -- 2017 -- discussed; "some cases" does not make sense in this context.	Agreed; the text has been revised as suggested.
Robert	Kopp	141167	Text Region	02. Our Changing Climate		89	89	33	39	Subsequent to the completion of the CSSR, Kopp et al 2017 (doi: 10.1002/2017EF000663) conducted this analysis of the combination of Kopp et al 2014 and DeConto and Pollard 2016 more formally. They found that DeConto and Pollard 2016 increased the central 90% of simulations for RCP 8.5 in 2100 from 0.5-1.2 m to 0.9-2.4 m (median increasing from 0.8 to 1.5 m); for RCP 4.5 from 0.4-1.0 m to 0.5-1.6 m (median from 0.6 to 0.9 m); and for RCP 2.6 from 0.3-0.8 m to 0.3-1.0 m (median from 0.5 to 0.6 m).	The table for 2100 has been updated with these more recent numbers.
Geoffrey	Marion	141829	Whole Chapter	02. Our Changing Climate						1) The chapter delivers a strong and firm grasp of the facts leading to our belief in the changing climate. It goes through various facets of climate, i.e. effect of anthropogenic activities on increased amount of carbon dioxide and a net increase in global temperature, decrease in arctic sea ice, widening of tropical belt, increase in precipitation extremes, changes in oceanic acidity and circulation and changes in the overall global circulation. 2) Although, the combination of satellite studies and general circulation models provide a holistic view of changing climate, uncertainties due to lack of understanding and hence representation of convective processes in the global scale models can create a significant bias in the results. Therefore, inclusion of uncertainties due to convective-radiative biases might create a deviation in the report results. Otherwise, the report does a very thorough analysis of providing the scientific characterization of changes in the global climate.	We thank the reviewer for the thoughtful comment. The much more detailed and in-depth discussion in NCA4 Volume 1 address these issues at the level of detail that the reviewer would like to see, including uncertainties in the climate models and their potential effects on the resulting projections. Chapter 4 and Appendix B of Volume 1 also describe the weighting approach used in examining the effects resulting from some of these uncertainties in the models. We include references to those resources in this chapter, and we encourage the interested reader to refer to them for more detailed discussion.
Kathy	Lynn	141864	Whole Chapter	02. Our Changing Climate						Excellent chapter going into further detail of climate change over the US and the world. It does a great job of going straight to the figures and graphs that matter most to the reader. One suggestion would be to include more elaboration when discussing new phenomenon. For example, on page 75, line 18 begins with a statement about the increasing intensity of severe thunderstorms and tornadoes over shorter time scales but does not discuss why that happens. Perhaps a sentence or two from the citation for this fact would be useful to the reader in adding fluidity and clarity as we read from fact to fact.	Thanks for this comment. There may be a slight misunderstanding here, so the text has been revised to read: "Extreme events such as tornadoes and severe thunderstorms occur over much shorter time periods and smaller areas than other extreme phenomena such as heat waves, droughts, and even tropical cyclones, making it difficult to detect trends and develop future projections (Kunkel et al. 2013; see Box 2.6)." We did not mean to imply that there were any physical changes occurring over shorter time-scales.
David	Wojick	141917	Text Region	02. Our Changing Climate		57	57	2	7	Here is the present text: 2 Key Message 1: Global climate is changing rapidly compared to the pace of natural variations 3 in climate that have occurred throughout Earth‰Ûªs history. Global average temperature has 4 increased by about 1.7â¡F from 1901 to 2016, and observational evidence does not support 5 any credible natural explanations for this amount of warming; instead, the evidence 6 consistently points to human activities, especially emissions of greenhouse or heat-trapping 7 gases, as the dominant cause. Comment: This entire Message states a clearly false claim. The scientific literature is full of discussions of possible natural causes for the observed changes. Moreover, there are numerous studies that suggest that these changes are well within the range of natural variability. In fact at least half of the temperature increase occurred early in the 20th century, when greenhouse gasses were thought to have little impact. (It should also be noted that these gases do not trap heat.) This Key Message probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	This statement is inconsistent with the findings of NCA4 Vol. 1 as summarized in Chapters 1 through 4. Specifically, Vol. 1 states that: “The global climate continues to change rapidly compared to the pace of the natural variations in climate that have occurred throughout Earth’s history.” (Chapter 1) It also concludes that: “Many lines of evidence demonstrate that it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century. Formal detection and attribution studies for the period 1951 to 2010 find that the observed global mean surface temperature warming lies in the middle of the range of likely human contributions to warming over that same period. We find no convincing evidence that natural variability can account for the amount of global warming observed over the industrial era. For the period extending over the last century, there are no convincing alternative explanations supported by the extent of the observational evidence. Solar output changes and internal variability can only contribute marginally to the observed changes in climate over the last century, and we find no convincing evidence for natural cycles in the observational record that could explain the observed changes in climate.” (Chapter 1) It additionally finds that: “In the industrial era, human activities have been, and are increasingly, the dominant cause of climate warming. The increase in radiative forcing due to these activities has far exceeded the relatively small net increase due to natural factors, which include changes in energy from the sun and the cooling effect of volcanic eruptions.” (Chapter 2) Vol. 1 also quantifies the human-induced contribution as follows: “The likely range of the human contribution to the global mean temperature increase over the period 1951–2010 is 1.1°F to 1.4°F (0.6°C to 0.8°C), and the central estimate of the observed warming of 1.2°F (0.65°C) lies within this range (high confidence). This translates to a likely human contribution of 93%–123% of the observed 1951–2010 change. It is extremely likely that more than half of the global mean temperature increase since 1951 was caused by human influence on climate (high confidence). The likely contributions of natural forcing and internal variability to global temperature change over that period are minor (high confidence).” (Chapter 3)

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David	Wojick	141918	Text Region	02. Our Changing Climate		60	60	7	13	Present text: 7 Key Message 2: Earth‰Ûªs climate will continue to change over this century and beyond. Past mid 8century, how much climate changes will depend primarily on global emissions of greenhouse 9 gases and on the response of Earth‰Ûªs climate system to human-induced warming. With 10 significant reductions in emissions, global temperature increase could be limited to 3.6â¡F 11 (2â¡C) or less compared to preindustrial temperatures. Without significant reductions, annual 12 average global temperatures could increase by 9â¡F (5â¡C) or more by the end of this century 13 compared to preindustrial. Comment: The entire Message falsely asserts a speculative claim as an established physical fact. That human caused warming exists and will continue in this extreme fashion has yet to be determined and is increasingly unlikely. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity.	This statement is inconsistent with the findings of NCA4 Volume 1 as summarized in Chapters 1 through 4. The referenced Key Message represents the scientific understanding of climate as summarized in, and grounded on, the peer-reviewed literature found in NCA4 Volume 1 which meets the requirements of the Information Quality Act. The text in this Key Message is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapter 4, for more information on the scientific basis for this statement, including relevant citations. Regarding the Information Quality Act, Volume I of the Fourth U.S. National Climate Assessment was prepared and Volume 2 is being prepared in compliance with Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (P.L. 106-554) and information quality guidelines issued by the Department of Commerce / National Oceanic and Atmospheric Administration pursuant to Section 515 (http://www.cio.noaa.gov/services_programs/info_quality.html). For purposes of compliance with Section 515, these documents are deemed a "highly influential scientific assessment" (HISA) and contain expert assessments of the relevant scientific literature that are peer-reviewed by the National Academy of Sciences. The report graphics follow the ISO 19115 standard which includes the necessary information to achieve reproducibility.
Christen	Armstrong	141919	Text Region	02. Our Changing Climate		61	61	23	26	Present text: 23 Key Message 3: The world‰Ûªs oceans have absorbed 93% of the excess heat from human-induced 24 warming since the mid-20th century and are currently absorbing more than a quarter of the 25 carbon dioxide emitted to the atmosphere annually from human activities, making the oceans 26 warmer and more acidic. Comment: This text falsely states several falsehoods and speculations as established physical facts. In reality all human emitted carbon dioxide is gone in just a few years. That the increasing atmospheric concentration of trace carbon dioxide is composed of human emissions is a common fallacy. That NCA4 should assume this fallacy in its fundamental scientific claims is very worrying. That there is any human-induced warming or that the oceans are absorbing most of it has yet to be determined and appears increasingly unlikely. Connecting ocean warming to human emissions is pure speculation at this point.	This statement is inconsistent with the findings of NCA4 Vol. 1 as summarized in Chapters 1, 12 and 13. As NCA4 Vol.1 states, "Trends in globally averaged temperature, sea level rise, upper-ocean heat content, land-based ice melt, arctic sea ice, depth of seasonal permafrost thaw, and other climate variables provide consistent evidence of a warming planet. These observed trends are robust and have been confirmed by multiple independent research groups around the world." More detail is provided in NCA4 Vol. 1 Figure 1.1 and Chapters 1, 6, 7, 11, and 12. Vol. 1 also states that: "Many lines of evidence demonstrate that it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century. Formal detection and attribution studies for the period 1951 to 2010 find that the observed global mean surface temperature warming lies in the middle of the range of likely human contributions to warming over that same period. We find no convincing evidence that natural variability can account for the amount of global warming observed over the industrial era. For the period extending over the last century, there are no convincing alternative explanations supported by the extent of the observational evidence. Solar output changes and internal variability can only contribute marginally to the observed changes in climate over the last century, and we find no convincing evidence for natural cycles in the observational record that could explain the observed changes in climate." (Chapter 1) It additionally finds that: "In the industrial era, human activities have been, and are increasingly, the dominant cause of climate warming. The increase in radiative forcing due to these activities has far exceeded the relatively small net increase due to natural factors, which include changes in energy from the sun and the cooling effect of volcanic eruptions." (Chapter 2) Vol. 1 also quantifies the human-induced contribution as follows: "The likely range of the human contribution to the global mean temperature increase over the period 1951–2010 is 1.1° to 1.4°F (0.6° to 0.8°C), and the central estimate of the observed warming of 1.2°F (0.65°C) lies within this range (high confidence). This translates to a likely human contribution of 93%–123% of the observed 1951–2010 change. It is extremely likely that more
Christen	Armstrong	141922	Text Region	02. Our Changing Climate		62	63	37	1	Present text: 37 Global mean sea level is very likely to continue 38 to rise, by at least several inches in the next 15 years and by 1‰ÛÒ4 feet by 2100 relative to 1 present-day levels. Recent studies suggest a rise of 6 to 10 feet by 2100 is physically possible. Comment: This text falsely asserts speculative computer projections as though they were established physical facts, which they are not. The text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." These wild claims exhibit neither quality, objectivity, utility or integrity. To begin with there is neither objectivity nor integrity. As a result there is no quality or utility.	This statement is inconsistent with the findings of NCA4 Vol. 1, particularly as summarized in Chapter 12. The referenced Key Message represents the scientific understanding of climate as summarized in, and grounded on, the peer-reviewed literature found in NCA4 Volume 1 which meets the requirements of the Information Quality Act. The text in this Key Message is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapter 12, for more information on the scientific basis for this statement, including relevant citations. Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: "The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends

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David	Wojick	141924	Text Region	02. Our Changing Climate		64	64	12	16	The present text says this: 12 Additional increases in annual average temperature of about 2.5â¡F (1.4â¡C) are expected 13 over the next few decades regardless of future emissions, and increases ranging from 3â¡F to 14 12â¡F (1.6â¡‰ÛÒ6.6â¡C) are expected by the end of century, depending on whether the world 15 follows a higher or lower future scenario, with proportionally greater changes in high 16 temperature extremes. Comment: These supposed "expectations" falsely assert speculative computer projections as though they were established physical facts, which they are not. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have these negative impacts has yet to be determined and appears increasingly unlikely.	Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: "The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation)." (Chapter 1) And over longer time scales, Vol. 1 concludes that: "While climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that can contribute to feedbacks, compound extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the
Christen	Armstrong	141925	Text Region	02. Our Changing Climate		67	67	2	9	Here is the present text: 2 Key Message 6: Annual precipitation has increased across most of the northern and eastern 3 United States and decreased across much of the southern and western United States; these 4 regional trends are expected to continue over the coming century. Observed increases in the 5 frequency and intensity of heavy precipitation events in most parts of the United States are 6 projected to continue. Surface soil moisture over most of the United States is likely to 7 decrease, accompanied by large declines in snowpack in the western United States and shifts 8 to more winter precipitation falling as rain rather than snow in many parts of the central and 9 eastern United States. Comment: These supposed "expectations" and "projections" falsely assert speculative computer projections as though they were established physical facts, which they are not. That climate change will have these negative impacts has yet to be determined and appears increasingly unlikely.	Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: "The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation)." (Chapter 1) And over longer time scales, Vol. 1 concludes that: "While climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that can contribute to feedbacks, compound extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Christen	Armstrong	141928	Text Region	02. Our Changing Climate		71	71	8	12	Present text: 8 Arctic-wide glacial and sea ice loss is expected to continue; by mid-century, it 9 is very likely that the Arctic will nearly free of sea ice in late summer. Permafrost is expected 10 to continue to thaw over the coming century as well, and the carbon and methane released 11 from thawing permafrost has potential to amplify human-induced warming, possibly 12 significantly. Comment: These supposed "expectations" falsely assert speculative computer projections as though they were established physical facts, which they are not. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have these negative impacts has yet to be determined and appears increasingly unlikely.	Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: "The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation)." (Chapter 1) And over longer time scales, Vol. 1 concludes that: "While climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that can contribute to feedbacks, compound extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the
Christen	Armstrong	141931	Text Region	02. Our Changing Climate		74	74	2	7	Here is the present text: 2 Key Message 8: Human-induced change is affecting atmospheric dynamics and contributing to 3 the poleward expansion of the tropics and the northward shift in Northern Hemisphere 4 winter storm tracks since 1950. Increases in greenhouse gases and decreases in air pollution 5 have contributed to increases in Atlantic hurricane activity since 1970. In the future, Atlantic 6 and eastern North Pacific hurricane rainfall and intensity are projected to increase, as are 7 the frequency and severity of landfalling ‰ÛÏatmospheric rivers‰Û on the West Coast. Comment: This entire message falsely states well known controversial claims as though they were established physical facts, which they are not. That these extreme claims are highly controversial stands out in the present literature, which NCA4 has clearly chosen to ignore. Thus the text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." These controversial claims exhibit neither quality, objectivity, utility or integrity. To begin with there is neither objectivity nor integrity. As a result there is no quality or utility.	Both NCA4 Vol. 1 and 2 represent a summary of the state of the science as published in the peer-reviewed literature. The referenced Key Message represents the scientific understanding of climate as summarized in, and grounded on, the peer-reviewed literature found in NCA4 Volume 1 which meets the requirements of the Information Quality Act. The text in this Key Message is a direct quotation from that document, which has been approved and was published in November 2017. We refer the reviewer to Volume 1, in particular Chapters 5 and 9, for more information on the scientific basis for this statement, including relevant citations. Regarding the Information Quality Act, Volume I of the Fourth U.S. National Climate Assessment was prepared and Volume 2 is being prepared in compliance with Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (P.L. 106-554) and information quality guidelines issued by the Department of Commerce / National Oceanic and Atmospheric Administration pursuant to Section 515 (http://www.cio.noaa.gov/services_programs/info_quality.html). For purposes of compliance with Section 515, these documents are deemed a "highly influential scientific assessment" (HISA) and contain expert assessments of the relevant scientific literature that are peer-reviewed by the National Academy of Sciences. The report graphics follow the ISO 19115 standard which includes the necessary information to achieve reproducibility.
David	Wojick	141933	Text Region	02. Our Changing Climate		75	75	26	34	Present text: 26 Key Message 9: Regional changes in sea level rise and coastal flooding are not evenly 27 distributed across the United States; changes in ocean circulation, land elevation, and 28 Antarctic ice melt will result in greater-than-average sea level rise for the Northeast and 29 western Gulf of Mexico under lower scenarios and most of the U.S. coastline other than 30 Alaska under higher scenarios. Since the 1960s, sea level rise has already increased the 31 frequency of high tide flooding by a factor of 5 to 10 for several U.S. coastal communities. 32 The frequency, depth, and extent of tidal flooding is expected to continue to increase in the 33 future, as is the more severe flooding associated with coastal storms, such as hurricanes and 34 nor‰Û³easters. Comment: These supposed "expectations" falsely assert speculative computer projections as though they were established physical facts, which they are not. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have these negative impacts has yet to be determined and appears increasingly unlikely.	Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: "The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation)." (Chapter 1) And over longer time scales, Vol. 1 concludes that: "While climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that can contribute to feedbacks, compound extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the

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Christen	Armstrong	141934	Text Region	02. Our Changing Climate		76	77	34	1	Here is the present text: 34 Key Message 10: The climate change resulting from human emissions of carbon dioxide will 35 persist for decades to millennia. Self-reinforcing cycles within the climate system have the 36 potential to accelerate human-induced change and even shift the Earth‰Ûªs climate system into 37 new states that are very different from those experienced in the recent past. Future changes 38 outside the range projected by climate models cannot be ruled out, and due to their 39 systematic tendency to underestimate temperature change during past warm periods, models 1 may be more likely to underestimate than to overestimate long-term future change. Comment: This text falsely asserts pure speculations as though they were established physical facts, which they are not. It is far more likely that climate change will be beneficial.	Both NCA4 Vol. 1 and 2 represent a summary of the state of the science including, where appropriate, an accurate and representative range of uncertainty in both historical observations and future projections. All future projections correspond to both a higher and a lower future scenario. The Front Matter of Vol. 2 states that, "For the sake of brevity and clarity, the Principals of the Subcommittee on Global Change Research (SGCR) decided that NCA4 would focus on RCP8.5 as a "higher" scenario and RCP4.5 as a "lower" scenario. Other RCP scenarios (e.g., RCP2.6, a "very low" scenario) may be used where instructive, such as in analyses of mitigation science issues. The use of RCP8.5 and RCP4.5 as core scenarios is broadly consistent with the range of scenarios used in the Third National Climate Assessment (Melillo et al. 2014)." Analysis of projected changes in past assessments have demonstrated that, if anything, such assessments tend to error on the side of under- rather than over-estimating observed change. A number of such analyses have been conducted by independent researchers as well as by organizations such as the National Research Council. These assessments are summarized in Brysse et al. (2012), who concluded that: "The available evidence suggests that scientists have in fact been conservative in their projections of the impacts of climate change. In particular, we discuss recent studies showing that at least some of the key attributes of global warming from increased atmospheric greenhouse gases have been under-predicted, particularly in IPCC assessments of the physical science, by Working Group I. We also note the less frequent manifestation of over-prediction of key characteristics of climate in such assessments. We suggest, therefore, that scientists are biased not toward alarmism but rather the reverse: toward cautious estimates, where we define caution as erring on the side of less rather than more alarming predictions." Brysse, K., N. Oreskes, J. O'Reilly and M. Oppenheimer. 2012. Climate change prediction: Erring on the side of least drama? Global Environmental Change, 23(1), 327-337. The referenced Key Message represents the scientific understanding of climate as summarized in, and grounded on, the peer-reviewed literature found in NCA4 Volume 1 which meets the requirements of the Information Quality Act. The text in this Key Message is a direct quotation from that document, which has been
Puja	Roy	141957	Text Region	02. Our Changing Climate		57	57	11	35	Just a minor observation. Here, 1.2 degree Fahreinheit is written as 0.7 degree Celsius, while in Line 35, Page 57, the same 1.2 degree Fahreinheit is written as 0.65 degree Celsius.	Thank you; this has been corrected.
Puja	Roy	141958	Text Region	02. Our Changing Climate		57		11		"and by 1.2â¡F (0.7â¡C) for the period 1986‰ÛÒ2015 as compared to 1901‰ÛÒ1960. " Why isn't the time period between 1961 to 1985 included in the latter part of this particular study?	This is the baseline that was used in NCA4 Volume 1.
Nicholas	Rajkovich	141959	Text Region	02. Our Changing Climate		58		11		Given that many aspects of direct, indirect and semi-direct effects of aerosols are yet to be completely understood, how strongly can it be said that the net effect of aerosols is to cool the planet?	Forcing over the industrial era via aerosol-radiation and aerosol-cloud interactions is assessed to be net negative with **high confidence** (see CSSR Chapter 2 Key Finding 2 and associated Traceable Accounts). While the magnitude of aerosol forcing is highly uncertain, there is much greater confidence in the sign of the global, annual average forcing. The range in effective radiative forcing via aerosol-cloud interactions in AR5 was estimated as -1.2 to 0.0 W/m2; i.e., there's a 95% chance it is negative. The range in effective radiative forcing via aerosol-radiation interactions (which includes the semi-direct responses) was estimated as -0.95 to +0.05, and in the ERF due to aerosols deposited on snow is +0.02 to +0.09. Thus, there is only a small chance that net aerosol ERF from all three mechanisms is net-positive.
Nicholas	Rajkovich	141961	Text Region	02. Our Changing Climate		74		4		How have "decreases in air pollution have contributed to increases in Atlantic hurricane activity since 1970."?	This is a good question. This point is addressed in a number of references and to save space, we chose to cite the AR5 rather than repeat that information here. We've added a more recent citation in the text that explicitly discusses this.
Sarah	Davidson	141988	Text Region	02. Our Changing Climate		61	61	10	16	Consider including the projected time of the peak in carbon emissions for RCP2.6 as done for all other RCPs in this paragraph. It is important to make clear to decision-makers that best available information suggests that this "even lower scenario" likely requires emissions to peak within the next decade. For example see Figure 2.2 of this draft report (p. 61), figures SPM.5 and SPM.11 in the IPCC's 2014 synthesis report, and Millar et al. (2017) doi:10.1038/NGEO3031.	The time for carbon emissions to peak under the RCP2.6 scenario has already passed; the caption has been revised to make this point clear.
Sarah	Davidson	141989	Text Region	02. Our Changing Climate		75	75	25	34	Under the description of Key Message 9, consider including a reference to NOAA Technical Report NOS CO-OPS 083 (Sweet et al. 2017).	Agreed; a reference to Sweet et al. (2018) has been added.
Sarah	Davidson	141990	Text Region	02. Our Changing Climate		78	78	10	29	Consider referencing 2017 temperatures, the warmest year on record without an El Nino (https://www.ncdc.noaa.gov/sotc/global/201713).	We appreciate this comment. Although the reviewer is correct in saying that 2017 was the warmest year on record without an El Nino, the purpose of this box is to describe human and natural factors that can contribute to climate at a given time (rather than what happened in a specific year in the historical record).
Sarah	Davidson	141991	Text Region	02. Our Changing Climate		79	79	4	10	Changes "that are consistent with a warming climate" leave open the possibility of alternative explanations. Consider clarifying by repeating the message from elsewhere in this report that these trends all fall outside variability that humans have experienced and that there is no alternative explanation. e.g. p. 24-25 "… clear evidence of a rapid warming trend that is pushing the climate system beyond the range of natural variability that modern civilization has experienced…. The long-term warming trend observed over the past century can only be explained by the effect that human activities, especially emissions of greenhouse gases from burning fossil fuels and clearing forests, have had on the climate."	This section concerns the observed changes in climate. In the chapter, this Box 2.2 is referred to in the paragraph that is immediately followed by the paragraph on the connections with human activities. In the final published version we expect the box to appear right next to where it is called for, so we see no need to further modify the discussion to make sure the human connections are discussed.
Sarah	Davidson	141992	Text Region	02. Our Changing Climate		80	80	13	14	When identifying the RCPs consider describing the +4.5 scenario as "low" rather than "lower" or describing +2.6 as "even lower"; as worded here, readers could be confused or incorrectly conclude that the +4.5 scenario is "lower" than the +2.6 scenario.	Scenarios are described as per the standardized wording that is used across all chapters in NCA Vol. 1 and 2.
Sarah	Davidson	141993	Text Region	02. Our Changing Climate		80	80	20	24	Consider updating to include preliminary published estimates of increased global emissions in 2017. See Le Quere et al. (in review, doi:10.5194/essd-2017-123) and Peters et al. (2017, doi:10.1038/s41558-017-0013-9).	Thank you for the update. The paragraph has been revised accordingly to include these references.
Sarah	Davidson	141994	Text Region	02. Our Changing Climate		80	80	18	24	Given this paragraph begins with "Which scenario is more likely?" consider referring to specific scenarios in the subsequent text, something like "…the higher future scenarios (RCP+6 or RCP+8.5)…" In particular explain if/how the 1.5/2 C targets compare to the RCPs. This is a critical piece of information for decisionmakers.	We appreciate this suggestion. The paragraph has been revised to refer to specific scenarios as suggested.
Sarah	Davidson	141995	Text Region	02. Our Changing Climate		80	80	25	37	Consider adding additional references to this paragraph. See e.g. Millar et al. (2017, doi:10.1038/NGEO3031), Raftery et al. (2017, doi:10.1038/NCLIMATE3352), Schnellnhuber et al. (2016, doi:10.1038/nclimate3013), van Vuuren et al. (2011, doi:10.1007/s10584-011-0152-3)	Thank you for the update. The paragraph has been revised accordingly to include these references.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Emily	Seyller	142384	Whole Chapter	02. Our Changing Climate						Melting Sea Ice and Its General Effects This chapter thus far seems to do an effective job at communicating to the general public the current state of climate change, as well as what the future is predicted to look like in different scenarios. However, there are parts within the draft‰Ûªs second chapter which are in need of clarification/explanation to the public crowd. Like many of the general public, I am aware of the rising sea levels due to the melting glaciers. However, with a limited background in chemistry, biochemistry, and ecology, I am confused as to what the direct effects on specific organisms will be from these rising sea levels. Ch. 2, Page 72, Line 24 states ‰ÛÏIt is very likely that by mid-century the Arctic will be almost entirely free of sea ice by late summer.‰Û Ï This wording is confusing. Does it mean that in one specific future late summer the Arctic will be free of sea ice? Or, does it mean that every recurring late summer the Arctic will not have any sea ice, and then in the winter and colder months ice will form again? Is there any significance that the water will be salt water that freezes as opposed to fresh water? Clarification of this point would be very helpful in concluding Key Message 7. The Effects of increased Ocean CO2 on Ocean Organisms The draft makes clear its prediction of rising sea levels, however fails to address what the projected effects of increased CO2 in the ocean will be on oceanic organisms? I would assume increased photosynthesis of photolithotrophs living in the ocean, however, what effects might this have on oceanic ecosystems? Will this dumping of freshwater into the ocean create a problem for current organisms living in a saltwater environment, or is this such a miniscule amount it is insignificant? A Raw Data Draft Devoid of Hope, and Perhaps Too Objective In so much as this draft presents the facts, raw data, and draws conclusions, it has left me, as part of the general public, feeling slightly hopeless, and my actions insignificant. As a current researcher studying oak tree genetic variation in order to predict changing range during climate change, I would like to see a glimmer of a tone of hope conveyed. This report is about being objective, however what good will that be if it has no effect on the public? The public needs to feel a sense of urgency, or at least worry, about the state of or climate entering into the unknown. Yet, at the same time, there is lots being done to study climate change. Aside from predicting what will happen without intervention, there is lots being done to determine how we will take further action, how we can reverse this process, and how we can maintain a high standard of living in an environmentally friendly	Thank you for this comment and the kind remarks on the chapter. While we appreciate the perspective put forward by this reviewer, unfortunately much of what they propose and suggest is either beyond the scope of this chapter, which focuses very narrowly and exclusively on observed and projected changes in the physical climate system -- or it is beyond the scope of this report, which does not deal with aspects of policy response. Regarding their comments on sea ice (which is within the purview of this chapter), the below Key Message 7 has been expanded to explain that the "ice-free" threshold would be crossed in late summer; that the metric is a statement of likelihood of this threshold being crossed for the first time in approx. 2 million years; and that sea ice will continue to form each winter. Clarification was also added regarding how loss of sea ice affects heat uptake and distribution in the ocean, further enforcing sea ice loss in subsequent years. Note that the fact that it is salt water that is freezing simply lowers the freezing temperature; we do not consider this of sufficient significance to point out. Other chapters (Chapter 9: Oceans and Marine Resources and Ch. 26: Alaska) discuss in more detail the impacts of sea ice loss to coastal communities and ecosystems.
Amy	Chen	142395	Whole Chapter	02. Our Changing Climate						I find that Chapter 2 has a number of major and minor problems. 1. Ostensibly, the point of the NCA4 comprising two volumes is so that one could be devoted to describing climatic changes themselves, and the other (this volume) to the effects thereof. It is therefore not necessary to re-hash findings findings from Volume I here, and especially given that much of this same, or similar, material is also repeated in the Executive Summary and the other two preliminary chapters. This problem is made even worse by the fact that most of this material is not even specific to the United States. Together these give the distinct impression that Volume II does not in fact place its highest priority on describing the climatic state(s) of the United States, but rather on using the NCA4 as an excuse to bolster IPCC Assessment Reports and their conclusions. This is unacceptable. 2. More specifically, "Key Messages" 1 to 4 are focused 100% on the global scale, with no mention of specifics for the United States whatsoever. A USA focus does not appear until Messages 5 and 6, which, focusing on primary climatic variables (T and P) should reasonably be the lead "Key Messages" of the chapter. Other Key Messages are either at global, or a mix of global and USA, scales. Key Messages 3 and 4 both deal with the ocean and can therefore be combined, and much of that discussion deals either with the open ocean generally, and/or non-climatic effects (ocean acidification). 3. The chapter mixes (1) observations from the past with (2) predictions of the future in a haphazard way, and it is by no means clear which if any of these represent truly new findings since the last NCA in 2014. Again, re-hashes of various claims of NCA4 Volume 1, or IPCC AR5, or other large scale assessments, do not fulfill the NCA mission/purpose of updating what is known (or believed) about the climate of the United States. Furthermore, the provenance or data sources for various claims made is very frequently unclear. 4. Box 2.4. The point of this box is incorrect--oviously, what matters is the flux into and out of the atmosphere, not into (i.e. emissions) alone. Increased sequestration, by whatever means, for a given emission level, will also reduces atmospheric accumulation; this is a very basic fact. There is also no such thing as "negative emissions"; emissions are positive by definition and the opposite process is sequestration. Furthermore, the paragraph in lines 18-24 is wrong or misleading. Emissions from the USA, and North America, have been declining for about a decade now, since roughly 2008 or so, not 2014. This is very clearly shown in the latest Global Carbon Project annual report and data (GCP, November 2017). The paragraph appears to be	1. The mandate of NCA4 Volume 1 and NCA4 Volume 2 Chapter 2 is to describe changes to the physical climate system at both the relevant global and the national scales, recognizing that global change affects the United States. This chapter fulfills that mandate. 2. Chapter 2 has been specifically organized to present global changes first, then national ones. 3. Each section combines observations with future projections for the same variable, mirroring the organization of NCA4 Volume 1. The reviewer is directed to NCA4 Volume 1 for a clear delineation of what is new relative to NCA3. 4. The terminology used in this box is that of the scientific community and the references to global emissions are relevant because these are what determine climate: not those of the US alone. The reviewer is directed to NCA4 Volume 1 Chapter 14 for more information. Both NCA4 Vol. 1 and 2 represent a summary of the state of the science including, where appropriate, an accurate and representative range of uncertainty in both historical observations and future projections. 5. We appreciate the reviewer's opinion but the title of the chapter cannot be changed at this time.
Linda	Heath	142420	Whole Chapter	02. Our Changing Climate						The chapter was very interesting, since it describes how much humans are really contributing to climate change.	Thank you for the kind comment.
Jeff	Lukas	143198	Whole Chapter	02. Our Changing Climate						The jet stream is mentioned for the first time in this chapter and referenced several times elsewhere, but a sufficient explanation may be lacking. Respectfully ask consideration of adding language to make the connection between (1) the warming of the Arctic as so intense (twice as great the rest of the world) that it has been dubbed, Arctic Amplification and (2) the Jet Stream. That is, the Jet Stream has responded to this arctic warming, the strength of the stream being influenced by the magnitude of the temperature gradient (pre- and post-Industrial Revolution), potentially weakening it, as well as causing its path to deviate.	We appreciate the comment. In NCA4 Volume 1, on which this chapter is based, we used a low confidence statement: "Potential linkages between the frequency and intensity of severe winter storms in the United States and accelerated warming in the Arctic have been postulated, but they are complex, and, to some extent, contested, and confidence in the connection is currently low." Give this level of confidence, we're somewhat reluctant to expound on this here, and instead, we'll defer this to a time when confidence is stronger and refer the interested reader to NCA4 Vol. 1 Chapter 5.

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Ryan	Maue	143378	Whole Chapter	02. Our Changing Climate						Detailed Review Comments of Chapter 2 There is voluminous research discussing the global warming ‰ÛÏhiatus‰Û or ‰ÛÏpause‰Û during the 16-years after the previous strong El Nino 1998-2014, only ended after the most recent uptick in global temperature in 2015-2017. While the background trend is clearly warming, the ‰ÛÏstep-like‰Û increases in temperature followed by ‰ÛÏpauses‰Û should not be glossed over but examined honestly. From conventional observational, satellite, and reanalysis datasets, the global warming coincident with the strong El Nino was over 0.2-degrees Celsius, similar but larger than the ‰ÛÏjump‰Û 20-years ago. Key Message 1: Lines 16-23 are not entirely representative of the ongoing research into the ‰ÛÏhiatus‰Û. The inclusion of the Lewandowsky et al. (2016) reference suggests this document is hedging toward ‰ÛÏstatistical‰Û cherry-picking as the reasoning for short-term global warming variability. Additionally, the Karl et al. (2015) paper includes arguably questionable data methodology choices and a better reference exists using the ERSSTv5 (Huang et al. 2017). These definitions are needlessly imprecise: ‰ÛÏfrom a few years to a decade or so‰Û and should be replaced with exact information about the length of previous ‰ÛÏpauses‰Û and then ‰ÛÏjumps‰Û or upticks in warming. The recent publication of Yin et al. (2018) in Geophysical Research Letters on the ‰ÛÏBig Jump of Record Warming Global Mean Surface Temperature in 2014-2016 Related to Unusually Large Oceanic Heat Releases‰Û (http://onlinelibrary.wiley.com/doi/10.1002/2017GL076500/abstract) is a useful reference as it provides an explanation for the observed warming. Hiatus ‰ÛÏdenial‰Û is not a good look and will not engender trust in future predictions of warming especially when leading climate scientists like James Hansen are predicting another decade-long ‰ÛÏhiatus‰Û. (http://www.columbia.edu/~jeh1/mailings/2018/20180118_Temperature2017.pdf) By weaving a narrative to sweep the recent warming hiatus under the rug, questions are raised about this section‰Ûªs adherence to the federal Day Quality Act as the misleading and imprecise nature of the analysis does not fulfill the ‰ÛÏmaximizing the quality, objectivity, utility, and integrity of information‰Û provision of the Act. Key Message 8: This entire section on Arctic amplification needs to be completely rewritten or excluded due to an inadequate level of analysis. Simply listing references with competing theories or contradictory conclusions is	Detailed Review Comments of Chapter 2 This comment should have been broken into separate comments about various sections of Chapter 2 rather than being a Whole Chapter comment. Nonetheless, we will deal with each of the comments one by one. The first comment is that there is a need to further discuss the so-called hiatus. The sentences relating to the hiatus have been rewritten to address this; however, they now also clearly reference the extensive discussion on the hiatus found in Chapter 1 of NCA4 Volume I, including the connections to changes in heat uptake during the period of the hiatus. A number of studies are referenced here, and others are also discussed in Volume I. The Huang et al. reference has been added as suggested. The next major comment relates to Key Message 8. This section is by necessity quite short, but the extensive discussion the reviewer wants to see on the Arctic can be found in Chapter 11 of NCA4 Volume I. Early in the chapter we state that the readers should see NCA4 Volume I formore extensive discussion on the topics discussed in chapter 2 of Volume II. Similarly, there is more discussion in Volume I on the other extremes, including atmospheric rivers (Chapter 7 of Volume I) and tropical cyclones (Chapter 9). We don't see a need to include Figure S.4 (which is essentially a redrawing of a figure in Wuebbles et al., 2014). We stand behind what is said in Box 2.5, which was written in close coordination with NOAA scientists.
Michelle	Tigchelaar	143602	Text Region	02. Our Changing Climate		62	63	35	30	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Annie Crawley, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. Key Message 4 includes the statement that a rise of 6 to 10 feet by 2100 is physically possible. We agree that it is important to acknowledge and address the low-probability, high-risk tail of sea level rise projections, but we think that by elevating this to a Key Message, greater confidence is implied than may be warranted. The assessment in the Traceable Accounts section around this statement is that it has low confidence, and in fact it is based on only one study (DeConto & Pollard, 2016), which uses a low-order dynamics ice sheet model with a relatively untested new parameterization scheme to make future ice sheet projections. We suggest the authors either remove this statement from the Key Message, or use existing literature to present a more consensus view on the extreme projections for 2100. In Chapter 8, page 304, line 11-13, for example, the following references are cited: Kopp et al., 2014; Jackson and Jevrejeva 2016; Sweet et al., 2017; Wong et al., 2017.	Agreed; a reference to Kopp et al. 2017 has been added.
Michelle	Tigchelaar	143606	Text Region	02. Our Changing Climate		64	64	19	20	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Annie Crawley, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. Regarding the statement ‰ÛÏSurface and satellite data both show accelerated warming since 1979.‰Û: Satellite data does not exist long enough before 1979 to know whether or not satellite record shows accelerated warming since 1979.	Agreed; we have modified the sentence to say "from 1979 to 2016" rather than "since 1979".
Michelle	Tigchelaar	143607	Text Region	02. Our Changing Climate		79	79	28	29	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Annie Crawley, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. The statement ‰ÛÏcontinued decline in the Arctic sea ice‰Û is vague. We suggest changing the sentence to: ‰ÛÏThe last few years have also seen record-breaking climate extremes, such as the three warmest years on record for the globe and low arctic summer sea ice extent relative to the average since satellite records began.‰Û	Thank you for this comment. We believe the existing statement ("continued decline in Arctic sea ice") is accurate and is actually more consistent with the rest of the box, which does not call out specific observing systems such as satellites.
Michelle	Tigchelaar	143608	Text Region	02. Our Changing Climate		76	76	2	14	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Annie Crawley, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. The authors may want to include evidence from a recently published paper in Science Advances, Liu et al. (2017). The study found that by correcting certain model biases which favor a stable AMOC, the AMOC collapses within 300 years after doubling CO2 concentrations from 1990s levels; this collapse then brings about very different climate responses. Most pertinent to the United States would be prominent cooling over the northern North Atlantic, some Arctic sea ice increases, and rain-belt migration over the tropical Atlantic. Liu W, Xie SP, Liu Z, Zhu J. (2017). Overlooked possibility of a collapsed Atlantic Meridional Overturning Circulation in Warming Climate. Sci Adv 3(1): e1601666. DOI: 10.1126/sciadv.1601666	This reference has been added.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michelle	Tigchelaar	143609	Text Region	02. Our Changing Climate		60	60	25	28	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Annie Crawley, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. There are a variety of definitions of feedback in the climate literature. For example, the highly cited Soden et al (2008) considers the Planck feedback to be one of the radiative feedbacks, so that the net feedback is damping. To be clearer what is meant, we suggest writing ‰ÛÏthe net effect of these feedbacks (excluding the Planck response) over the industrial era has been to amplify.‰Û Soden, B.J., I.M. Held, R. Colman, K.M. Shell, J.T. Kiehl, and C.A. Shields, 2008: Quantifying Climate Feedbacks Using Radiative Kernels. J. Climate, 21, 3504‰ÛÒ3520,https://doi.org/10.1175/2007JCLI2110.1	We disagree with the suggestion that the "net radiative feedback is damping". As was stated in NCA4 Volume 1: "When the temperatures of Earth's surface and atmosphere increase in response to RF, more infrared radiation is emitted into the lower atmosphere; this serves to restore radiative balance at the tropopause. This radiative feedback, defined as the Planck feedback, only partially offsets the positive RF while triggering other feedbacks that affect radiative balance. The Planck feedback magnitude is −3.20 ± 0.04 W/m2 per 1.8°F (1°C) of warming and is the strongest and primary stabilizing feedback in the climate system (Vial et al. 2013)." NCA4 Volume 1, on which this chapter is based, does account for the Planck function. So the statement in the chapter that "net effect of these feedbacks over the industrial era has been to amplify human-induced warming" is correct as it stands.
Michelle	Tigchelaar	143615	Text Region	02. Our Changing Climate		57	57	17	20	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Annie Crawley, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. Our comment regards the statement ‰ÛÏOver the past decade, such a slowdown led to numerous assertions that global warming had stopped. No temperature records, however, show that long-term global warming has ceased or even substantially slowed over the past decade.‰Û It is not clear what is meant by this statement. Consider instead the following, ‰ÛÏThe slowdown from about 1998 to 2008 led to some speculation that 20th century warming was not due to anthropogenic climate forcing. However, global warming resumed in the last decade, and global warming is clear in long-term temperature records despite occasional 5 to 10-year periods of slowdowns.‰Û	We appreciate this comment and considered it carefully, but concluded in the end that we do not feel that the original text is unclear, and moreover the suggested text does not say the same thing as the text it is intended to replace, which is in turn based on a very similar statement in NCA4 Volume 1.
Michelle	Tigchelaar	143630	Text Region	02. Our Changing Climate		75	76	38	3	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Annie Crawley, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. This text has three issues. (1) There is little sinking in the Arctic Ocean, (2) the freshwater budget of the Arctic is not described correctly, and (3) ocean heat loss is by far the largest contribution to the sinking rate, not freshwater. Melting sea ice causes no significant annual source of freshwater to the Arctic Ocean. Instead, owing to a large export of sea ice out the Fram Strait, there is actually a net loss of freshwater from net annual growth in the Arctic Ocean. The major sources of freshwater to the Arctic Ocean are direct precipitation, land runoff, and import of fresh Pacific waters. Presumably this text should be altered to describe the sinking in the North Atlantic and its freshwater budget. Consider replacing the text with, ‰ÛÏThe rate of sinking in the northern North Atlantic depends on heat loss from the ocean to the atmosphere as well as freshwater input to the surface. Freshwater sources include runoff from melting land ice, direct precipitation, and export of sea ice and relative freshwater from the Arctic ocean into the northern North Atlantic. For decades scientists have been concerned that the sinking rate could slow as atmospheric warming impedes ocean heat loss and raises direct precipitation and meltwater runoff from land-ice.‰Û	The text has been revised based on the suggested language.
Union of Concerned Scientists	Union of Concerned Scientists	143796	Whole Page	02. Our Changing Climate		62				Topline comment for Key Message 4: Sea Level Rise - The fact that SLR rates have been higher since 1993 seems to be downplayed here, when it should be highlighted if this document is to be used by policymakers (which is what we want and went through great discussions about how to make it so). The way it is written leaves out the fact that rates may increase even more, with sizable implications for policymaking and coastal adaptation measures.	We have now better articulated that the current rate of rise responsible for 'almost half' the rise since 1900 is very likely to continue through year 2100 to 1-4.3 feet.
Union of Concerned Scientists	Union of Concerned Scientists	143797	Text Region	02. Our Changing Climate		63	63	14	15	It is worth highlighting (1) why and (2) the implications of a higher rate for decision making and adaptation, since we have a lot of this SLR baked in for the first half of this century. And it can keep accelerating. The fact that land-based ice is melting at a faster rate than predicted should be highlighted.	The text has been revised to highlight this point as suggested.
Union of Concerned Scientists	Union of Concerned Scientists	143798	Text Region	02. Our Changing Climate		63	63	16	16	But the higher rate is since early 1990's, not in the last decade only - the way it is written is a bit misleading. From CSSR: Tide gauge analyses indicate that GMSL rose at a considerably faster rate of about 3 mm/year (0.12 inches/year) since 1993, a result supported by satellite data indicating a trend of 3.4 â± 0.4 mm/year (0.13 â± 0.02 inches/year) over 1993--2015	The text has been revised to make this point more clear.
Margaret	Matter	143890	Figure	02. Our Changing Climate	2.7	70				The Figure 2.7 title on line 9, Observed and Projected Change in Heavy Precipitation does not correspond to the titles above the two pairs of maps of the U.S. The title on line 9 appears to relate to heavy precipitation events, whereas the titles of the two pairs of maps refer to the 99th percentile of total annual precipitation. The title for the top pair of maps is, Observed Change in Total Annual Precipitation Above the 99th Percentile; and the title accompanying the lower pair of maps is, Projected Change in Total Annual Precipitation Above the 99th Percentile by Late 21st Century.	Thank you; this has been corrected.
Union of Concerned Scientists	Union of Concerned Scientists	143908	Whole Chapter	02. Our Changing Climate						It may be helpful to have all the key messages up front, followed be a breakdown of each one, to better-follow the format of the other chapters and have the main points in one place.	The chapter follows the pre-determined format of the NCA4 chapters.
Rebecca	Laurent	143957	Text Region	02. Our Changing Climate		57	57	21	23	Great that the misconception of natural variability is addressed directly here. The wording of the sentence that begins at the end of Line 21 is somewhat confusing. The beginning could be reworded to say ‰ÛÏInstead, the annual global temperature average from 1986-2015‰Û_.‰Û It is not clear why it is necessary to compare 1986-2015 to a ‰ÛÏsimilar period‰Û in the last 1,500 years (is it not the case that the average temperature has been higher and risen at a more rapid rate than at any other period in the last 1,500 years?). It would be helpful to define what a ‰ÛÏsimilar period‰Û is in a manner that identifies why the comparison is necessary.	Sentence has been revised to be more direct and clear, as suggested.
Rebecca	Laurent	143959	Figure	02. Our Changing Climate	2.1	59				Fantastic job explaining these graphs and what they mean. Love this.	Thank you; we appreciate the comment.
Rebecca	Laurent	143961	Text Region	02. Our Changing Climate		60	60	24	24	The word ‰ÛÏwith‰Û was left out of this sentence (uncertainties associated with modeling).	Corrected; thank you.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Rebecca	Laurent	143962	Text Region	02. Our Changing Climate		60	60	29	32	The first sentence of this paragraph is unclear. It would be helpful to explain the delay as being between the rise in carbon dioxide concentrations (rather than ‰ÛÏhuman influences‰ÛÒ) and corresponding temperatures. The sentence would be reword to say ‰ÛÏBecause there is a time lag between a rise in carbon dioxide concentrations and the resulting increase in global temperature, even if greenhouse gas concentrations could be stabilized at their current level in the atmosphere, the global temperature would increase by 1.1oF over this century relative to the last few decades.	Revised as suggested.
Michael	MacCracken	144099	Text Region	02. Our Changing Climate		57	57	25	25	Please capitalize "Earth" when talking about the planet. Or are you talking about warming of the land areas of the globe by using "earth." Names of all other planets are capitalized (even the former planet Pluto)--Earth deserves the respect of having its name capitalized. This will also make text consistent with page 58, lines 4 and 6--and hopefully in the rest of the document.	This chapter follows the same naming conventions that apply to the entire NCA4.
Michael	MacCracken	144100	Text Region	02. Our Changing Climate		58	58	2	2	I would also urge capitalizing "Sun" when referring to our sun. Also, see page 59, line 6 and then further on.	This chapter follows the same naming conventions that apply to the entire NCA4.
Michael	MacCracken	144101	Text Region	02. Our Changing Climate		60	60	9	11	This is a pretty optimistic statement--given how slow the response has been to the need to cut emissions. Pick's FOOD of 1.5 C had all emission pathways having large overshoots. I think it needs to be made clearer here that the emissions cutbacks need to do this will be much greater than nation's have committed to do, much less are set to actually do, per the Paris Accord.	This statement, as written, is based on the much more extensive disucssion of the issue of 2 C or less (including 1.5 C) found in NCA4 Volume 1 Chapter 14, as well as the supplementary text provided in Box 2.4, which will appear near this statement in the final product. The statement does not relate to the Paris Accord, just to the extensive decrease in emisisons that would be needed to meet 2C or less. The reviewer is referred to Vol. 1 Chapter 14 for more detail.
Michael	MacCracken	144102	Text Region	02. Our Changing Climate		60	60	12	13	I'd urge adjusting the wording to say "by the end of this century and beyond compared to preindustrial" to indicate warming would last, and also that a warming this large may take until a bit after 2100 to give some wiggle room.	While the reviewer's point is well made, this specific statement is accurate as written, since it refers to specific projections by climate models for 2100.
Michael	MacCracken	144103	Text Region	02. Our Changing Climate		60	60	24	24	Missing a word, need to say "associated with modeling"	Corrected; thank you.
Michael	MacCracken	144104	Text Region	02. Our Changing Climate		60	60	26	26	It seems to me the parenthetical phrase is located in the wrong location--if it is a reference, that style needs to be used; otherwise, the assessment itself is not going to be in that box (findings of it may be in that box, and if that is what is meant, a bit of clarification is needed).	Agreed; the reference to the box has been moved to the end of the sentence.
Michael	MacCracken	144105	Text Region	02. Our Changing Climate		60	60	31	31	Change "what's" to "the amount" to be clearer and a bit more formal.	Revised as suggested.
Michael	MacCracken	144106	Text Region	02. Our Changing Climate		61	61	5	22	As I have suggested elsewhere, I think it would be much more informative for readers to have the scenarios named based on what the scenario means with respect to ongoing CO2 emissions--FFforever, FFphasedown, or FFphaseout, etc.	Scenarios are described as per the standardized wording that is used across all chapters in NCA Vol. 1 and 2.
Michael	MacCracken	144107	Text Region	02. Our Changing Climate		61	61	23	23	As noted elsewhere, I would urge changing "about 93%" to "over 90%" to better recognize that there are uncertainties that really don't justify going to two-figure precision.	While the reviewer's point is well made, this specific number is that given in NCA4 Volume 1 on which this chapter is based.
Michael	MacCracken	144108	Text Region	02. Our Changing Climate		62	62	2	3	Not to mention the role of the oceans in maintaining the atmospheric oxygen concentration, moderating seasonal temperature change, and so on. A bit more explanation of their role would seem justified.	While we appreciate this comment, we are unable to expand on this suggestion due to space limitations.
Michael	MacCracken	144109	Text Region	02. Our Changing Climate		62	62	6	6	As noted previously, would be better to say "over 90%" than 93% due to uncertainties. Also, capitalize "Earth" or you could be read to talking about soil sciences.	While the reviewer's point is well made, this specific number is that given in NCA4 Volume 1 on which this chapter is based. Also, this chapter uses the naming conventions established for the entire NCA4 report.
Michael	MacCracken	144110	Text Region	02. Our Changing Climate		62	62	6	7	And really, it is increasing GHG concentrations, not increasing GHGs. For the reader, it is really important to be complete and precise and not be sloppy in phrasing.	Revised as suggested.
Michael	MacCracken	144111	Text Region	02. Our Changing Climate		62	62	11	12	Need to say "roughly a quarter" as varies a lot from year to year. Also, this sort of implies it is taking up those particular molecules, and that is not the case. It is also important to say that this uptake is the net effect as there is confusion out there about gross and net amounts. Thus, it might be said that 'the oceans net uptake each year has been about a quarter of each year's emissions.' I would also note that this has been the case when the CO2 emissions are rising. As emissions eventually start going down and eventually reach zero, the relationship will change, so it might be said this is what the situation is now--as it won't be forever.	Revised as suggested.
Michael	MacCracken	144112	Text Region	02. Our Changing Climate		62	62	12	13	For clarity, change "them" to "near surface ocean waters"--actually, below the compensation depth their pH is already low enough to be dissolving shells, etc.	Revised as suggested.
Michael	MacCracken	144113	Text Region	02. Our Changing Climate		62	62	30	31	To justify numbers being so precise, it would be good to somewhere along here indicate that these numbers are developed from the results of a number of models, each separately preparing an ensemble of simulations. But, I would note, this is really not a true measure of uncertainty as to opposed to a measure of the spread among the set of simulations of a set of models, each of which is being run in its presumably optimal configuration.	We appreciate the comment. More information on the derivation and source of this information is provided in NCA4 Volume 1 Chapter 13.
Michael	MacCracken	144114	Text Region	02. Our Changing Climate		62	62	31	31	In referencing the change to late 20th century values, the extent of disturbance to date is left off and this makes the result not useful for comparing to the Paris objectives. In addition to presenting in F and C, I'd urge presenting the results to both preindustrial and late 20th century, so perhaps saying something like 'with an increase of 4.9 +/- 1.3 F (2.7 +/- 0.7 C) by 2100 as compared to the late 20th century, so a rise of xx (yy) above preindustrial.'	The Paris objectives refer to global mean temperature (GMT), including both ocean and land. This paragraph and section are limited to the ocean only. Discussing the Paris objectives here would confuse the readers as SST and GMT are two different (albeit related) quantities. Key message #1 puts the Paris targets into perspective with current GMT change.
Michael	MacCracken	144115	Text Region	02. Our Changing Climate		62	62	36	38	[Really to page 63, line 1, but entry system prevents inputting that] What I am wondering is why be including both F and C for temperature if not also including metric along with metric units for sea level rise. I would also suggest adding a sentence indicating that future sea level rise could continue for many centuries at the amplified rate associated with the large temperature changes by 2100, such that keeping maximum global warming as low as possible will be critical to limiting the rate of future sea level rise.	We agree; both metric and imperial units are now listed in KM4.
Michael	MacCracken	144116	Text Region	02. Our Changing Climate		63	63	4	4	Again, for formal report writing, change "It's" to "Global sea level is"	Revised as suggested.
Michael	MacCracken	144117	Text Region	02. Our Changing Climate		63	63	5	5	I'd urge change "it" to "seawater" and then later in the sentence change "seawater" to "the seawater"	Revised as suggested.
Michael	MacCracken	144118	Text Region	02. Our Changing Climate		63	63	6	7	Change "water" to "seawater" for consistency of expression (even though the added water is freshwater). And no need for comma on line 7.	Revised as suggested.
Michael	MacCracken	144119	Text Region	02. Our Changing Climate		63	63	16	16	It needs to be said that the reason one is stopping at 2800 years is that is how far back adequate proxy records extend, and that the actual period likely goes back to over 8000 years ago, the time when major melting from the last glacial period ended.	The sentence already says "at least". NCA4 Volume 1 expains the basis for this statement much more fully.
Michael	MacCracken	144120	Text Region	02. Our Changing Climate		63	63	22	24	This might better say "While the rate of near-term sea level rise will be little affected by the near-term emissions trajectory, sea level rise beyond 2050 will be significantly affected." I'd just note that "future scenario" is repetitive and not what matters, future emissions are what matters.	The scenarios are not necessarily emission scenarios so we follow official guidance here in referring to them simply as future scenarios.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144121	Figure	02. Our Changing Climate	3	63				The flattening of this graph does not really seem a good way to convey how much sea level rise is being projected. By my calculation, the vertical scale is reduced by something like a factor of 128 compared to reality. I'd suggest reducing this to something more like a factor of 30, and then perhaps indicate this in the caption.	We agree; this figure has been revised and updated.
Michael	MacCracken	144122	Text Region	02. Our Changing Climate		64	64	2	2	Something happened as the caption says the units are inches where as the figure shows feet and meters. Again, this graph is just too flat.	This figure has been revised and updated to address both of these issues.
Michael	MacCracken	144123	Text Region	02. Our Changing Climate		64	64	3	3	I would not use the word "bound"--get a West Antarctic ice sheet collapse and the rise could be greater. Fine to say the various curves cover a range of what present understanding suggests is plausible, but given the limits of knowledge (and arbitrary assumption by DeConto and Pollard on limit of how rapidly could occur), I'd avoid using the word "bound." I would also urge adding a sentence to the caption indicating that sea level rise would be likely to keep rising at a high rate after 2100 because once the melting process is begun, it will become more and more difficult to stop.	We have re-worded accordingly.
Michael	MacCracken	144124	Text Region	02. Our Changing Climate		64	64	23	23	Unless time is running backwards, you have the periods cited in the wrong order.	Revised as suggested.
Michael	MacCracken	144125	Text Region	02. Our Changing Climate		64	64	33	35	I wonder if it might be useful here to indicate that at least some of the extra warmth was the result of poor land use practices that tended to strip the land of vegetation, which in turn reduced evaporative cooling. The present warming, it might be noted, is occurring even in the presence of much more responsible land use practices, greater vegetation cover and soil moisture, and higher humidities (an indication of evaporative cooling).	The text has been revised to incorporate this suggestion.
Michael	MacCracken	144126	Text Region	02. Our Changing Climate		64	64	38	38	Given variability, might it be better to say "much more common" instead of "common". I'd also be a bit cautious in using the word common. Given current NOAA practice of updating the "normal" every decade to the most recent three decades, weather forecasters will tend not to be saying that the warm periods are as unusual as is implied here. While the wording here is actually comparing the years instead of likelihood, what is really being missed is that if one considers the changing likelihood since the mid 20th century when a lot of infrastructure was put in place following World War II, the extremely warm conditions becoming typical are 5 to 6 or more standard deviations above the 1951-80 normal--so roughly 1 in a few million type of occurrences for infrastructure built in the mid 20th century (and forests that were growing then). This updating of normals that NOAA does is fine if the underlying climate is not changing and for aspects of the economy that are continually adapting to the then current climate, but for anything that was built tied to some previous climate, the degree of change is way beyond design factors used for a large portion of the infrastructure that we depend on.	We believe the word "common" is sufficiently descriptive, so the text remains the same.
Michael	MacCracken	144127	Figure	02. Our Changing Climate	4	65				What about for the Caribbean island component of the US?	Long-term, bias-corrected temperaure records are not available for the Caribbean islands. See NCA4 Vol.1 Chapter 6.
Michael	MacCracken	144128	Text Region	02. Our Changing Climate		65	65	6	6	In talking about the increase in heat waves, it also needs to be mentioned that the absolute humidity will also be higher, and that the discomfort index will be increasing even more than the temperature. Basically, the situation is going to become intolerable for working and exercising outdoors during much of the year.	The purpose of this paragraph is to summarize Chapter 6, which focused on changes in temperature (vs. humidity).
Michael	MacCracken	144129	Text Region	02. Our Changing Climate		67	67	2	3	During what period of time have these changes occurred?	The text has been revised to say "Since the beginning of the last century."
Michael	MacCracken	144130	Text Region	02. Our Changing Climate		67	67	10	12	It might be noted that this is consistent with the expansion of the subtropics, which is a feature associated with human-induced climate change.	A comment to this effect has been added.
Michael	MacCracken	144131	Text Region	02. Our Changing Climate		67	67	16	16	Change "increases" to "precipitation increases". Well, actually, it is quite surprising that in the sentence that goes from line 12 to line 18 the word "precipitation" does not get mentioned until line 17--it needs to be mentioned earlier.	Two mentions of precipitation have been added to this paragraph.
Michael	MacCracken	144132	Text Region	02. Our Changing Climate		67	67	22	22	I'd prefer "stronger" to "greater"	Revised as suggested.
Michael	MacCracken	144133	Text Region	02. Our Changing Climate		67	67	24	24	Delete "future"--"projected" means future.	Revised as suggested.
Michael	MacCracken	144134	Text Region	02. Our Changing Climate		67	67	28	28	Change "average" to "projected to average" as changes have not yet occurred--and the precision is likely overdone--how about saying "about 40%"	The reviewer is mistaken; the numbers they reference are clearly indicated to be observed, not projected.
Michael	MacCracken	144135	Text Region	02. Our Changing Climate		67	67	30	31	What this basically says is models are doing what the theory inherent in them indicates is likely--I would suggest critics might suggest they are too connected to be relevant. What is perhaps more important is that they continue observed trends.	What the sentence indicates is that that both observations and models show significant increases in the precipitation coming as larger events in these region,s and that the models are slightly underestimating the observed increases in extreme precipitation. Then the next sentence states that the projected changes are for an even more significant increase in severe precipitation events. No change needed.
Michael	MacCracken	144136	Text Region	02. Our Changing Climate		67	67	34	34	That this is the case could be explained by mentioning the greater variability makes it difficult to identify trends at this point.	The existing sentence fully explains the lack of clear trends from floods, and additional information is provided in NCA4 Volume 1 Chapter 8. No changes needed.
Michael	MacCracken	144137	Text Region	02. Our Changing Climate		68	68	4	5	Delete the word "Future"--these are present projections. The word projection includes saying that one is looking ahead in time.	We reviewed the relevant text and did not feel any changes were necessary.
Michael	MacCracken	144138	Text Region	02. Our Changing Climate		68	68	7	7	Again, delete the word "future"--these are scenarios that we have now and that they are scenarios includes meaning they are about the future.	Scenarios can be past or future; the word "future" makes it clear that these are the latter.
Michael	MacCracken	144139	Text Region	02. Our Changing Climate		68	68	16	16	By eliminating the potential for evaporative cooling, drought itself leads to warming and so the simultaneity mentioned here. What happened in those years was that changes in the atmospheric circulation led to less precipitation and thence drying and thence warming while also bringing warmer air to start with into the region.	Thank you for this comment. Chapter 6 of NCA4 Vol. 1 expands on this point in some detail.

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Michael	MacCracken	144140	Text Region	02. Our Changing Climate		71	71	8	9	This is a very cautious projection about sea ice retreat. Given its deteriorated state in mid-summer now, I'd suggest what is proposed here is likely by no later than 2030 and by 2050 most of the Arctic is likely to be ice-free by most of the summer. The model simulations are tending to lag behind the observed change, indicating a systematic bias (perhaps due to small problems in what the forcing is due to sulfates and other pollutants or for other reasons). In any case, the statement here seems very cautious.	As this is an assessment, key findings statements require a solid and typically broad quantitative basis in the literature and, as such, tend towards being conservative in their assertions. Although it is certainly possible that this statement is overly conservative, it is based on the best data currently available to project future sea ice cover: a suite of CMIP5 model runs. While it is true that models have under-predicted recent sea ice decline, we don't fully know why this is the case, making it difficult to apply an ad-hoc quantitative adjustment to predicted sea ice trends. Some of the recent decline may have been enhanced by natural variability amplifying the decline and/or have been driven by processes (e.g. circulation changes) that will not necessarily be maintained over the coming decades. Thus, simple extrapolation is not a robust basis for predicting with very high confidence when the Arctic is likely to be ice-free by end of summer. As such, the Key Message has been left unchanged, but the supporting text following the KM has been revised to read: "It is very likely that by mid-century we will see, for the first time in approx. 2 million years, an Arctic Ocean almost entirely free of sea ice at the end of the annual melt season (i.e. late summer) (Collins et al. 2013; Snape and Forster 2014); as models have tended to under-predict recent sea ice loss (e.g. Stroeve et al., 2007) it is possible this will happen before mid-century."
Michael	MacCracken	144141	Text Region	02. Our Changing Climate		71	71	13	14	I'd suggest reversing the order of the phrases in this sentence.	We reviewed the relevant text and did not feel any changes were necessary.
Michael	MacCracken	144142	Text Region	02. Our Changing Climate		71	71	25	26	In that there is major focus on near-term warming so as not to exceed 1.5 to 2 C, would it not be more appropriate to be giving the 20-year GWP?	The 1.5 to 2 C change is for the end of this century, and the most the commonly used metric by policymakers is the 100-year integrated GWP.
Michael	MacCracken	144143	Text Region	02. Our Changing Climate		71	71	27	27	Change "that is" to "that it is" (and no need for comma on line 28)	Corrected; thank you.
Michael	MacCracken	144144	Text Region	02. Our Changing Climate		71	71	34	34	Change to "changes in local salinity that can in turn affect the local ocean circulation"	Revised as suggested.
Michael	MacCracken	144145	Text Region	02. Our Changing Climate		71	71	35	35	Change "less the year" to "less than the year"	Corrected; thank you.
Michael	MacCracken	144146	Text Region	02. Our Changing Climate		71	71	38	38	Three figure precision not likely justified--how about saying "at an average rate of about 270 gigatons per year" which is equivalent, if my conversion rate is close to about an inch per quarter century, which may seem small, but rate is accelerating and there are other contributors to sea level rise.	Revised as suggested.
Michael	MacCracken	144147	Text Region	02. Our Changing Climate		72	72	7	7	You might change "arctic" to "Arctic Ocean"	We reviewed the relevant text and did not feel any changes were necessary.
Michael	MacCracken	144148	Text Region	02. Our Changing Climate		72	72	10	10	Change ", from" to "of"--does not read well now.	Revised as suggested.
Michael	MacCracken	144149	Text Region	02. Our Changing Climate		74	74	3	3	It is not the poleward expansion of the tropics that is occurring or is of concern to the US--it is the expansion of the subtropics	We disagree with the reviewer on this comment. This text refers to the following statement from NCA4 Vol. 1 Chapter 5, which reads: "Evidence continues to mount for an expansion of the tropics over the past several decades, with a poleward expansion of the Hadley cell and an associated poleward shift of the sub-tropical dry zones." We refer the reviewer to Vol. 1 Chapter 5 for further discussion, as well as citations and references for this statement.
Michael	MacCracken	144150	Text Region	02. Our Changing Climate		74	74	9	9	You want to say "changes in atmospheric circulation patterns"	Revised as suggested.
Michael	MacCracken	144151	Text Region	02. Our Changing Climate		74	74	10	18	Line 10 does not capitalize Arctic, as I think it should, even as an adjective; but on line 18 it is capitalized as an adjective. And on line 13, it is capitalized when used as a noun, and it certainly should be capitalized.	The chapter text will be reviewed to conform with the grammatical standards of the entire NCA4 document.
Michael	MacCracken	144152	Text Region	02. Our Changing Climate		74	74	26	27	I would think that you mean "subtropics" instead of "tropics"--what really matters for the US is the poleward edge of the subtropics and focusing the key finding on what is happening in the tropics is just not all that relevant.	Revised as suggested.
Michael	MacCracken	144153	Text Region	02. Our Changing Climate		74	74	36	36	Change to "are likely" as subject is plural.	Revised as suggested.
Michael	MacCracken	144154	Text Region	02. Our Changing Climate		75	75	14	15	This needs to say "in changes in the projected frequency"--they will still be occurring and be more powerful; it is limitations in how the number/likelihood of them will change.	Revised as suggested.
Michael	MacCracken	144155	Text Region	02. Our Changing Climate		75	75	16	17	You might want to add that the time for real recovery from very severe storms can be a decade or more, as is seeming apparent from the highest intensity storms of this past summer.	This is beyond the scope of this chapter, which addresses only the physical changes in the climate system. Other NCA4 chapters address human response.
Michael	MacCracken	144156	Text Region	02. Our Changing Climate		75	75	30	34	It really might be emphasized here that the rate of increase will be disproportionately large--that is, will occur an accelerating rate. This occurs as a bell-shaped distribution shifts across a threshold such as the height of the dunes, etc., just as the shifting bell-shaped curve of distribution of summer temperature anomalies shifted and led to a much, much greater likelihood of some particular high temperature threshold being crossed.	We feel that this point is already made by the text: "The frequency, depth, and extent of tidal flooding is expected to continue to increase in the future..." but we have also added a new reference to Sweet et al. 2018 that provides an update on tidal flooding.
Michael	MacCracken	144157	Text Region	02. Our Changing Climate		75	75	37	37	Capitalize "Earth"--it is our planet and deserves respect.	The chapter text will be reviewed to conform with the grammatical standards of the entire NCA4 document.
Michael	MacCracken	144158	Text Region	02. Our Changing Climate		76	76	4	5	The water is not really being removed "from the Atlantic"--I'd delete the phrase. and then change "surface" to "surface of the North Atlantic Ocean". I would also note the main effect is not on the, but mainly affects the climate of Europe. I would also change ", closing a cycle" "as part of a global circulation"--I'm not sure how just the surface and bottomwater flows would close a cycle.	The entire first half of this paragraph has been re-written to address these and other reviewer comments.
Michael	MacCracken	144159	Text Region	02. Our Changing Climate		76	76	11	12	No need for the words "In the future, however". Also change "ocean circulation" to "AMOC"--there are surface currents as well, so this needs to make sure the text is referring to the overturning circulation.	We reviewed the relevant text and did not feel the first change made the sentence clearer. The second revision has been made.
Michael	MacCracken	144160	Text Region	02. Our Changing Climate		76	76	10	10	For consistency, I'd change "Atlantic meridional overturning circulation" to "AMOC" as is done elsewhere in the text.	Revised as suggested.
Michael	MacCracken	144161	Text Region	02. Our Changing Climate		76	76	17	17	Change "average in" to "average along the coastlines of"	Revised as suggested.
Michael	MacCracken	144162	Text Region	02. Our Changing Climate		76	76	28	29	Given that this information is for local decision makers, I'd suggest changing "extreme flooding" to "extreme coastal erosion and flooding" because beach erosion also becomes a very problematic challenge.	We agree; the text has been revised accordingly.
Michael	MacCracken	144163	Text Region	02. Our Changing Climate		76	76	35	35	Delete "decades" and if one wants to replace it, say "many centuries and beyond" or something similar. But "decades" is far too short a time to mention.	We disagree; as NCA4 Volume 1 Chapter 4 shows, if GHG concentrations were stabilized, the resulting increase in global temperature would largely (though not entirely) stabilize over decades.
Michael	MacCracken	144164	Text Region	02. Our Changing Climate		76	76	37	37	How about changing "recent past" to "historical past" or something to indicate how unprecedented the changes will be.	"Historical past" is redundant; we have retained the original wording as it was used in NCA4 Volume 1.
Michael	MacCracken	144165	Text Region	02. Our Changing Climate		76	76	39	39	Perhaps change to "during attempts to simulate warm periods over Earth's history"	This text is based on original wording as used in NCA4 Volume 1.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144166	Text Region	02. Our Changing Climate		77	77	1	1	Suggest changing to "may be more likely to be underestimating than overestimating long-term future change."	The proposed text is too wordy and does not add to the clarity of the key message.
Michael	MacCracken	144167	Text Region	02. Our Changing Climate		77	77	6	7	The reasoning in this sentence needs some clarification.	Agreed; more information and references have been added.
Michael	MacCracken	144168	Text Region	02. Our Changing Climate		77	77	12	12	How about saying "comprehensive" instead of "complex"--they are useful because they are comprehensive even if they are complex.	Revised as suggested.
Michael	MacCracken	144169	Text Region	02. Our Changing Climate		77	77	13	13	Change "to simulate" to something like "to represent the effects of the processes that contribute to determining"---otherwise it seems to me this is saying we just represent the results in the models, not the processes that lead to the results.	Revised as suggested.
Michael	MacCracken	144170	Text Region	02. Our Changing Climate		77	77	20	22	Change "cycles" to "feedbacks" or "processes"--twice. A cycle takes one somewhere and then back again whereas a process can take one there without bringing one back.	We refer to feedbacks as self-reinforcing cycles in both NCA4 Volumes 1 and 2.
Michael	MacCracken	144171	Text Region	02. Our Changing Climate		77	77	14	15	This sentence seems a bit isolated--as a reader I was expecting there would be some examples given and explained.	This sentence is amplified in the remainder of this paragraph as well as the paragraph that follows.
Michael	MacCracken	144172	Text Region	02. Our Changing Climate		77	77	23	23	Change "not quantified" to something like "have not yet been quantitatively successfully"--in that, there is no reason that they cannot be quantified at some point--and things do improve with better resolution/faster computers.	Revised as suggested.
Michael	MacCracken	144173	Text Region	02. Our Changing Climate		77	77	26	29	Again, it needs to be said that the models do not yet represent these processes, although this is changing as development continues. Most of the processes not yet included have been thought to only very slowly change over time, so have been assumed to be relatively constant. An example is the flow of the ice streams in the Greenland and Antarctic ice sheets. The models have long had the ice sheets themselves and the relatively fast acting surface processes--just not the movement of the ice streams. Well, this is now changing. Same with respect to permafrost. So, I think it would be helpful to include the main reason for the processes not being included, namely that in the baseline climate, these changes were not really happening, so observations were plugged in and used. This is no longer a valid assumption--even what were very slow changing aspects in the past are now changing.	This point has been added to the sea level rise section above, and the interested reader is referred to NCA4 Volume 1 Chapters 4 and 15 for more detail.
Michael	MacCracken	144174	Text Region	02. Our Changing Climate		78	78	5	5	They are really "projections of future changes", not "future projections of changes"--real need to be more precise about things.	We reviewed the relevant text and did not feel the proposed change made the sentence clearer.
Michael	MacCracken	144175	Text Region	02. Our Changing Climate		78	78	19	22	This is WRONG--even with perfect observations, the chaotic behavior of nonlinear systems makes prediction of climate variations over the period of seasons to perhaps two decades mostly not possible (not to mention one can have unexpected forcings like volcanic eruptions). Saying the problem is observations leads to officials focusing all attention on observations--while we need more observations, even with them there is no real indication that useful forecasts could be made. For forecasts up to seasonal and perhaps a bit longer, ocean conditions are critical, but, despite some hints, there is no indication yet that skillful projections can be made out much longer.	While we do not agree that this is wrong, we agree the issue is more nuanced than the text implies. To address this point, the text has been revised as follows: "How will global—and even more importantly, regional—climate change over the next few decades? The actual state of the climate is always a superposition of natural variability and anthropogenic climate change. At the decadal scale, the magnitude of these two factors are equivalent (Easterling and Wehner 2009). At longer time scales (about 3 decades for global measures of the climate), the anthropogenic influence dominates (Santer et al 2011). Our ability to predict the climate at the seasonal to decadal scale is limited both by our imperfect ability to model to specifying the initial conditions of the state of the ocean and the chaotic nature of the interconnected earth system (Branstator and Teng 2012; Deser et al., 2012b). Further into the future, as the anthropogenic forcing exceeds natural variability, uncertainty in how human activities will evolve becomes increasingly important in projecting the magnitude and patterns of future global warming. Natural variability will continue to be a factor, but most of the difference between present and future climates will be determined by choices that society makes today and over the next few decades that determine emissions of carbon dioxide and other heat-trapping gases, as well as any potential large-scale interventions as discussed in CSSR Chapter 14 (DeAngelo et al. 2017). The further out in time we look, the greater the influence of these human choices on the magnitude of future warming."
Michael	MacCracken	144176	Text Region	02. Our Changing Climate		78	78	21	21	Capitalize "Earth"	The chapter text will be reviewed to conform with the grammatical standards of the entire NCA4 document.
Michael	MacCracken	144177	Text Region	02. Our Changing Climate		78	78	31	32	I'd suggest changing "Earth is warming" to "the Earth's climate is changing"--given variables being looked at are not just temperature. The title might also say "indicating that human activities are the dominant cause"	We reviewed the relevant text and did not feel the proposed change made the title clearer.
Michael	MacCracken	144178	Text Region	02. Our Changing Climate		79	79	29	29	Change "arctic" to "Arctic Ocean"	The chapter text will be reviewed to conform with the grammatical standards of the entire NCA4 document.
Michael	MacCracken	144179	Text Region	02. Our Changing Climate		80	80	8	8	Change "Future climate projections" to "Projections of future changes in climate"	Revised as suggested.
Michael	MacCracken	144180	Text Region	02. Our Changing Climate		80	80	13	14	The parenthetical terms being used are based on a policy perspective of what might be reasonably done in the future--they are not scientific judgments and so should not be used here. As I have suggested elsewhere, I think it would be much more informative to given an indication of what each scenario includes with respect to fossil fuel emissions, and in doing this one might well add a more rapid phaseout option. My suggestions were thus for something like: replace RCP8.5 by FFforever, RCP4.5 by FFphasedown, and RCP2.6 by FFphasedown. Perhaps then call RCP6.0 by FFdelayed phasedown, and create an RCP1.0 or something like that and call it FFfastphaseout. Doing this would basically I think be much more informative than having to remember what each of the RCP numbers mean, doing so having no real understanding of what radiative forcing is.	This chapter follows the same naming conventions that apply to the entire NCA4.
Michael	MacCracken	144181	Text Region	02. Our Changing Climate		80	80	24	24	It would be helpful to the reader to add a phrase to the effect "much less restore the climate to conditions near those of the mid- to late-20th century"	This point is already implicit, and KM2 addresses the question of stabilization.
Michael	MacCracken	144182	Text Region	02. Our Changing Climate		80	80	25	25	It seems to me there is a good chance that the increase in global average temperature relative to preindustrial will be above 1.5 C by 2030 and 2 C before 2050. Given climate inertia, I don't see any real way that waiting until anywhere near 2040 would keep the warming below the Paris Accord objectives. The statement here in lines 25-27 just seems to me far from what is most likely, especially if one also includes the reduction in net aerosol cooling that is also likely to occur. There is no reference indicating such a protracted wait to act can keep the warming below 1.5 to 2 C.	Sentence has been modified to say "substantial reductions", which is in line with the finding in Chapter 14 of the NCA4 Volume 1. The sentence here is simply intended to be an introduction to the issue; we have included references to relevant chapters (4 and 14) from Vol. 1 and the interested reader is referred to those chapters for more detail.
Michael	MacCracken	144183	Text Region	02. Our Changing Climate		80	80	28	29	There is no basis at all for including the words "decades" here--the time scale at a minimum is centuries unless climate intervention is begun very soon.	We disagree; as NCA4 Volume 1 Chapter 4 shows, if GHG concentrations were stabilized, the resulting increase in global temperature would largely (though not entirely) stabilize over decades.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144184	Text Region	02. Our Changing Climate		80	80	31	32	This needs to say "about 800 GtC since preindustrial times". And, I would note, even assuming this number is right, this means 23 years at current emissions rates and then zero thereafter. How is this consistent with the earlier statement on line 26 saying starting emission reductions before 2040--by then one has to be at zero. And if one set the objective to be 1.5 C, then one has to be at zero much sooner. I would also note that 1.5 and 2 C as stabilization levels would have tremendous impacts. The objective needs to be to peak at lower than the 1.5 or 2 C and get back to 0.5 C as soon as possible.	In response to the first part of the comment, we have revised the text as suggested. The new text is "Stabilizing global average temperature at or below long-term warming targets would require significant reductions in net global carbon emissions relative to present-day values well before 2040, and likely would require net emissions to become zero or possibly negative later in the century. The warming and associated climate effects from carbon emissions will persist for decades to millennia (Ciais et al. 2013; Joos et al. 2013). Accounting for emissions of carbon as well as other greenhouse gases and particles with lifetimes from weeks to centuries, cumulative anthropogenic carbon emissions would likely need to stay below about 800 GtC since the preindustrial era in order to provide a two-thirds likelihood of preventing 3.6°F (2°C) of warming, implying that approximately only 230 GtC more could be emitted globally in order to meet that target." In response to the second part of the comment, it is not our role to recommend or advocate for specific policy choices or targets.
Michael	MacCracken	144185	Text Region	02. Our Changing Climate		81	81	1	1	This needs to say "reduce the increase in global average temperature."	Revised to read: "limit the increase"
Michael	MacCracken	144186	Text Region	02. Our Changing Climate		81	81	1	4	It needs to be added that, despite the likelihood of exceeding the emissions limit, relatively little research is going on about potential climate intervention or geoengineering approaches, with the exception being a growing program in China.	This is beyond the scope of this chapter, which addresses only the physical changes in the climate system. Other NCA4 chapters address human response.
Michael	MacCracken	144187	Text Region	02. Our Changing Climate		81	81	21	22	Wording needs to be simplified, replacing "have been observed to increase" to "have increased" and then on line 22 delete "now"	Revised as suggested.
Michael	MacCracken	144188	Text Region	02. Our Changing Climate		81	81	24	24	Change "exceeds" to "exceeded that of"	Revised as suggested.
Michael	MacCracken	144189	Text Region	02. Our Changing Climate		81	81	25	25	"higher" than what?	Than Harvey's; revised accordingly
Michael	MacCracken	144190	Text Region	02. Our Changing Climate		81	81	36	38	I would suggest saying "human-influenced contribution", and in that the subject is singular, change "were greater" to "was greater"	Revised as suggested.
Michael	MacCracken	144191	Text Region	02. Our Changing Climate		82	82	10	10	Again, change "future projections" to "projections of future changes"	Revised as suggested.
Michael	MacCracken	144192	Text Region	02. Our Changing Climate		82	82	13	14	I'd suggest changing "Other types" to "Characteristics"	We reviewed the relevant text and did not feel the proposed change made the text clearer.
Michael	MacCracken	144193	Text Region	02. Our Changing Climate		82	82	16	16	Should change "predict" to "project"	Revised as suggested.
Michael	MacCracken	144194	Text Region	02. Our Changing Climate		83	83	16	16	Again, change "future projections" to "projections of future changes"	Revised as suggested.
Michael	MacCracken	144195	Text Region	02. Our Changing Climate		83	83	17	17	Suggest changing "to local" to "to consideration of local"	We reviewed the relevant text and did not feel the proposed change made the title clearer.
Michael	MacCracken	144196	Text Region	02. Our Changing Climate		83	83	18	18	Again, change "future projections" to "projections of future changes"	Revised as suggested.
Michael	MacCracken	144197	Text Region	02. Our Changing Climate		83	83	19	19	Capitalize "Earth"	The chapter text will be reviewed to conform with the grammatical standards of the entire NCA4 document.
Michael	MacCracken	144198	Text Region	02. Our Changing Climate		83	83	32	32	I've by now forgotten what "NCA4" stand for	The Fourth National Climate Assessment.
Michael	MacCracken	144199	Text Region	02. Our Changing Climate		85	104	1	19	In order to spend some time on reviewing other chapters, I will assume comments made on the main text will be carried over to the Traceable Accounts	Yes.
David	Wojick	141603	Text Region	03. Water		135	135	5	8	5 Extreme precipitation events are projected to increase in a warming climate and may lead to 6 more severe floods and greater risk of infrastructure failure in some regions. Infrastructure 7 design, operation, financing principles, and regulatory standards typically do not account for 8 a changing climate, presenting a risk to existing infrastructure systems. Comment: The text falsely asserts speculative computer projections as though they were established physical facts, which they are not. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	The statements cited by the reviewer represent the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 [Climate Science Special Report, the CSSR]; that volume provides the underlying scientific basis for the statements about future climate change included in the Water chapter. The report does acknowledge uncertainties in climate model projections. The statements cited by the reviewer represent the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume.
Sarah	Davidson	141996	Table	03. Water	2	129				Consider including just one key to avoid redundancy and make clear that the scale and coloring are the same in both the 1900-2000 and 2001-2008 maps.	We have updated the figure to keep the legend uniform.
Sarah	Davidson	141997	Text Region	03. Water		133	133	15	15	Given the state of scientific understanding described in Chapter 2, consider changing "If temperatures continue…" to "As temperatures continue".	The text has been revised as suggested.
Sarah	Davidson	141998	Text Region	03. Water		133	133	31	34	Consider providing the context that the High Plains Aquifer is the largest freshwater aquifer in the US and is used to sustain one of the nation's primary agricultural regions, e.g. see Brauer et al. (2017, doi:10.1111/j.1936-704X.2017.03256.x), McGuire et al. (2017, doi:10.3133/sir20175040)	We added the McGuire 2017 reference and the following text - "the largest freshwater aquifer in the conterminous United States that supports an important agricultural region (McGuire, 2017)"
Sarah	Davidson	141999	Text Region	03. Water		134	134	18	21	In discussing sea level rise and saltwater intrusion, consider mentioning that groundwater depletion can itself cause land subsidence, thus increasing relative sea level rise. See e.g. Epps et al. (2016, doi:10.1109/IGARSS.2016.7731007) and Eggleston et al. (2013, doi:10.3133/cir1392).	Added ", or relative sea-level rise related to land subsidence, " to the text.
Sarah	Davidson	142000	Text Region	03. Water		135	135	3	39	Consider referencing Neumann et al. (2015, doi:10.1007/s10584-013-1037-4)	The suggested reference has been added.
Erica	Brown	142041	Text Region	03. Water		130	130	8	9	Severe storms should be mentioned with droughts and floods.	The text has been added that climate change affects the frequency and magnitude of sever storms. The link between severe storms and floods is discussed in the regional roll-up section.
Erica	Brown	142045	Text Region	03. Water		135	135	20	21	Useful life should be defined.	We have replaced it with "design life" which is a more commonly used term in egineering design and operation.
Erica	Brown	142046	Text Region	03. Water		135	135	11	11	The statement "Much of the aging US water infrastructure poses a risk to society" is a blanket statement that must be supported with a quantifable description, rather than a general qualifier. What constitutes "water infrastructure" should also be defined.	The text has been revised. The phrase "risk to society" has been revised to say risk of failure. Text has also been added listing the types of water infrastructure the statement refers to.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Erica	Brown	142047	Text Region	03. Water		135	135	11	13	The references cited to do not support the estimate of four trillion dollars. This sentence appears to cite an AWWA report on a one trillion dollar cost. Furthermore, the other citations for this sentence reference publications about dams, and not other types of water infrastructure.	The text has been revised to clarify. The phrase "risk to society" has been changed to say risk of failure. Text has also been added listing the types of water infrastructure the statement refers to. The reference to 4 trillion dollars was not based on a single reference, but rather an aggregated cost across multiple types of infrstructure based on information from multiple sources. To simplify, the text has been revised to be more general, referring to costs aggregated across infrastructure as being in the "trillions of dollars". Additional references on the construction and maintenance of levees and other water infrastructure have also been added as the sources for this information.
Erica	Brown	142048	Text Region	03. Water		135	135	13	13	The "Macdonald, 2017" citation should read "McDonald, 2017".	The typo has been corrected.
Erica	Brown	142049	Text Region	03. Water		135	135	11	11	"Risk to society" should be defined. The nature of risk and factors used in assessing risk to society should be described. Influence of climate change on risk should be described.	The text has been revised. The phrase "risk to society" has been changed to say risk of failure. Text has also been added listing the types of water infrastructure the statement refers to.
Erica	Brown	142050	Text Region	03. Water			136	21	24	Key Message 2 should provide examples of interconnected systems.	We have included one example: water-energy infrastructure including dams used for storage and flood control and also energy generation.
Erica	Brown	142051	Text Region	03. Water		134	134	10	11	Water providers will manage the risk of water quality impacts as required by the Safe Drinking Water Act, but it may cost more. A follow-up sentence should address the fact that utilities will continue to comply with existing standards while there may be higher costs due to climate change adaptation and mitigation.	We thank the reviewer for the comment. This seems like a likely outcome, but we do not have any literature references to substantiate the claim.
Erica	Brown	142052	Text Region	03. Water		137	137	3	5	This is an important point to make; there are institutional structures that constrain innovation, planning and infrastructure design. Suggest also adding these structures can constrain adaptation as well.	Thank the review for the good suggestion. The text was revised accordingly.
Erica	Brown	142053	Text Region	03. Water		137	137	18	18	Suggest replacing the word major with a better descriptor - possibly large metropolitan, or large?	The text has been revised as suggested.
Erica	Brown	142054	Whole Chapter	03. Water						Water infrastructure should be defined within the first page or two of the chapter; as currently drafted it's not until page 144 lines 9-10 that the authors mention all the types of infrastructure. Also there is a typo in that levees should be listed, and not levels.	We agree that a definition would be helpful, and have made the addition.
Erica	Brown	142057	Whole Chapter	03. Water						In general, the key messages for the water chapter are on point. However, the text and description elaborating on these key messages misses the mark in two areas in particular. First, key message 2 discusses how climate risk is compounded by aging infrastructure and the fact that infrastructure design and regulation do not account for climate change. This is true, however stating that therefore "much of the U.S. water infrastructure poses a risk to society" is an overstatement (per AMWA's comment noted on line 26). What's more, it's not clear which part of "water infrastructure" is being discussed here. The types of water infrastructure should be defined. In addition, key message 2 notes that infrastructure " financing principles" are not aligned with this climate risk, but the issue is not explained or discussed in the text. Another example, key message 3, notes that there are "positive examples of promising directions to manage climate vulnerabilities" yet no examples are provided in the text. While it would be impossible for NCA4 to provide every example out there, there are certainly several good ones from which the authors could point to, e.g.,: the 2015 report by WUCA, AWWA, AMWA and WRF "Embracing Uncertainty A Case Study Examination of How Climate Change is Shifting Water Utility Planning" https://www.wucaonline.org/assets/pdf/pubs-uncertainty.pdf	Thanks very much for these helpful comments. We have now defined what we meant by water infrastructure in the beginning, and elaborated on the concern in the description of the associated key message. We appreicate the reference to the WUCA co-authored report. The examples there are excellent and we now cite this report and briefly discuss it in the adaptation key message, KM3. Key Message 3 cites the WUCA report and some specific examples from WUCA members. This is now also mentioned in the Summary section.
Erica	Brown	142058	Text Region	03. Water		135	136	3	24	Given the underlying costs and required effort for necessary local climate change adaptation and mitigation measures, there is an inevitable need for finance mechanisms to support such water sector efforts on a large scale. This is especially important since utilities, cities and regions with tight budgets might not be able to finance adaptation on their own and therefore will rely on additional support to make climate change adaptation and mitigation successful nationwide. The NCA4 so far does not sufficiently address this issue.	Thank you for the comment. While we agree this is an important issue, the topic of infrastructure financing/funding is beyond the scope of the Water chapter. NCA4 Chapter 28 (Adaptation) includes a general discussion of finance.
Ross	McKitrick	142059	Text Region	03. Water		135	137	3	38	In general, the key messages for the water chapter are on point. However, the text and description elaborating on these key messages misses the mark in two areas in particular. First, key message 2 discusses how climate risk is compounded by aging infrastructure and the fact that infrastructure design and regulation do not account for climate change. This is true, however stating that therefore "much of the U.S. water infrastructure poses a risk to society" is an overstatement (per AMWA's comment noted on line 26). What's more, it's not clear what part of "water infrastructure" is being discussed here. The types of water infrastructure should be defined. In addition, key message 2 notes that infrastructure " financing principles" are not aligned with this climate risk, but the issue is not explained or discussed in the text. Another example, key message 3, notes that there are "positive examples of proimising directions to manage climate vulnerabilities" yet no examples are provided in the text. While it would be impossible for NCA4 to provide every example out there, there are certainly several good ones from which the authors could point to, e.g.,: the 2015 report by WUCA, AWWA, AMWA and WRF "Embracing Uncertainty A Case Study Examination of How Climate Change is Shifting Water Utility Planning" https://www.wucaonline.org/assets/pdf/pubs-uncertainty.pdf	Text has been revised in Key Message 2 to list the types of infrastructure systems referred to, and to clarify what is meant by the term risk. The WUCA report and examples from WUCA members are mentioned in KM3.
Allison	Crimmins	142106	Text Region	03. Water		128	128	17	23	This third key finding would be improved by making it more relevant and specific to the water impacts outlined in key findings one and two. Right now, I could replace the word "water" with any other chapter (e.g. forests, agriculture, coastal, etc.) and the message would stay the same. This demonstrates the vagueness of the message the authors say is a key message. What water strategies are you talking about? How would they work, who would do them, what impacts would they avoid? What impacts can't be avoided? Just the notion that 'adaptation strategies exist and someone is doing something but its hard' isn't very compelling or informative, and I wonder if this is truly the synthesis of the literature assessed for this specific chapter.	The comments points to the generality of Key Message 3. It's true that the message may apply to other sectors as well, but in terms of a summary, we believe it accurately reflects the state of the water sector (and other sectors, as noted). Additional details are provided later in the chapter, and the space constraints limit the ability to answer the questions raised in this initial summary section.
Allison	Crimmins	142107	Text Region	03. Water		128	128	30	30	water systems face water risk? I think maybe you need to drop that second "water"	The text has been revised as suggested.
Allison	Crimmins	142108	Text Region	03. Water		128	128	35	35	I believe you that no comprehensive assessment has been conducted, but are there even best-guess estimates from the Army Corps of Engineers?	Thank you for the comment. We are not aware of credible, published reports and papers that provide the information requested. Even if "best-guess estimates" or informal estimates are available, these are not acceptable for inclusing in the Fourth National Climate Assessment.
Allison	Crimmins	142109	Figure	03. Water	2	129				Interesting that certain areas, like in Arizona, see a decrease in groundwater depletion rate. This may be worth mentioning in the caption, which only notes that supplies have been decreasing in major regional aquifers	While the declining groundwater level is true over certain regions, this cannot be generalized at the national level. Hence, we would like to have the caption as such.
Allison	Crimmins	142110	Text Region	03. Water		130	130	15	28	This paragraph skips around a lot- it jumps from paleoclimate, to operational considerations, back to water quality, then back to adaptation without discussing water quality. I'd consider ending the paragraph after line 22 or maybe line 25. If you discuss adaptation later (line 28) then don't waste valuable space in your chapter to say that here; delete it.	The text has been revised as suggested to simplify this paragraph. The material on water quality was redundant and has been deleted, making the paragraph more cohesive.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142111	Text Region	03. Water		130	130	34	34	"in all sectors"- I'm not sure what sectors you're talking about here. All water sectors? Sectors meaning, like, agriculture and health? Or the economic sector? Really, all sectors have seen efficiency increases? You say in the last 30 years this is true, but your citation is from 2014, which will be at least 4 years old when this comes out. Will that still be true for all sectors?	Thanks for pointing this out. The text has been revised for clarity.
Allison	Crimmins	142112	Text Region	03. Water		131	131	8	12	There is a text box on the food distribution impacts in the health assessment food chapter (Ziska et al 2016) that you could cite here.	The reference has been added as suggested.
Allison	Crimmins	142113	Text Region	03. Water		131	131	25	30	There is a text box on Lake Erie in the health assessment water chapter (Trtanj et al 2016) that you could cite here. The event happened in 2014 but all your citations are from 2013 and earlier.	The text has been revised to address the date discrepancy. The pre-2014 references document a long term trend, and are not specifc to the 2014 Toledo event. The references have been deleted from the statement about Toledo 2014, and placed earlier in the paragraph suporting a more general statement about changes in HAB risk. Trtanj et al 2016 has also been added as a citation.
Allison	Crimmins	142114	Text Region	03. Water		131	131	31	31	You could also cite EPA 2016 (indicators report) for a more recent citation of the streamflow values	The text has been revised to incorporate this reference, listed as U.S. EPA 2016a.
Allison	Crimmins	142115	Text Region	03. Water		131	131	31	35	May want to rearrange sentence to put salmon up front (e.g. "Salmon populations are disrupted by climate stressors including…") since this is such a long sentence. I read "mortality" and thought you were talking about humans until I got to the end of the sentence.	The text has been revised as suggested, moving "Pacific salmon" to the beginning of the sentence.
Allison	Crimmins	142116	Text Region	03. Water		132	132	9	13	Overall, this was one of the better "regional rollups" I've read. Well done. I would suggest trying to put a concrete example in the Caribbean and Pacific Islands section, as you've done with the other regions. I liked how you named specific memorable events in each region. I'm not sure if the hurricane in Puerto Rico happened after you drafted this, but that seems like a really really important message-- if not a text box-- to have in the water chapter. Talk about threats to dependable and safe water supplies!	The text has been revised to include a concrete exmple of impacts for Caribbean and Pacific Islands.
Allison	Crimmins	142117	Figure	03. Water	1	132				I'm not sure this is the most compelling figure to have in the water chapter. While it does have drought and flooding, it also has freezes and wildfires. Also, is this figure shown elsewhere in the CSSR? It seems a good figure to have somewhere in the report, maybe in chapter 1, but I'm not sure its the best use of space for water. I'd have preferred a more water-specific figure. Also, the gray line is really hard to see and it is confusing that sometimes drought is on the bottom (gold) and flooding is stacked above it (blue) and other times the order is switched. If you decide to keep, suggest getting help from TSU to make this more reader friendly. A more useful figure could be one from the NOAA state factsheets that show the increase in nuisance flooding or maybe from the EPA indicators report on droughts.	The figure has been revised to show updated data for the full calendar year 2017, to delete hazards not directly water related (e.g., wildfire), and to improve the legibility of gray and black lines shown on the graphic.
Allison	Crimmins	142118	Text Region	03. Water		133	133	10	11	These are all pretty old citations, especially since this is something that was in the NCA3 (2014) and the EPA indicators report (2016)	Some important studies were included in NCA3, and are also included in this report. We feel these citations are relevant for this report and critical for our summary statements.
Allison	Crimmins	142119	Text Region	03. Water		133	133	24	24	I'm a bit confused why you called out both rural and urban areas. What areas are not included in this list? If efficiencies everywhere are needed, maybe drop this unnecessary text.	Sankarasubramanian et al., (2017) considers all the counties based on urban/rural classification suggested by USDA. Hence, we feel this sentence is accurate.
Allison	Crimmins	142120	Text Region	03. Water		134	134	4	5	I'm not sure why you're making the point about water rights structures-- is limiting integrated management a good thing? Or a bad thing? I honestly don't know. This also seems a little policy prescriptive, or at least something that fits better under key message 3.	We replaced "limit" with "influence".
Allison	Crimmins	142121	Text Region	03. Water		134	134	6	24	This is a good paragraph with a lot of meat in it. I would suggest to the authors a more restrained use of the word "can". In the end, I was left with a general feeling of uncertainty and "hey, this could happen but we don't know if it does or will" after reading this. For instance, you say "Increases in high flows can increase the delivery of….". Just deleting the word "can" from this sentence (and the next three sentences, followed by a "may" and a "also possible") makes this much stronger without sacrificing scientific accuracy. Increased flows do lead to increased delivery of sediments. Period. Especially when you are saying something like increased nutrient loads CAN lead to more RISK of HABs. You're not saying that increased load always lead to HAB events every time. But you can surely say that they led to more RISK of HAB events every time.	The test was revised as suggested.
Allison	Crimmins	142122	Text Region	03. Water		135	135	19	19	I do not understand the use of the word "misspecified". Is this an error? Or is this a jargon term for engineers? Suggest rewording.	We have revised the sentence. "Mispecified" was replaced with "remains unquantified"
Allison	Crimmins	142123	Text Region	03. Water		135	135	20	26	Suggest making clear whether these estimates include climate impacts, since you say earlier there are no comprehensive assessments of climate vulnerability. If these EPA numbers don't include consideration of climate impacts, it seems important to say that they are then underestimates.	This sections has been revised. We have provided more information on the impact and included additional references
Allison	Crimmins	142124	Text Region	03. Water		137	137	6	8	Is this a long way of saying climate models don't provide local-scale outputs? I would also suggest not using the word "forecasts" as we do not "forecast" anything at all with climate models. They are projections, not predictions.	We thank the reviewer for the comment. Our intent was to make clear that although forecasts are desireable, only projections are available. This sentence has been entirely revised to be clearer.
Allison	Crimmins	142125	Text Region	03. Water		137	137	8	10	I'm a little confused- you've said three times now already that we don't consider the full range of variation that paleoclimate records suggest we do in making water management decisions, but now you're saying it is a good thing to only consider current prevailing conditions and forecasts? This seems very contradictive. And why wouldn't a manager at least use the indicator record? On lines 26-27, the text again mentions using current conditions to form adaptation plans- doesn't this seem short-sighted, in the very sense of the word short-sighted? Wouldn't that mean that under climate change, their plans will be woefully inadequate? So why is this chapter promoting these examples?	It remains a pareto improvement to better manage variability at present and in the future. Better use of monitoring current conditions and accurage operational forecasts is a promising approach for doing so. The text has been revised to eliminate possible confusion regarding suggested use of historical record.
Allison	Crimmins	142126	Text Region	03. Water		137	137	24	24	If you are talking about climate projections, then use of the word "forecasts" in incorrect. I'm not sure what you mean by "near-term". If that is a weather thing (like a few years) then maybe forecasts is fine. But I thought this was a paragraph about incorporating climate projections into long-term plans.	The section has been revised to make clearer the forecasts being referenced, vs projections.
Allison	Crimmins	142127	Text Region	03. Water		138	138	6	6	Because you are talking about climate here and not weather, and showing changes that happen 30 years into the future, the word "predicted" is inaccurate. These are projections, not predictions.	We thank the reviewer for the comment. The point is that predictions that are accurate are desired. The section has been revised accordingly to clarify.
Allison	Crimmins	142128	Figure	03. Water	3	138				This is a nice figure, but I do have some questions. First, the dotted "today" line looks like it starts around maybe 2016 or 2017 (an x-axis based on 5 or 10 years instead of 7 would be easier to read). But the citation is from 2012. So is the data between 2012 and "today" actual data or a projection made in 2012? You do say this figure is "adapted" from the source, so maybe that is fine, there are just more data points available now. But my bigger question is why the leap from the water use today to the water use tomorrow? If water use has been declining over the last ten years, why would we expect a sudden increase in water demand? And why is even the lowest bound of that projected demand higher than water use over the last ten years? This figure seems to be telling me that the Bureau of Reclamation way overestimated the problem, as water demand is actually much lower and looks to be headed straight in between the projected blue lines. Also, what happens in 2020 that you get that one decrease in water supply when the rest of the projections are fairly smooth?	The points made were discussed in detail by the authors. There is general agreement with the reviewer. The figure illustrates the potential imbalance of future supply and demand given clinate projections and present trends, (AND the long-term variability that is not well predicted). The goal is to illustrate estimates into the future in the context of demand and supply, with projected warming and precipitation changes. It is based on the Bureau of Reclamation Basin Studies of the impacts of future climate on the watershed.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142129	Traceable Account	03. Water		140	140	1	26	This is a good run-down of all the findings and citations. Well done. I would have liked a little more "description of the evidence base" though- are these findings well known, been around for decades, well-established? Are they emerging, contentious, uncertain? Are some thing known for sure, others we're still working on? Is there strong consensus, or do things vary wildly depending on location?	We appreciate the comment. The details that support KM1 are in the text of the chapter. We feel that the studies we reference provide an appropriate context for KM1.
Allison	Crimmins	142130	Traceable Account	03. Water		140	140	28	33	This section needs editing or clarification, as it seems to be directly contradicting the CSSR. For instance, it says projections of temperature is medium confidence, when the CSSR has high or very high confidence. There is medium confidence in the CSSR about precipitation, but here you say high uncertainty. This is not correct. CSSR also have very high confidence for drought. This is not only very confusing, but it doesn't seem to jive with what is in the chapter or even the text above it in this traceable account, which says climate change has predictable impacts on water quality (line 9). Then on page 141 lines 1-2, you say changes in water quality are associated with high uncertainty. ?? I would suggest cutting or revising the uncertainties that are not presented in this chapter (e.g. the findings from the CSSR) and focusing more on the uncertainty on impacts, as the latter half of this paragraph does.	The low confidence is in reference to the water attributes - quantity and quality - not on precipitation. For clarity, we changed the "high uncertainty" to " Uncertainty".
Allison	Crimmins	142131	Traceable Account	03. Water		141	141	7	7	Again, this uncertainty ranking doesn't match the CSSR. You say there is high uncertainty in precipitation, but the CSSR found medium uncertainty. I don't know what you mean by saying there is high uncertainty in emissions scenarios. There is no certainty in emissions scenarios, because they are scenarios, not predictions. Also, it seems very inappropriate in a section on confidence and likelihood of water quality/quantity impacts to have a sentence about investment in water infrastructure (lines 10-11), unless you are strictly telling the reader that this would alter the confidence/likelihood. Saying "could be better addressed" sounds policy prescriptive, not an assessment of confidence for KM1 based on the literature.	As mentioned earlier, for clarity, we removed "High Uncertainty" to "Uncertainty". With regard to emission scenarios: We agree they are not predictions, but all our projections are based on different RCPs. Hence, we have to refere to them as uncertain.
Allison	Crimmins	142132	Traceable Account	03. Water		139	139	27	33	I am very confused about what the confidence rankings are for this key message. In the Key message itself on lines 27-33 there are 5 "high"s and 1 "medium". But the text below in the Major Uncertainties and Description of confidence and likelihood sections does not bear this out. Nowhere in these section does it talk about high confidence, but instead says high uncertainty, lots of mediums, and low confidence. This key message needs to be evaluated for consistency with uncertainty language guidance and the CSSR.	We thank the reviewer for the comment. The key message and the confidence statements are based on the guidance by the USGCRP. Further, the key message is based on the published literature, hence we are comfortable in having it as such.
Allison	Crimmins	142133	Traceable Account	03. Water		142	142	26	35	Rather than just repeating which things have low or high confidence (which is done in the next section), this section may benefit from just an explanation of where the major uncertainties lie and why. For instance, the sentences from line 28-31 and 32-33 tell me about two places with major uncertainty and why there is high uncertainty. But the other sentences are just this is high, this is moderate, etc. Have any of these uncertainties improved with recent scientific advancements (or since NCA3)? More description, less ranking would be helpful for this section. The following section does a much better job of explaining why things are ranked low, medium, high, so you don't need to do it here too. The section in the traceable account for KM3 does this well.	The text has been revised to focus on key (or major) uncertainties.
Allison	Crimmins	142134	Traceable Account	03. Water		143	143	21	23	This first sentence is such a milquetoast sentiment that I'm surprised it has only medium confidence. Seems like every chapter has a similarly vague sentence that says strategic adaptation planning would be helpful.	We believe that medium confidence is appropriate given the limited state of knowledge of water infrastructure and water management capability in the US. While there is increasing movement in the development of water strategies for an evolving future, it is largely happening outside of scientific study and there is limited and decreasing research funding to evaluate how effective such strategies will be.
Allison	Crimmins	142135	Traceable Account	03. Water		143	143	29	37	This section is really well-written. Would be a good model for the other key message traceable account sections on Description of the Evidence Base	Thank you. No respones required.
Allison	Crimmins	142136	Whole Chapter	03. Water						After reading the chapter and traceable accounts (especially for KM3), I am left unsure whether you are saying that adaptation planning based on historical and/or current record is a good thing or a bad thing. At times you seem to be suggesting that there may be risks that are greater than anticipated from current or paleo records. At other times you are praising adaptation plans that use historical or current records. I believe the authors must have a strong feeling about this, but that strong feeling is not shining through.	We thank the reviewer for the comment. The chapter reflects the view that use of the historical record will remain an essential element of water resources planning and risk management. However, it is not sufficient. In KM3, where adaptation is directly addressed, the recommended approach is described as one that performs well over a range of future climate conditions, not only the historical record. The chapter has been revised to make that message clearer.
Juanita	Constible	142455	Text Region	03. Water		132	132	9	13	The problems that Hurricanes Irma and Maria inflicted on Puerto Rico and USVI are text book cases of water infrastructure failures and cascading infrastructure failures. Given the timeliness of those events NRDC highly recommends that the section on Caribbean impacts includes a discussion of the aftermath of Irma and Maria, highlighting the vast failures of water and wastewater infrastructure and the role of power failures played in putting those systems offline.	The text has been revised to incorporate this perspective; it now mentions the significant disruption of water and power services following Hurricanes Maria and Irma.
Mikko	McFeely	142835	Text Region	03. Water		131	131	31	32	Sentence should highlight low snowpack impacts in this NW regional roll up since the 2015 snow drought had a signficant impact on the region. Suggest changing text to: Climate stressors, including low snowpack years like 2015, decreasing summer streamflow…. etc.	The text has been revised as suggested, listing the effects of low snowpack, as in 2015, as a climate stressor affecting salmon in the Pacific Northwest.
Mikko	McFeely	142836	Text Region	03. Water		134	134	10	11	This text does not acknowledge that most water providers will manage the risk of water quality impacts as required by the Safe Drinking Water Act, but it may cost them more. Suggest changing text to: These changes present a risk to safe, sustainable water supplies, public health, and aquatic ecosystems. Even where risks to water quality can be managed by drinking water suppliers, additional treatment needs may end up costing significantly more.	We appreciate this comment and it makes a good point, but to include this statement in the text we need literature references to substantiate it. Although these efffects are likely, we don't have studies to reference at this point.
Mikko	McFeely	143013	Whole Chapter	03. Water						It is not clear when discussing the Water Sector if that just means drinking water or also encompasses waste water and stormwater management. Waste water and stormwater management comes up in the chapter but the focus is on impacts to drinking water. Stormwater managment and waste water systems will also be impacted by climate change. Increasing precipitation and its impact to drainage system in the NE is a major issue for urban centers and deserves more focus in this chapter.	Thanks very much for the comment. We have now added a definition of the water infrastructure as encompassing levees, dams, distribution and treatment systems. This covers drinking, storm, waste water as well as the risk mitigation of floods and droughts. It is much more comprehensive than drinking water.
Mikko	McFeely	143014	Text Region	03. Water		128	128	3	5	This first sentence should clearly and directly link the significant changes to water quality and quantity to climate change. We suggest also using the term water cycle to drive home the point that climate change affects the water cycle broadly, changing water quality and quantity.	We thank the reviewer for the comments. However, not all changes to water quantity and quality are due to climate change, there are several factors that affect water quantity and quality. We prefer to keep the text as written.
Mikko	McFeely	143015	Text Region	03. Water		128	128	5	7	These two sentences are too narrow. It is not only the snow to rain ratio that leads to differences in the timing of water supply and demand and it is not only groundwater depletion that exacerbates drought risk. Low river discharges contribute to drought risk too.	The text has been revised to include variability in precipitation which also contributes to differences in the timing of water supply and demand. Low discharges are related to drought, but it is not clear that the frequency of low discharges have increased.
Mikko	McFeely	143016	Figure	03. Water	2	129				This is listed as Figure 3.2 but it comes before Figure 3.1, which is found on page 132	The first two pages of the chapter are an executive summary pulled from the main chapter. The figures appear in the correct order in the chapter itself.
Mikko	McFeely	143017	Text Region	03. Water		130	131	1	4	Appreciate this section at the start of the chapter. It provides needed context before moving into the regional section.	Thanks for your comment. We appreciate it.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	143018	Text Region	03. Water		130	130	10	13	While we acknowledge that extreme events often cause the most damage, slow changes to baselines and overall trends can also contribute to declining resilience.	We thank the reviewer for the comment. We agree, but resilience has to consider the frequency and severity of extreme events and the recovery from them. So, if you are interested in resilient infrastructure, it has to of necessity also consider performance under extreme events that become more frequent.
Mikko	McFeely	143019	Text Region	03. Water		130	130	15	19	Any wording referring to paleoclimate information, especially in regard to extremes, should be aware of unintentionally adding to the argument that the climate is not in fact changing in comparison to historic records. If the point is that there has been climate instability in the past, well beyond what observed records show, then this should be stated more explicitly.	We are quite clear that the point of the sentence we have is that the larger extremes in the past are not incorporated in water management practice. This effectively says that even if the climate were not to change we have a problem to deal with. The next sentence says that climate change presents an increasing risk to water security in the United States, so we think we are reasonably clear in maintaining a narrative that we have not adequately addressed climate risk based on the longer paleo record, and that we expect things to get worse.
Mikko	McFeely	143020	Text Region	03. Water		130	130	29	29	Suggest removing the word water before the word risk.	The text has been revised as suggested.
Mikko	McFeely	143021	Text Region	03. Water		130	130	23	25	This is an important point and should be expanded. There is no mention of how reduced water quality due to climate change could lead to more intensive water treatment with negatives side effects like increases in disinfection by products. There is a great opportunity to link this point to a reduction in ecosystems services. As climate change and land use increase the amount of sediment, nutrients, algae found in our source waters, we have to spend more time and resources manually cleaning the water and unfortunately there are side effects like more DBPs.	Text has been added to Key Message 1 stating that water quality changes affect the cost and have implications for water treatment.
Mikko	McFeely	143022	Figure	03. Water	1	132				The double y axis and inclusion of the gray line depicting total cost is confusing. If the y axis on the left is showing the number of billion dollar disaster events, then shouldn't the grey total cost line correspond to the years with the greatest number of events? Even considering inflation, the gray line doesn't appear to correspond with the bars.	The figure has been revised to show updated data for the full calendar year 2017, to delete hazards not directly water related (e.g., wildfire), and to improve the legibility of gray and black lines shown on the graphic.
Mikko	McFeely	143023	Text Region	03. Water		133	133	10	11	Increasing air temperatures affect the water cycle generally, not just the fraction of winter precip falling as snow. Suggest making this opening broader.	The key messages are summaries of some of the major points in the chapter. Not all effects of temperature on the water cycle are included in this chapter or in the key messages.
Mikko	McFeely	143024	Text Region	03. Water		133	133	17	21	If the goal of this report, as it states in the Front Matter section, is to better inform the public and decisionmakers, further explanation is needed for certain points. For example, please explain why higher temperatures result in increased water demand for agriculture. It may seem intuitive, but pointing out the fact that water evaporates and plants transpire more with higher temperatures can drive home the point that when drought conditions are present, plants need more water than ever. The issue is not linear but compounds as temperatures rise.	The test was revised to include "arising from increased evapotranspiration".
Mikko	McFeely	143025	Text Region	03. Water		133	133	23	26	Water use efficiency is mainly used in the context of reducing water consumption. Policies to create a legal environment which enforces or encourages the use of water conservation measures and or water efficiency technologies in municipal, residential, nonresidential buildings and agriculture (irrigation) is one important factor to reduce water demand. Another significant factor is the optimization of distribution systems through reducing water losses. Reducing losses through optimization can be a significant factor to lower water demand. Recommend the authors introduce water conservation or water demand management as a combination of water efficiency measures and water distribution system optimization. Alternatively, give examples of what water conservation and efficiency entails from a policy and water sector perspective.	To address this point we have revised the text to include "promoting water conservation and reducing distribution losses".
Mikko	McFeely	143026	Whole Page	03. Water		133				Key message 1 and associated chapter text neglects finished drinking water quality impairment in distribution systems. There are potential treatment and compliance implications to chlorine residual and disinfection byproduct formation throughout the water system under warmer climates. While this is related to infrastructure, which is covered in key message 2, it is ultimately a water quality issue.	This chapter focuses water quantity and quality issues due to climate under natural systems as opposed to quality issues arising locally in engineered systems. Hence, we would like to leave it as such.
Mikko	McFeely	143027	Text Region	03. Water		134	134	2	3	This sentence should be a stronger statement on the importance of coordinated and integrated water management; use isinstead of maybe. Independent and uncoordinated management of groundwater and surface water hinders actions to address climate variability. Succesfully addressing climate change and climate variability has to happen in a coordinated manner. Water resource management activities such as management of groundwater and surface water are of multi sectoral nature and the key to sustainable use of freshwater is integrated and coordinated planning and management. This is a principle that has been recognized by the World Community already in 1992 during the United Nations Conference on Environment and Development (Rio Declaration) Agenda 21, Chapter 18 Protection Of The Quality And Supply Of Freshwater Resources: Application Of Integrated Approaches To The Development, Management And Use Of Water Resources. A large number of case studies and best practices worldwide prove the importance and necessecity of this principle for water management to be sustainable.	The text has been revised as suggested.
Mikko	McFeely	143028	Text Region	03. Water		134	134	3	5	An example should be given to this statement to help to understand why current legal regimes in the water sector can be a significant challenge for integrated water resource management (in particular in the western half of the US). For example overallocation of water rights in combination with poor allocation volume tracking and verification has been reported to be a problem in California (https://watershed.ucdavis.edu/files/content/news/WaterRights_UCDavis_stu…). Further it should be mentioned that the institutional challenges also go beyond water quantity. Water quantity decisions can be a significant source and cause of water quality impairment, while water quality protections can upset water usage and infrastructure development. Quantity and quality management is often regulated by different agencies which increases the risk of siloed planning and decision making. https://www.eli.org/sites/default/files/eli pubs/d23 02.pdf	This is a good point. We have revised the text to include "given that different agencies often govern water quantity and quality issues."
Mikko	McFeely	143029	Text Region	03. Water		134	134	6	24	Key Message number two is about changes to water quantity and quality. The first three paragraphs in this section are about quantity and only one paragraph is devoted to changes to water quality. This is disappointing as water quality and subsequent treatment costs may be a major issue in the future for many regions.	We feel critical issues related to quality and quantitiy are highlighted from the literature. Additional water quality issues are discussed in the regional water issues section.
Mikko	McFeely	143030	Text Region	03. Water		131	131	6	7	We suggest cross referencing the regional chapters here as this regional roll up only provides minimal examples of regional impacts. While we understand that Volume I provides the scientific backing, it is unfortunate that this chapter doesn't provide more national context the way NCA3 did with figures and visuals comparing different parts of the US, such as water withdrawal distribution maps, seasonal surface soil moisture trend maps, maps comparing shanges in snow, runoff and soil moisture, etc.	The text has been revised with cross-references to the regional chapter key messages relating to water to address this comment.
Mikko	McFeely	143031	Text Region	03. Water		135	135	13	15	The list of water infrastructure should also include wastewater treatment and collection systems.	We agree; we have listed wastewater treatment and collection systems.
Mikko	McFeely	143032	Text Region	03. Water		135	135	18	19	Suggest rewording this sentence. Unclear what is meant by the phrase climate risks to existing infrastructure systems are misspecified.	We agree and we have reworded the sentence.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	143033	Text Region	03. Water		135	135	20	26	Could these numbers be put into context? Most people can't fathom amounts that large. Give them a reference. For example, you could say Capital improvement needs for public water systems have been estimated at $384.2 billion, which is more than the GDP of Norway in 2016, for projects necessary from 2011 through 2030.	We appreciate the suggestion. However, the space is very limited and we have tried to be as concise as possible. Also, this chapter and other chapters include different dollar values and for consistency across the report, we have decided not to add examples similar to what is suggested here.
Mikko	McFeely	143034	Text Region	03. Water		135	135	20	26	An EPA 2015 report on public water sytems indicates investment needs of up to $200billion in drinking water related infrastructure only. https://www.epa.gov/sites/production/files/2015 04/documents/epa816f13002.pdf. Suggest using a pie chart or similar graph to visualize which diversity of wastewater and water infrastructure and required amount of investment (drinking water dams, reservoirs, distribution system, treatment etc.; wastewater CSO correction, WWTP, MS4 etc.)	We thank the reviewer for this great suggestion. Unfortunately, we do not have access to credible and comprehensive information on amount of investment required for wastewater and water infrastructure.
Mikko	McFeely	143035	Text Region	03. Water		135	135	33	35	It is not just extreme events that are changing. Acknowledge that longterm trends in one direction can also change a risk profile.	We agree with the Reviewer. The chapters that focus on change in precipitation, temperature and other variables do acknowledge this issue.
Mikko	McFeely	143036	Whole Page	03. Water		135				Key message 2 Aging water infrastructure. This section is very focused on structural resiliency, design and planning of water and wastewater infrastructure (flood risk, capital improvements, planning and design methods). However, operation and maintencance and in particular their optimization is not mentioned in the report though it can be a very useful short term adaptation option. For example, computer simulation models can be used to improve water allocation and distribution efficiency. Similarily, an example for wastewater systems is combined sewer tunnel cleaning which could optimize sewer performance in the short term.Text should acknowledge importance of water distribution optimization and associated costs with it. According to a EPA 2015 document (https://www.epa.gov/sites/production/files/2015 04/documents/epa816f13002.pdf), The United States will need to spend up to $200 billion dollars on water systems over the next 20 years to upgrade transmission and distribution systems. Of this amount, $97 billion is estimated to be needed for water loss control to optimize distribution	Operations and the ability to optimize them in response to changing conditions is a good addition to possible adaptation activities. This is now mentioned in KM3.
Mikko	McFeely	143037	Text Region	03. Water		136	137	25	38	A few more concrete examples of best practices and successful management strategies in the Key Message 3 section would be good. Or perhaps cross reference to the chapter on Adaptation Planning.	This is a good suggestion. We have attempted to provide a limited number of examples that allow us the space to explain them and thus make them meaningful.
Mikko	McFeely	143038	Text Region	03. Water		136	136	7	9	There are examples of cities (NYC, Boston, Miami) that are incorporating climate change risk information into planning and design guidelines. The fact that some munitipalities are starting to include this information should be acknowledged here.	Text in KM3 has been revised to include mention of promising approaches of water sector responses by several cities/utilities. Chapter 28 (Adaptation) also includes discussion of adaptation responses.
Mikko	McFeely	143039	Text Region	03. Water		137	137	6	8	This statement implies that there are no projections (or forecasts?) that can be used to inform and potentially update historic information. Since downscaled climate projections are available to cities and states, this sentence is misleading. Additionally, it is confusing to talk about accuracy in the context of forecasts or projections.	We thank the reviewer for the comment. That was not the intention of the statement. It has been revised.
Mikko	McFeely	143040	Text Region	03. Water		140	140	23	26	This paragraph seems a bit random and the wording is unclear. What is meant by impacts on the water system may be moderated?	Thank you for this comment. We have deleted this section of text.
Christa	Peters-Lidard	143185	Text Region	03. Water		133	133	3	9	Here is the present text: 3 Key Message 1: Significant changes in water quantity and quality are evident across the 4 country, presenting a risk to coupled human and natural systems and related ecosystem 5 services. Rising temperatures are reducing snow-to-rain ratios, leading to significant 6 differences between the timing of water supply and demand. Groundwater depletion is 7 exacerbating drought risk. Surface water quality is declining as water temperature increases, 8 and more frequent high-intensity rainfall events mobilize pollutants such as sediments and 9 nutrients. Comment: This entire message falsely asserts speculative attribution claims as though they were established physical facts, which they are not. Very little warming is taking place and there is no known connection between this slight warming and the referenced changes. These speculations are then coupled with speculative projections of drought and increased rainfall, which are apparently based on questionable computer models. There is no scientific message here.	The statements cited by the reviewer represent the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 [Climate Science Special Report, the CSSR]; that volume provides the underlying scientific basis for the statements about future climate change included in the Water chapter. The statments in this summary are supported by text in the chapter. Several references are provide to studies that support and confirm these key messages.
David	Wojick	143186	Whole Chapter	03. Water						Thank you to the authors for their excellent work synthesizing many lines of evidence and indicators of water system changes. As an author of NCA3, I was somewhat confused when reading this chapter, because I was looking for more discussion up front regarding changes in basic hydrological variables before proceeding to water infrastructure and governance. I know that the NCA4 guidance differed from NCA3, but for continuity and context in this chapter, it would be helpful to refer to and explicitly connect the key findings to the Climate Science Report key finding on Precipitation changes, which also includes changes in soil moisture, snowpack and ET. "U.S. Precipitation Changes. Annual precipitation has increased across most of the northern and eastern United States and decreased across much of the southern and western United States; these regional trends are expected to continue over the coming century. Observed increases in the frequency and intensity of heavy precipitation events in most parts of the United States are projected to continue. Surface soil moisture over most of the United States is likely to decrease as evaporation increases with increasing temperature. Large declines in snowpack in the western United States are expected to be accompanied by shifts to more winter precipitation falling as rain rather than snow in many parts of the central and eastern United States."	Thanks very much for the comment. Text has been added in KM1 linking to the Climate Science Special Report and NCA4 chapter 2. We have also added text summarizing biophysical changes to KM1, with additional details in the traceable account for KM1.
Carole	LeBlanc	143187	Text Region	03. Water		136	136	26	32	Here is the present text: 26 Key Message 3: Water management strategies designed in view of an evolving future that we can 27 only partially anticipate will help prepare the nation for the water and climate risks of the 28 future. Current water management and planning principles typically do not incorporate the 29 ability to address risk that changes over time. There are positive examples of promising 30 directions to manage climate vulnerabilities, while the gap between research and 31 implementation, especially in view of regulatory and institutional constraints, remains a 32 challenge. Comment: This entire message falsely assumes that there are increasing climate risks that need to be prepared for. These speculations are apparently based on questionable computer models. There is no scientific message here. It is increasingly likely that what little human caused climate change there is will be beneficial. See just as an example "Lukewarming: The New Climate Science that Changes Everything," Patrick J. Michaels and Paul C. Knappenberger, Cato Institute, 2016. https://store.cato.org/book/lukewarming	The statements cited by the reviewer represent the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 [Climate Science Special Report, the CSSR]; that volume provides the underlying scientific basis for the statements about future climate change included in the Water chapter.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Kurtis	Duff	143382	Whole Chapter	03. Water						(Chapter 3, ‰ÛÏWhole Chapter‰Û) All of the key messages stress the risks climate change has on freshwater in relation to human use and safety. Apart from mentioning that natural systems/ecosystems are at risk, the key messages do not speak to what those risks are. What are they?	Text has been added stating the health and productivity of natural aquatic and wetland ecosystems are also closely linked to the water sector. We also explicitly link to the Ecosystems Chapter.
Kurtis	Duff	143383	Text Region	03. Water		128	128	19	20	Key message 3 mentions that current water management practices do not incorporate the ability to address risk that changes over time‰Û_Does this make current methods inadequate? How often must strategies be developed to account for the evolving future?	The revision has added the statement that this leads to increased exposure to risk. Suggestions on developing new strategies are made in the final section of the chapter, given space limitations for doing so here.
Kurtis	Duff	143384	Figure	03. Water	3.1	132				3) Figure 3.1: Billion-Dollar Disaster Events in the United States (pg 132) The figure presents two important sets of data, however plotting both data sets in the same figure does not seem to add to the overall meaning. The total cost and 95% confidence lines are difficult to see in contrast to the color of the bar graph. Perhaps two separate figures would be a better presentation of the data. It is surprising to see that the total cost does not necessarily correlate with the number of events. The higher number of events does not appear to have a higher cost overall.	The figure has been revised to show updated data for the full calendar year 2017, to delete hazards not directly water related (e.g., wildfire), and to improve the legibility of gray and black lines shown on the graphic.
Adam	Carpenter	143390	Text Region	03. Water		129	129	3	7	Chapter 3. Page 129. Lines 3-7: This discussion lays out the need for dynamic planning techniques. However, it does not mention that some water utilities are already beginning to lead the way in planning for uncertain future conditions. The Water Utility Climate Alliance (WUCA), working with AWWA and other organizations has outlined practices for water utilities to use when planning for multiple possible futures (see https://www.wucaonline.org/our-work/index.html) as well as examples of how some utilities are addressing these issues. The US EPA has also created the Climate Resilience Evaluation and Awareness (CREAT) tool to help water utilities adapt to long-term extreme weather conditions and analyze the costs and benefits of risk reduction strategies. These items should be mentioned as the current discussion makes it appear that this issue exists but does not mention the progress that has been made in finding strategies to address it. Although some of these resources are mentioned later in the chapter, it is appropriate to at least mention that efforts are underway in this summary.	Thanks for these good suggestions. We have incorporated some examples from WUCA into the section supporting Key Message 3.
Adam	Carpenter	143391	Text Region	03. Water		130	130	6	9	Chapter 3. Page 130. Lines 6-9: The statement on these lines suggests that a changing climate plus ‰ÛÏdeteriorating water infrastructure‰Û is a ‰ÛÏcritical challenge.‰Û Although it is true that both factors are of serious concern, as worded the implication is a negative one that makes it appear that little to no action is being taken, and possibly that few options exist to address these concerns. We recommend a revised phrasing such as ‰ÛÏaging infrastructure presents an opportunity for reinvestment to develop more adaptive and resilient water systems designed to meet plausible climate related challenges.‰Û	Thanks for the suggestion, but we feel that the statement while appropriate, is too mild. Yes, it presents such an opportunity, but we are ignoring the risk of catastrophic failure. The New Orleans - Katrina event was largely about the failure of a levee that did not overtop prior to failure, i.e., the climate event was not the significant aspect. It was the lack of the maintenance. The same is the case for the Oroville spillway failure in 2017. Yet in both cases these were spun out as climate stories that detract from the everpresent danger from aging infrastructure.
Adam	Carpenter	143392	Text Region	03. Water		131	131	16	21	Chapter 3. Page 131. Lines 16-21: This section states that 50 regulated dams and other flood management infrastructure failed during extreme rainfall in South Carolina in 2015. We recommend elaborating on the nature of these dam and levee failures and what the consequences of these failures were. Were there spillovers? Was the dam or levee itself damaged or destroyed, and/or was other property destroyed or lives lost resulting from the failure (as opposed to from other effects of the event)? What were the factors that caused their inability to operate properly beyond the extreme precipitation? This is important to recognize as many failures could be unrelated or tangentially related to climate issues, which is vital contextual information when discussing this type of event.	We appreciate this suggestion, but due to the size of the water topic and the page limit for the chapter, we limit the Regional Rollup section to higher level statements of impacts and do not include details of how and why different dams failed.
Adam	Carpenter	143393	Text Region	03. Water		135	135	11	12	Chapter 3. Page 135. Lines 11-12: This line indicates a ‰ÛÏreconstruction cost‰Û for the water sector of ‰ÛÏupwards of $4 trillion‰Û based on several references, including AWWA‰Ûªs 2012 Buried No Longer report. This line also states that ‰ÛÏ‰Û_the aging U.S. water infrastructure poses a risk to society‰Û_‰Û which is a potentially misleading statement, especially when presented without additional context. We recommend that the draft be updated to: - Detail what ‰ÛÏrisk to society‰Û is being discussed here. AWWA‰Ûªs Buried No Longer report details $1 trillion in expected costs over 25 years to repair and expand water utilities, encouraging action to provide funding and financing through local, state, and federal means. This investment is necessary, but it does not mean that the current state of infrastructure presents an immediate risk, but rather that infrastructure renewal is needed. - We encourage updating the report to state how the $4 trillion number was calculated, and specifically what expected infrastructure needs it does and does not include. Furthermore, the various reports this number comes from may or may not be over the same time period, and this information should be clearly stated in the document. To further enhance this discussion, the report could also compare this to recent historical expenditures to identify how much of a gap this represents.	The text has been revised to clarify. The phrase "risk to society" has been changed to say risk of failure. Text has also been added listing the types of water infrastructure the statement refers to. The reference to 4 trillion dollars was not based on a single reference, but rather an aggregated cost across multiple types of infrstructure based on information from multiple sources. To simplify, the text has been revised to be more general, referring to costs aggregated across infrastructure as being in the "trillions of dollars". Additional references on the construction and maintenance of levees and other water infrastructure have also been added as the sources for this information. About the second comment: this report is synthesis of the existing publications and does not include new data analysis. We were not able to identify a published report comparing the required funding for maintenance with the recent historical expenditures. Hence, we cannot comment on the gap based on the past expenditures.
Adam	Carpenter	143394	Text Region	03. Water		135	135	17	19	Chapter 3. Page 135: Lines 17-19: To state that ‰ÛÏthere are no design standards and criteria addressing how this infrastructure should be designed and operated in the face of changing climate risk‰Û is an overly broad statement, implying that little to no information is available for addressing climate issues in infrastructure. Although it certainly is true that climate-related issues have not been incorporated into all design standards (often because sufficient information to inform such a change has not been developed), there are numerous tools and some standards available to inform this type of planning. For example, AWWA‰Ûªs J-100 Risk and Resilience Management of Water and Wastewater Systems (RAMCP) at https://www.awwa.org/store/productdetail.aspx?productid=21625 provides an ‰ÛÏall hazards‰Û approach to planning. Although it is not climate-specific, it can be utilized to plan for most of the impacts of climate change. Additionally, EPA‰Ûªs Climate Resilience Evaluation and Awareness Tool (CREAT) is available for utility planning. These are just two of many resources available. We recommend changing this statement to recognize that there are tools and resources, although they may not cover all types of infrastructure in all situations.	The statement in the chapter text argues that we do not have design standards and criteria for integrating climate change information in design and operational processes. We agree that there are some tools available. The revised text now mentions there are existing tools, case studies and other information available that can be adopted into design standards and operation guidelines to account for future climate, and includws a reference for EPA's CREAT tool.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Adam	Carpenter	143396	Text Region	03. Water		136	136	5	9	Chapter 3. Page 136. Lines 5-9: The statement that ‰ÛÏstatistical methods have been developed for climate risk and frequency analysis‰Û_ but have not yet been incorporated into infrastructure design codes and operational guidelines‰Ûas an overly broad statement. Design codes and operational guidelines can and are updated as conditions change. In addition to resources previously mentioned (such as AWWA‰Û¾s J-100 Risk and Resilience Management of Water and Wastewater Systems), several states (for example, Maryland) have set freeboard standards to elevate state-sponsored structures above predicted floodwaters, including those that will be impacted by sea level rise. In its report on Climate Risks to Water Utility Built Assets and Infrastructure, the Water Utility Climate Alliance describes utility responses to climate or extreme weather risk through planning, capital infrastructure, managing asset risks, and operations and maintenance, outlining how they are building new infrastructure, repairing or replacing assets, changing operations, and quantifying climate risks to assets. These are only a few of many more examples of addressing this issue.	Our main point is that, in many regions, historical observations indicate change in statistics of extremes. However, the methods developed for accounting the observed changes have not been integrated in infrastructure design codes and operational guidelines. We agree that this issue is mentioned in several publications including the American Water Works Association's (AWWA) report among others. However, AWWA's report is not an official design code.
Aimee	Delach	143595	Whole Chapter	03. Water						A case in point is the ‰ÛÏWater‰Ûchapter, which scarcely mentions the effects of climate changes on aquatic species and biodiversity, despite the fact that the loss and degradation of wetland, stream and other aquatic habitats has been a major driver of species imperilment, requiring action to prevent species extinction. For instance, of the 711 domestic animal species currently listed as ‰ÛÏthreatened‰Ûor ‰ÛÏendangered,‰Ûunder the federal Endangered Species Act, nearly half are from taxa that depend on water resources for all or part of their life cycle, including 164 fish, 89 clams and mussels, 35 amphibians and 28 crustaceans. Many other listed taxa, including aquatic and terrestrial species, depend on aquatic environments: snails (springsnails, riversnails and limpets); insects (naucorids, dragonflies, damselflies and riffle beetles); and birds (whooping crane, southwestern willow flycatcher, yellow-billed cuckoo, wood stork and clapper rails). In fact, thousands of rare, imperiled, and more common species depend upon seasonal or annual water sources. Many of these species are imperiled due to a wide range of legacy impacts on wetlands and waterways‰ÛÓhabitat loss and degradation, damming and diversion, and an array of pollutants. Climate change will exacerbate and pose new threats on these systems‰ÛÓincluding the amount and timing of hydrologic flow, altered scouring and sedimentation, changing levels of dissolved oxygen, and harmful algal blooms and the toxicity of pollutants.	Text has been added stating the health and productivity of natural aquatic and wetland ecosystems are also closely linked to the water sector. We also explicitly link to the Ecosystems Chapter. Effects on species are beyond the scope of this overview water chapter.
Glenn	Watkins	143616	Whole Chapter	03. Water						January 31, 2018 Comments on the U.S. Global Change Research Program‰Û¾s Third Order Draft of the Fourth National Climate Assessment (NCA4) To Whom It May Concern: We the undersigned organizations, representing millions of American families, conservationists, supporters of a healthy environment, and supporters of clean and safe drinking water, commend the U.S. Global Change Research Program on the draft National Climate Assessment which is rooted in sound science that documents the climate change impacts happening across the country, not only in regards to air, ecosystems, oceans, agriculture, but also water. All life on Earth depends on reliable, constant access to clean water. Due to a changing climate, water quality and water supply reliability are in jeopardy in a variety of ways that will affect not only our natural ecosystems, but our very lives. This report highlights how our surface and groundwater drinking supplies will be compromised and how flooding will intensify in many U.S. regions, even in areas where the total precipitation is projected to decline. These changed climate conditions will have major impacts in terms of human safety and health, infrastructure, economies, and ecology of many waterways across the U.S. Absent concerted, targeted attention and investment, these impacts seem destined to fall most harshly on less wealthy, more vulnerable communities across this country. In the face of these concerns, and immediate threats from climate skeptics undermining climate science, the Clean Water for All Campaign will continue to support the scientific consensus on climate change and its effects on our nation‰Û¾s water supplies, ecosystems, and infrastructure. The assessment and its clarion call for adaptation strategies to mitigate the threats to our water supplies, communities, and ecosystems is a vital complement to our non-partisan efforts to increase awareness of what‰Û¾s at stake for water and the future impacts climate change will have on this country‰Û¾s most valuable resource. We thank you for your leadership in drafting this National Climate Assessment and we strongly support it. Sincerely,	We appreciate your statement of concern and the support of the concerns with climate and water.
Union of Concerned Scientists	Union of Concerned Scientists	143687	Whole Chapter	03. Water						Most of the figures are on groundwater depletion. While this is critical, it could be helpful to add figures showing some of the other key climate change impacts in the water sector, e.g., snow:rain ratios, changes in soil moisture, and/or extent of water quality issues.	We include figures showing groundwater depletion, flood and drought disaster and their impact, and on projected imbalances in water supply and demand. After discussion, we think these are appropriate to support key mesages in the water chapter.
Union of Concerned Scientists	Union of Concerned Scientists	143688	Text Region	03. Water		128	128	10	10	May be helpful to list examples of infrastructure up front for easier interpretation.	The text has been revised to explcitly include examples of the water infrastructure we refer to (e.g., dams, levees, aqueducts).
Union of Concerned Scientists	Union of Concerned Scientists	143689	Text Region	03. Water		131	132	5	13	This is a nice list of examples, but rather than a regional overview (that highlights the key overarching concerns for each region), it is more like a snapshot of great examples, organized by regions. Perhaps either (1)rephrase the introductory sentence to clarify that this is not meant to exhasutively represent problems within the regions, (2) remove the italicized region titles at the front of each bullet or (3) edit the blurbs to ensure that each covers the major water-related concerns for each region.	The text has been revised with cross-references to the regional chapter key messages relating to water to address this comment.
Union of Concerned Scientists	Union of Concerned Scientists	143690	Text Region	03. Water		135	135	13	15	The idea that "no comprehensive assessment exists" seems in conflict with the preceding sentence. Explain why the $4 trillion estimate was not comprehensive (and what it did include)	The reference to 4 trillion dollars was not based on a single reference, but rather an aggregated cost across multiple types of infrstructure based on information from multiple sources, and not all types of infrastructure are considered. To simplify, the text has been revised to be more general, referring to costs aggregated across infrastructure as being in the "trillions of dollars". Additional references on the construction and maintenance of levees and other water infrastructure have also been added as the sources for this information. We have also added additional references in the revised version.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Union of Concerned Scientists	Union of Concerned Scientists	143691	Text Region	03. Water		136	136	10	14	Not clear with the two or more events were in the LA case were (i.e., what were the compounding effects?)	We thank the reviewer for the comment. The text has been revised to clarify that it refers to simultaneous flooding across a large area.
Union of Concerned Scientists	Union of Concerned Scientists	143692	Text Region	03. Water		140	140	34	36	This could be a great place to reference the agriculture and land use chapters	Thanks for this suggestion. We have added a references to the agriculture chapter.
Margaret	Matter	143913	Text Region	03. Water		128	128	25	29	Agriculture is more than economic sector (line 27). It is also the source of food and fiber, such as wool and cotton, and in Western and Mid-Western states, agriculture is increasingly dependent on clean freshwater to irrigate crops, and thus fits in line 25 with individuals, communities, and ecosystems. Approximately 70-80% of surface water diverted from streams is used for agriculture (https://water.usgs.gov/edu/wuir.html).	Thanks very much for the suggestion. We added agriculture to the list as suggested.
Margaret	Matter	143914	Text Region	03. Water		130	130	3	6	Agriculture is more than economic sector (line 27). It is also the source of food and fiber, such as wool and cotton, and in Western and Mid-Western states, agriculture is increasingly dependent on clean freshwater to irrigate crops, and thus fits in line 25 with individuals, communities, and ecosystems. Approximately 70-80% of surface water diverted from streams is used for agriculture (https://water.usgs.gov/edu/wuir.html).	Thanks very much for the suggestion. We added agriculture to the list as suggested.
Michael	MacCracken	144200	Text Region	03. Water		128	128	37	37	It seems to me that "Paleoclimate" might be a bit of a jargony word for the audience. I'd suggest saying something like "Reconstructions of variations in precipitation, runoff, and drought over the last 500 years indicate that North America là" Just a suggestion.	Thank you for this suggestion. We now defined "paleoclimate" (e.g. precipitation or streamflow reconstructions over the past several hundred years).
Michael	MacCracken	144201	Text Region	03. Water		129	129	3	7	Sentence is a bit long, and the opening phrase "Emerging risk management strategies" also a bit long--at least my thought process felt complete after the second and then the third word, but then had to go on. It might help to simplify, or perhaps add hyphens to make it clear the phrase goes together.	The sentence was revised accordingly.
Michael	MacCracken	144202	Figure	03. Water	2	129				First, I don't know where Figure 3.1 is. More substantively, I am a bit confused by the sign convention for the figure. Normally, negative sign means one is reducing something, and so when I looked at the scale, I felt negative would be depletion, but then there is only one color for that, and so one then has to recognize that a positive number is a depletion. This may be fine for experts, but I think it would be helpful to perhaps treat the blue color separately, indicating that it shows recharge. Or, at the very least, make sure there is a clarifying explanation in the caption. Also, the change of sign for the basin mainly min Arizona as one goes from one with discharge over the 20th century to recharge since then seems strange enough that an explanation needs to be provided--what is causing this? Diversion of Colorado River Water? An increasing occurrence of tropical like rains in a few years that could be driven by climate change? Much, much better water management practices in the region? How can this be given all the news articles we here and how low Lake Mead is?	Figure 3.2 is from Konikow (2015), so we would like to keep it as such since it is a published article from NGA.
Michael	MacCracken	144203	Text Region	03. Water		130	130	34	34	I think it would help to indicate what "all sectors" means--what are the main sectors is being referred to? A figure might really help here, showing relative amounts of water going to each sector and what the changes have been due to efficiency (and is calculation done on some sort of normalized basis, so is this per capita or total by sector despite population and economic growth?).	We have dropped the reference to all sectors and obviated the need to provide such a figure. The reader is suggested to go to the reference cited for details. Given the length requirements of the chapter we feel that it is not wise to belabor this point beyond what is said here
Michael	MacCracken	144204	Text Region	03. Water		131	131	11	11	Rather than saying "navigation", how about saying something like "river barge movement" or something a bit easier for reader to understand. "Navigation" would seem to me to mean the direction one goes rather than that the movement of barges was disrupted.	The text has been revised as suggested.
Michael	MacCracken	144205	Text Region	03. Water		131	131	12	12	I'd suggest changing "at" to "to have totaled"	The text has been revised as suggested.
Michael	MacCracken	144206	Text Region	03. Water		131	131	17	17	Need comment after parenthetical insert	The text has been revised to shorten and clarify the specified sentence, including punctuation.
Michael	MacCracken	144207	Text Region	03. Water		131	131	35	36	Interesting phrasing on line 35: so "salmon" can technically be singular or plural, "are" sets it up as plural, then it is said they are "a là species" where species can be singular or plural, and here is used as singular. I guess correct, but I would guess a bit unconventional for the normal reader. On line 36, however, "Loss" is singular so it should be "Loss is" or "Losses are"	The text has been revised as suggested to say "Salmon loss is …".
Michael	MacCracken	144208	Text Region	03. Water		131	131	39	39	Somewhere it does need to be pointed out that the two tend to go together in that the loss of evaporative cooling leads to the energy going to create warming--but then also the coming in of hot dry air accelerates loss of soil moisture and accelerates drought onset. To the extent that both contributed due to the particular locations, I think a bit clearer phrasing might help--namely that one had a circulation change that brought in warmer, drier air, and that also inhibited precipitation events. Just a thought.	We appreciate this suggestion, but due to the size of the water topic and the page limit for the chapter, we limit the Regional Rollup section to higher level statements of impacts and do not include details about underlying causes. The mechanics of drought is beyond the scope of this chapter, but are discussed in the NCA4 Climate Sciences Special Report.
Michael	MacCracken	144209	Text Region	03. Water		132	132	21	22	Indeed, I would hope the recent estimates of damage in 2017 would be added--otherwise take that year's data off. And so here is Figure 3.1 following Figure 3.2.	The figure has been revised to show updated data for the full calendar year 2017, to delete hazards not directly water related (e.g., wildfire), and to improve the legibility of gray and black lines shown on the graphic.
Michael	MacCracken	144210	Text Region	03. Water		133	133	15	16	Please change "If" to "As" because there is really no question of this happening--do not leave that open for question. And then for second part of sentence make it clear that this is what is projected to happen--it will occur (or say "very likely" or "almost certain" if one wants to indicate there is some chance this will not occur. Right now, the sentence is really a quite meaningless hypothetical and not a projection.	The text has been revised as suggested.
Michael	MacCracken	144211	Text Region	03. Water		133	133	25	25	The word "may" is really useless and is not part of the official lexicon. In the first national assessment, we required scrubbing of that word (with only a very few exceptions) as it says nothing and can be interpreted in so many different ways--almost anything may happen. Save the word for the month of the year, not for expressing risk related information.	The text has been revised the text to "likely will".
Michael	MacCracken	144212	Text Region	03. Water		133	133	30	30	For clarity, I'd suggest changing "during the past century" to "since 1900" or something so not seeming to limit the trend to the 20th century.	The text has been revised as suggested.
Michael	MacCracken	144213	Text Region	03. Water		134	134	19	19	Another use of the word "may" that needs to be converted to the likelihood lexicon. For example, here "may" could be replaced by "will" or "very likely" or something similar.	The test was revised as suggested.
Michael	MacCracken	144214	Text Region	03. Water		135	135	22	22	Really, 4-figure precision. This seems overdone. Might it be better to express in terms of a share of the GDP or a multiple of the current rate of expenditure on such efforts? Similarly, on line 26, even 3-figure precision seems overdone (and ten billion a year does not really seem like all that much money--equal to a dime a day per person in the US)	Thanks for the comment. We have rounded the estimates.
Michael	MacCracken	144215	Text Region	03. Water		135	135	27	27	Hooray, a specific example of why I always am urging that the word "Earth" be capitalized when referring to the planet, and that "earth", when not capitalized, is referring to dirt. Do make sure that if a grand sweep is done on the report to capitalize Earth, the planet, that they do not make that change here.	We agree and we have implemented this suggestion.
Michael	MacCracken	144216	Text Region	03. Water		136	136	4	4	Again, scrub "may" and say "is likely to" or some other word from the lexicon. If the sign is really unknown, one can say "it is possible that" or something similar tied to a definition in the lexicon. But take out "may" which can mean from 99 (e.g.,' you may get cancer' is a totally useless statement).	We thank the reviewer for the comment. However, in this case, we cannot use the term " likely" as we cannot assign probability/confidence (unlike change in a variables from different models)

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144217	Text Region	03. Water		137	137	6	8	Regarding "there are no accurate là"--well, this is the way life is, but we still make decisions. It seems to me that this type of statement needs to be taken on by saying that is why society and individuals always have and need to continue to make decisions based on risk assessment. So, the lack of what is wanted is not just a challenge for "water planning and management"--it is a challenge for everyone all their lives. The question is if the scenarios provide a plausible enough range of possible future conditions for planning purposes. So, it seems to me the text needs to take this statement on and give it some context, etc. The next sentences get to emerging approaches, but don't point out the impossibility of the indicated desire for perfect information (and even if he had the desired accurate forecast, there would be so many other factors to consider that there would be no guarantee of a perfectly safe design and outcome.	The section has been revised to better address how planning is moving forward despite the uncertainty, while acknowledging the uncertainty.
Michael	MacCracken	144218	Text Region	03. Water		137	137	11	11	Instead of "wide range of uncertain", might it be better to say "plausible range of possible" or "wide, but plausible, range of possible"	The text has been revised as suggested.
Michael	MacCracken	144219	Text Region	03. Water		137	137	19	19	Although suggesting it above, might it be that "plausible" needs to replace "possible"	The text has been revised as suggested.
Michael	MacCracken	144220	Figure	03. Water	3	138				Is not "Projected Future" duplicative--I would think "Future" can be dropped, and should be. Same point with respect to caption on lines 3-4.	Thank you for this suggested revision. The text in the figure has been revised to "Projected Water Supply and Demand"
Michael	MacCracken	144221	Text Region	03. Water		139	144	1	20	Not reviewed, assuming that authors will incorporate any changes suggested for main part of chapter in these sections and so that I can have time to review additional chapters.	We thank the reviewer for the message.
Julie	Maldonado	144767	Whole Chapter	03. Water						The Water Chapter provides an excellent summary of the state of our Nation‰Ûªs water. It is well written, comprehensive and concise. One issue that might be addressed a bit further is the few chapter statements on the scarcity of adequate spatial and temporal hydrologic data. These are most likely referring to in situ data. Earth satellite remote sensing has been increasing used for over three decades to reduce the uncertainties in understanding terrestrial water and energy storages and fluxes, both through direct observation and through satellite data assimilation within terrestrial models. Especially when used in concert with in situ data, together they have demonstrated improved hydrologic understanding and water management.	Thanks very much for the suggestion. It is quite appropriate. Especially in the context of inter-annual and decadal variability we meant to indicate that the duration of the associated climate data poses some limits. Beyond that, we have very little systematic data on water use in the USA. This is something that is not easily overcome by remote sensing - at best we can get a surrogate for evapotranspiration, and for large scale water storage changes. However, it is an important source of data.
Gregory	Swift	140862	Figure	04. Energy	4.1	167				In Figure 4.1 (which appears on pages 163 and 167), there is a typographical error in the box named Pipelines: ‰ÛÏundermines‰Û should be ‰ÛÏundermine‰Û . Please also check other boxes in that figure.	The figure is being updated to address the comments.
Gregory	Swift	140863	Text Region	04. Energy		172	173	23	8	Chapter 4, at page 172 line 23 and in the caption of Fig. 4.3, Recirculating water: Please consider providing possible clarification for the non-expert like me: I don‰Ûªt understand why it says ‰ÛÏrecirculating or dry‰Û cooling technologies. I cannot imagine a utility-scale thermal plant rejecting its waste heat to ‰ÛÏdry‰Û air without an intermediate recirculating coolant fluid, so I think that all ‰ÛÏdry‰Û heat rejection MUST involve a recirculating fluid. So, does ‰ÛÏrecirculating‰Û but not ‰ÛÏdry‰Û here mean that the heat is rejected to a body of water (e.g. ocean, river) through an intermediate recirculating fluid? If so, how can this help harden a thermal plant against drought or extreme weather? Maybe only ‰ÛÏdry‰Û cooling provides hardening against drought.	The text in the body of the document was changed so as not to distinguish between alternative cooling systems. In the caption to Figure 4.3 and explanation of the different types of systems was given. The following text was added "Traditionally, power plants utilized once-through systems requiring large volumes of water to be diverted through a condenser where the heat was conducted to the water. More recently, recirculating system have been adopted that typically withdraw a fraction of the water as heat is dissipated through evaporation. Dry-cooling systems are gaining interest which use air rather than water for cooling."
Douglas	Bessette	140873	Figure	04. Energy	4.1	163				There is a typo in the Pipelines box "can undermines…"	Comment accepted and sentence modified.
Gavin	Dillingham	140890	Text Region	04. Energy		186	186	20	21	Link to Rhodium group paper does not work…citation can be found here… https://energy.gov/sites/prod/files/2017/01/f34/Assessing%20the%20Effect%20of%20Rising%20Temperatures%20The%20Cost%20of%20Climate%20Change%20to%20the%20U.S.%20Power%20Sector.pdf	An updated link hss been provided.
Gavin	Dillingham	140891	Text Region	04. Energy		168	168	19	34	The increase in demand and need for additional generation does not take into account energy efficiency and its role in reducing future demand. The Rhodium study does not cover energy efficiency to any degree. Energy efficiency is only modeled as a program cost in the study. Could a study like the one by Reyna and Chester 2017, that looks at the role of energy efficiency in reducing future demand for CA, be included as part of this discussion? There is also no discussion on improved energy efficiency standards of appliances and the potential benefit they could have on reducing consumption. The electric power market is more than the supply side conditions. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5440627/ There could also be a reference or discussion of the findings from this 2017 LBNL study on energy efficiency impacts on consumption. This paper discusses the state of energy efficiency in the residential and C&I space and how future demand can be shaped by energy efficiency https://emp.lbl.gov/sites/all/files/lbnl-1006983.pdf Page 171, line 36 is the only mention of energy efficiency in the entire chapter.	Suggest inclusion of text noting "Despite anticipated gains in end use, building, and appliance efficiencies" as iintro to sentence on line 21. Point taken but increase in energy demand references modeled impacts of increasing ambient temperatures and impact on peak loads and not an argument that EE will continue to make gains and positively impact future reductions in consumption.
Gavin	Dillingham	140892	Text Region	04. Energy		180	180	1	11	In this section, there is a discussion of mitigation efforts that may or may not reduce the impacts of climate change, all due to the extent to which mitigation efforts are introduced. In this section, it appears there is an opportunity to be more specific on mitigation efforts and discuss opportunities that energy efficiency and appliance standards could have to reduce emissions and possibly reduce some risk to the grid.	Reference was added to the text at page 172, line 20: "while promoting improved energy efficiency and associated appliance standards"
patrick	michaels	141604	Text Region	04. Energy		166	166	8	10	Regarding this text: 8 …. Increasingly, the energy system is affected by 9 climate change and extreme weather events, threatening more frequent and longer-lasting 10 power outages …. Comment: This text makes a speculative claim that is based primarily on speculative computer projections that are far too sensitive to human emissions. Asserting this speculative threat as an established physical fact is false. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	The comment is inconsistent with the current state of the science on this topic.
Rebecca	Ambresh	141767	Text Region	04. Energy		167	167	8	8	It might be helpful here to define what wave action and storm surge is.	Comment accepted and sentence modified.
Rebecca	Ambresh	141768	Text Region	04. Energy		167	168	10	9	This section talks about the potential damage flooding (due to hurricanes for example) can cause on power plants and oil refineries. I think the message would be more impactful if associated costs were added here. Talking about the economic damage to both the government and the tax payer adds to the environmental, reliability and security threats that climate change will cause.	The authors agree about the value of including economic impact information, but also recognize the limitations of data avaiablility. Text Box 4.1 has been added to describe "Economic Impacts to Electricty Systems" .

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Neha	Gupta	141769	Text Region	04. Energy		169	170	30	3	I really like the points made here. It is important to highlight that renewable energy is a growing sector which is becoming more innovative and competitive. I especially liked the connection that an increased use in natural gas has lead to an increase of grid flexibility which in turn, widens the use of using solar and wind as it keeps growing.	We thank the reviewer for these comments.
Rebecca	Ambresh	141798	Text Region	04. Energy		172	172	4	10	What steps are being taken to encourage other areas who are also vulnerable to hurricanes, floods and other natural disasters to invest in similar upgrades like New York and New Jersey did?	Propsed additional text tracked in revised draft.
Susanne	Moser	141799	Figure	04. Energy	4.3	173				It might also be helpful to include any information about outliers in figures like the large amounts of recirculating plants in 2000-2004. Why did these four years see such a spike in recirculating plants?	This figure has been deleted from the chapter.
David	Wojick	141916	Whole Chapter	04. Energy						This chapter is well-written and organized. It presents some important concerns about the vulnerability of US energy production to climate-related events such as storms and sea level rise. However, the chapter is missing one very important point: the US energy sector is a major source of CO2 emissions, both historically, currently, and into the future. The NCA authors were asked to consider, whenever possible, two different emissions scenarios, a high scenario (RCP 8.5) and a lowish scenario (RCP 4.5, I think). These scenarios assume a particular evolution of global energy production over the next century, and the differences in the assumptions are striking. This chapter would be much more interesting and much more relevant to the goals of the NCA if it included a discussion of current carbon emissions from the US (relative to global emissions) and the kind of energy sector that is implied by the two scenarios. Unlike the other chapters that talk about impacts of climate change on US interests, this energy sector actually has a feedback on climate change that needs to be acknowledged in some way--to avoid it is intellectually dishonest and not consistent with the best available science. This should either be a key message or at minimum, a box.	The authors believe the comment addresses issues that are out of scope for the chapter.
Sarah	Davidson	142001	Text Region	04. Energy		169	169	30	31	Please clarify whether the statement beginning with "…in 2016, for the first time in history…" describes energy use in the US or globally.	We thank the reviewer for the suggestions, and have added clarifying text as requested.
Sarah	Davidson	142002	Text Region	04. Energy		169	169	33	34	Please clarify whether this statement the 44% and 19% numbers describe growth of solar and wind generation in the US or globally.	We thank the reviewer for the suggestions, and have added clarifying text as requested.
David	Peterson	142408	Text Region	04. Energy		167	168	11	9	It is surprising that the number of electricity generation facilities and oil refinery in the Southeast that could potentially impacted by the hurricane storm surge is quite large. If sea level rises coupled with storm surge happens, the results will be severe and hazardous. With this in mind, it would be very beneficial and helpful in terms of understanding and visualizing the impacts if there is a graph that shows the geographical area and population that could be impacted by when electricity generation facilities or oil refineries are down. Especially compare it with the range of sea level rise scenarios that are stated in the paragraph.	We appreciate this suggestion but space is limited.
Juanita	Constible	142456	Text Region	04. Energy		162	162	35	36	The sentence starting "Rising temperatures will drive …" seems somewhat complex for the general public to grasp. It is advisable to unpack it and emphasize the increase in power prices driven by the increased demand for cooling as well as the strain on the reliability of the transmission system that the increased demand could cause. Here is a suggested revision: "Rising temperatures will drive greater use of air conditioning in the summer months. The increase in electricity demand would increase power prices for Americans and add strain on the reliability of the electricity transmission system."	The suggestion for revising the language was accepted.
Juanita	Constible	142457	Text Region	04. Energy		163	163	4	5	Re: "Dryer conditions may also increase the risk of wildfires and damage to energy assets." It would be useful to explain what is meant by energy assets, perhaps by enumerating an example of two.	Comment accepted and definiaton provided as a footnote in the first sentence of key message 3, to read as: "The term "energy assets" is used in this chapter to refer to a broad suite of energy equipment used in the production, generation, transmission, and distribution of energy."
Juanita	Constible	142458	Text Region	04. Energy		169	169	33	34	Re: "Solar and wind generation grew by 44% and 19% in 2016, respectively (EIA 2017b)." It would be useful to specify compared to which year this increase occurred.	We thank the reviewer for the suggestion. We have revised the sentence to clarify the time interval in question.
Juanita	Constible	142459	Text Region	04. Energy		170	170	1	3	Re: "In addition, increased adoption of flexible demand programs, increased transmission, and energy storage technologies are being explored as ways to enhance system flexibility and reliability (DOE 2017b)." It would be useful to unpack this sentence to make it more accessible to the public. For instance, we would recommend explaining what flexible demand programs are, and provide an example or two to help illustrate how demand could be managed to alleviate strain on the grid (direct load control programs, time-of-use rate structures etc.). It would also be useful to quantify the "increased adoption" of the aforementioned measures by providing some growth numbers, to the extent possible.	We thank the reviewer for the suggestions and have reworded the sentence to add clarity.
Juanita	Constible	142460	Text Region	04. Energy		170	170	17	19	Re: "Fuel availability for electricity generation can affect reliability and resilience." Maintaining onsite fuel resources is one way to improve fuel assurance, but most generation technologies have experienced fuel deliverability challenges in the past (DOE 2017b). We strongly advise striking the above sentence as multiple recent studies have shown that on-site fuel availability for power generation has had virtually no impact on either resiliency or reliability, with extreme weather events included in the underpinning analyses. For instance, a recent analysis performed by the Rhodium Group concluded that outages caused by disruptions of fuel supply to generators appear to be virtually nonexistent. A mere 0.00007% of customer-hours lost to outage were caused by fuel supply emergencies between 2012-2016, a period when 32% of the country's coal fired power units and 6% of its nuclear generating units were retired. The same period also featured two of the coldest winters during the past 30 years in the Eastern United States, including the 2014 Polar Vortex. And virtually all of those customer-hours that were lost due to fuel supply disruption between 2012-2016 were related to a single incident involving one coal plant in Northern Minnesota (Houser, Larsen, and Marsters, The Real Electricity Reliability Crisis, October 3, 2017, found at http://rhg.com/notes/the-real-electricity-reliability-crisis). Similarly, in the National Academy of Sciences, Engineering and Medicine's recent report on "Enhancing the Resilience of the Nation's Electricity System," the authors explain the risks associated with many potential hazards to the electricity system from human actions and from natural causes. Nowhere in the report did the authors recommend maintaining or increasing the on-site fuel capabilities of certain generation facilities as a potential improvement to the grid's resilience (National Academies of Sciences, Engineering, and Medicine. 2017. Enhancing the Resilience of the Nation's Electricity System. Washington, DC: The National Academies Press. Available at: https://doi.org/10.17226/24836)	We appreciate the reviewers suggested wording change and have adopted the suggestion.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142461	Text Region	04. Energy		170	170	17	19	We strongly recommend that the section authors refer to the comments to the recent DOE proposed Grid Resiliency Pricing Rule, recently rejected by FERC (available in the FERC docket number RM18-1, found at https://elibrary.ferc.gov/idmws/docket_search.asp), where multiple groups reasonably argued that there is no evidence that fuel secure generation is linked to reliability, and that the vast majority of electric service disruptions in the U.S. are virtually all related to transmission and distribution outages, not unscheduled generation outages. In particular, we would recommend consulting comments submitted by the following groups, and dealing with this particular issue: The Rhodium Group (found in the FERC docket mentioned above), the Clean Energy Trades (also found here http://www.acore.org/images/publications/ACORE_JointIndustryComments_102…), and Natural Resources Defense Council, Sierra Club, Environmental Defense Fund and EarthJustice (found in the FERC docket mentioned above). Some relevant comments can also be found at the three following links: https://www.dropbox.com/s/qwa2op00k5je5ln/2017-10-24%20DOE%20NOPR%20Comm… https://www.dropbox.com/s/b7b5vwnbkw1k5qe/2017.11.07%20RM18-1%20Public%2… https://www.dropbox.com/s/uxhlh9mbdu2eii8/DOE%20Prop%20Comments%20NRDC%2…	The authors appreciate the comment about the FERC rulemaking and believe that the major points made by the commentor have been addressed in the various sections of the chapter, including pointing out that coal and nuclear generators have not been shown to be more resilient than other sources, citing examples in which those generators failed to function during extreme weather events because the fuel supplies froze, flooded or were otherwise unavailable (see page 174). As well as pointin out that transmission issues, rather than generation issues, have historically been the principal cause of significant disruptions.
Juanita	Constible	142462	Text Region	04. Energy		171	171	1	1	Re: "have created supply constraints in the past (2017b)". It would be useful to point to the 2014 Polar Vortex, and the electricity price spikes that occurred due to competing demand for natural gas.	We thank the reviwer for the comment. As there are many specific examples of supply constraints contained within the reference, we are declining to include further specific examples here.
Juanita	Constible	142463	Text Region	04. Energy		171	171	26	28	Please provide a supporting reference for this statement: "For example, the inability of natural gas-fired power plants to store fuel are leading energy providers to explore resilience options, such as co-firing with fuel oil, which can be more readily stored." It seems to be a reference to the dual fuel capability to gas-fired units required by grid operators, particularly in the Northeast. In that case, it would be important to add the geographical context, i.e. that this has been one of the solutions to enhance resiliency in the Northeast, where competing uses of gas for both heating and power generation have historically led to price spikes during cold snaps. It would also be important to add that demand response availability is increasingly recognized as an important resiliency measure alongside dual fuel capability. For instance, the New England grid operator runs a "winter reliability program" to boost fuel reserves and demand response availability when the grid is under weather stresses (the program was initiated in the wake of the outages prompted by the 2014 polar vortex). We also strongly advise that the authors of this section mention that the increased used of oil use is not a good long-term solution from an environmental standpoint. Instead, more investments in energy efficiency, smarter use of existing gas pipelines (here's a recent study on how withholding of gas pipeline capacity may be artificially limiting supply in New England and driving up prices: https://www.edf.org/sites/default/files/vertical-market-power.pdf), and increased energy storage, demand response and renewable energy are better tools to meet our energy needs, lower peak power demand, and enhance grid resiliency. (Please refer to our comments to the sections on pages 171 through 173 of this chapter discussing how demand response in particular helped the grid carry the crisis during the 2014 polar vortex, and how well wind projects have fared during last week's cold spell that hit much of the Northeast region).	The language has been expaned along with the addition of two references: (1) NERC (North American Electric Reliability Corporation) 2013. Special Reliability Assessment: Accommodating an Increased Dependence on Natural Gas for Electric Power – Phase II: A Vulnerability and Scenario Assessment for the North American Bulk Power System (Washington, DC: NERC, May 2013), http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_PhaseII_FINAL.pdf.; and, (2) DOE, 2017b: Staff Report to the Secretary on Electricity Markets and Reliability. August 2017, U.S. Department of Energy, Washington, DC. [Available online at https://energy.gov/staff-report-secretary-electricity-markets-and-reliability] http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_PhaseII_FINAL.pdf.
Juanita	Constible	142464	Whole Page	04. Energy		171				It seems like some of the major measures to enhance energy system resilience, like the deployment of smart grid technologies, energy efficiency (weatherizing homes provide the greatest benefits during extreme cold or hot weather events), distributed generation and energy storage, are lost in the many enumerations provided in the section. It is advisable to emphasize on the large role that those measures have already played and are poised to play in strengthening grid resilience and reducing peak demand, along with both the recent growth in their deployment as well as their projected growth. For instance, sources like Bloomberg New Energy Finance and others project a significant increase in the adoption of distributed solar resources and storage technologies. In addition, it's important to mention that Northeast states are setting large energy storage targets and making significant investments. Just this week, New York Governor Cuomo announced a plan to install the capability to store 1,500 megawatts of energy by 2025. We would also recommend emphasizing the important role that wind, solar, and demand response play in enhancing grid resiliency during extreme weather events. For instance, these resources were critical in helping the power stay on and keeping the grid stable and functional during the 2014 Polar Vortex, while fossil plants were struggling to function in the frigid cold. Additionally, given that wind often generates more power than normal during the rapid-wind spells of extreme weather events, the nation's first offshore wind project- Block Island Wind- operated nearly around the clock in the strong winds which accompanied the frigid cold that most of the East Coast just experienced. These points are discussed here: https://www.nrdc.org/experts/vignesh-gowrishankar/demand-response-rescue… and https://www.nrdc.org/experts/john-moore/cold-temps-prove-value-electrici….	Several other comments also touch on similar themes of broadening discussion beyond emphasis on infrastructure hardening including finance measures, storage, smart grids, and distributed generation. New language has been incorporated into the chapter to place great emphasis on these points.
Juanita	Constible	142465	Whole Page	04. Energy		171				The Brattle Group has recently outlined in detail how RTOs and system planners are beginning to favor increased grid flexibility as the optimal means of ensuring reliability and resilience (Chang, Aydin, Pfeifenberger, Spees, Pedtke, "Advancing Past 'Baseload' to a Flexible Grid, June 26, 2017, found at http://files.brattle.com/files/7352_advancing_past_baseload_to_a_flexibl…). Flexibility can be provided by technologies such as storage, demand response, advanced combined cycle and combustion turbine units, and others. The report also documents the various innovations system planners and operators continue to make to provide the flexibility needed to support the grid. For example, they are increasingly recognizing demand-side resources like demand response, energy efficiency and distributed generation and incorporating them into planning and wholesale market design. We would thus strongly recommend revising the section language to put more emphasis on the growing importance of these demand-side and storage technologies in enhancing grid resilience and reliability.	The discussion under Key Message 3 was revised to include the key points and the reference provided by the commentor.
Mikko	McFeely	142837	Whole Chapter	04. Energy						The chapter refers to a climate ready energy system. In some instances a hyphen is used between climate and ready (for instance page 165, line 14) and other places no hyphen is included. I recommend being consistent either way.	Comment accepted and the term "climate-ready" adopted throughout text.
Mikko	McFeely	142838	Text Region	04. Energy		162	162	28	30	In both the Summary Overview and the State of the Sector (p 165, line 10) the comment is made that the energy sector is undergoing substantial policy, market, and technology driven changes. You do a very nice job describing the market and technology changes but you don't explain what is meant by substantial policy changes. We recommend deleting policy or give a brief example of a changed policy (do you mean the clean power plan? if so, you should use that as an example)	We thank the reviewer for this comment. We have added text at lines 2 and 5 on page 170, to make the role of policy more explicit.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	142839	Text Region	04. Energy		166	166	8	12	We recommend breaking up the second sentence in Key Message 1. In it's current form it is easy for the reader to lose the message. For instance, change to: Increasingly, the energy system is affected by climate change and extreme weather events, threatening more frequent and longer lasting power outages. Such outages affect critical energy infrastructure and create fuel supply and demand imbalances. Cascading impacts on other critical sectors could affect the Nation's economic and national security. Supply and demand imbalances is suggested in place of availability and shortage imbalances because the term shortage already implies there is in an imbalance, making the word redundant. Alternatively, you could use availability and demand.	Comment accepted and sentence modified.
Mikko	McFeely	142840	Text Region	04. Energy		166	166	5	5	Change soil water content to soil moisture. I've never heard this variable being refered to as soil water content.	Comment accepted and sentence modified. Soil water content changed to soil moisture as suggested.
Mikko	McFeely	142841	Text Region	04. Energy		178	178	17	19	This sentence is a fragment. We recommend changing from…enables modern electricity dependent critical infrastructures that support… to …enables modern electricity dependent critical infrastructures to support…	We thank the reviewer for this comment. We have adopted the recommendation.
Mikko	McFeely	142842	Text Region	04. Energy		179	179	33	33	Yield is used twice in this sentence. We recommend changing to The energy system is highly complex. This introduces uncertainty in whether particular actions could yield unintended consequences.	The suggested change was made.
Ken	Moraff	143152	Whole Chapter	04. Energy						High temperatures can decrease the carrying capacity of transmission lines. This impact should be added. http://iopscience.iop.org/article/10.1088/1748-9326/11/11/114008/pdf	An identical commnet has already been addressed.
Ken	Moraff	143153	Text Region	04. Energy		167	167	10	34	Add to this paragraph that the increase in temperature of the cooling waters will decrease the generation of electricity. Two examples are cited in these articles:https://green.blogs.nytimes.com/2012/08/13/heat-shuts-down-a-coastal-rea… http://www.capecodbaywatch.org/2015/08/pilgrim-in-hot-water/	The text has been modified to refer to impact of both increases in air and water temperatures.
Jeff	Lukas	143189	Text Region	04. Energy		169	169	20	26	Here is the present text: 20 Key Message 2: Changes in energy technologies, markets, and policies are affecting the energy 21 system‰Ûªs vulnerabilities to climate change and extreme weather. Some of these changes may 22 increase reliability and resilience, while others may create additional vulnerabilities. For 23 example, natural gas is an increasingly important fuel for power plants, renewable resources 24 are becoming increasingly cost competitive and expanding market share, and a resilient 25 energy supply is increasingly important as telecommunications, transportation, and other 26 critical systems are more interconnected than ever. This message is so vague that it is meaningless. However, the assumption seems to be that there are increased risks coming from climate change and extreme weather. This is speculation falsely asserted as established physical fact. There is no scientific message here. It is increasingly likely that what little human caused climate change there is will be beneficial. The fact that the CMIP5 models run hot is well known. See just as an example "Lukewarming: The New Climate Science that Changes Everything," Patrick J. Michaels and Paul C. Knappenberger, Cato Institute, 2016. https://store.cato.org/book/lukewarming	We thank the reviewer for their engagement. Given that the federal government is required to report to Congress under the Global Change Research Act of 1990, and that NCA4 is being prepared to comply with this statue, the suggestions appear to be outside the scope of this chapter and the NCA.
patrick	michaels	143191	Text Region	04. Energy		171	171	9	14	The present text says this: 9 Key Message 3: Actions are being taken to enhance energy security, reliability, and resilience 10 with respect to the effects of climate change and extreme weather. This progress occurs 11 through improved data collection, modeling, and analysis to support resilience planning, and 12 the deployment of new, innovative energy technologies for hardening energy assets against 13 extreme weather hazards. Although barriers remain, opportunities exist to enhance energy 14 systems resilience. This message is so vague that it is meaningless. However, the assumption seems to be that there are increased risks coming from climate change and extreme weather. This is speculation falsely asserted as established physical fact. Extreme weather has always been a well known risk, one which is presently planned for. There is no scientific message here. It is increasingly likely that what little human caused climate change there is will be beneficial.	Greater clarity has been incorporated into the text.
Social Science	Coordinating Committee	143220	Text Region	04. Energy		162	162	31	31	This section discusses increases in energy demands. To what extent is there information on how changes in the built environment, e.g. more energy efficient homes, white roofs, etc. can offset increases in energy use due to air conditioning? Can this be tied into the chapter on the built environment? Discussing what is known about links between changes in the built environment and energy demands, and how they intersect around adaptation issues could be useful.	We thank the reviewer for this comment. We have added text at line 5 on page 170 to address the general suggestion.
Social Science	Coordinating Committee	143221	Text Region	04. Energy		168	168	13	16	Should condition these statements to reflect that emissions of criteria air pollutants such as NOx and SO2 may be limited by current regulations, e.g. SO2 limits and NOx limits required to meet national ambient air quality standards. As a result, any increases in energy demands will have to be met using technologies that do not increase emissions beyond regulated levels.	Comment accepted and sentence modified.
Social Science	Coordinating Committee	143222	Text Region	04. Energy		168	168	24	27	The use of the term 'likely' to describe these cost increases should be carefully justified. Almost any long term energy cost projection is highly uncertain and dependent on many factors such as technology development, urban adaptation, etc. You might be better to say, 'under X assumptions about technology and urban development, it is likely…' to indicate that the determination of 'likely' is conditioned on the starting assumptions in the model.	Comment accepted and sentence modified.
Social Science	Coordinating Committee	143223	Text Region	04. Energy		169	169	15	17	Agricultural drought is only one of the climate related pathways that affect wildfire frequency, intensity, and areal coverage. What does the scientific evidence say about the overall risks to energy production from increased wildfire risks due to climage change?	We appreciate the reviewer's thoughtful comment. We have rewritten the sentence to convey a broader sense of threats to the energy system, given that land cover and land use change, agriculture, and forests are the focus of their own chapters in NCA4.
Social Science	Coordinating Committee	143224	Text Region	04. Energy		171	171	15	20	This provides a listing of actions that are being taken to increase resilience of the energy system. Does the scientific literature provide any assessments of the likelihood that these measures will be effective in addressing the climate related risks under different cliamte scenarios? It will be very helpful to policymakers to know the state of the science as to whether adaptation measures are likely to be successful. There is a general statement at the end of the chapter that says that current measures are not likely to be adequate, but this seems very general and not providing information on why, which measures are better than others, under which climate scenarios will they be inadequate, etc.	Greater clarity has been incorporated into the text.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Marjorie	McGuirk	143376	Whole Chapter	04. Energy						Page Reference Comment 163 Fig4.1 It would be more in keeping with the standard practice to refer to the four components of the energy system - production, transmission, distribution, and consumption. Several references and DOE diagrams (cartoons) use the nomenclature. Though it is somewhat address on page 176, it can be more explicitly stated. several instances In several places, the text states "extreme weather and climate change". This can be most unhelpful and confusing. Climate change induces more frequent extremes. It would helpful to explain clearly that "Weather impacts the operations of energy components, while climate and climate change impacts the design of those components". Explain please that energy is the only commodity that is sold the instant it is produced. Energy systems operate on a four second refresh cycle. Weather is the primary threat to the safe deliver of energy. Climate, on the other hand, is used for the design of future energy systems. Renewable energy is inevitable as the next step in the energy evolution. Whereas previous energy infrastructure was "one-way" from proccuction to consumption, renewable energy production can be on the "consumption" end of the energy system. Two-way production to consumption is a new design criteria, not only accounting for the need to reduce CO2 emissions, but also accounting for the realities of local distributed production, at the point of consumption. Local production becomes more necessary in a changing climate. 173 line 15 Good point "Because energy infrastructure is long lived, decisions about how to locate, expand, and modify‰Û_will influence for decades to come". Draw a parallel to climate. Decisions taken for infrastructure design, in the long term, require a project of the climate in which those infrastructure will operate. 172 Hardening Though the definition of "hardening" on line 12 is accurate, be more specific. "Hardening assets in place" is common terminology for preparing energy systems for a severe weather event (or more frequent climate-change induced extreme event). Make it more clear that power companies "harden" assests so that they can continue to function durning a storm. Define assests: transformers, substations, switching boxes. State that assests tend to be in low-lying areas, coastal or not, they tend to be install away from "prime" real estate, . Define "hardening", e.g. installing rows of sandbags around a substation. Make a distinction between "hardening assets in place" durng a weather event (which may be more extreme and more frequent due to climate change) and RELOCATING assets. 172 key barriers A key barrier not mentioned here is "making the rate case". The ability of a utiliy to relocate an	There are several issues rasied in this set of comments. The athors modifed the text to address many of the points including: hardneing, key barriers, peak air temperatures. However a few comments were not addressed including: providing additional treatment of the difference between climate and extreme weather; threats from electromagnetic pulse; and water intensity of nuclear power plants.
Lesley	Jantarasami	143663	Text Region	04. Energy		166	166	4	5	The regional summary on page 166 includes mention of climate impacts on growing biofuel crops, highlighting a connection between the agriculture and energy sectors. The authors may want to similarly consider the potential connection between the forestry and energy sectors with regard to biomass fuel for electricity generation. It seems like the climate impacts described in Chapter 6 of NCA4 on forest health, productivity, and forest management and operations within forest products sector as could have implications for the availability of wood and wood waste solids for biomass electricity generation. Is there any literature on this possible relationship that could be cited?	Comment accepted and sentence modified.
Union of Concerned Scientists	Union of Concerned Scientists	143693	Whole Chapter	04. Energy						The impact of climate on biofuels is briefly noted in a few areas, but a few things are missing. For example, the competition for land (induced by climate change), and the possible impacts of changing climate & seasonality on suitability of land for biofeuls (either current, or innovative future biofeuls, which could theortically be well-adapted to local climates and improve climate change resilience).	Language has been added in response to the comment, including: "Research can also reduce the water needs of biofuels and the possible impacts of changing climate on suitability of land for biofuels production, with innovative future biofuels that are adapted to local climates."
Union of Concerned Scientists	Union of Concerned Scientists	143694	Figure	04. Energy	1	163				What about biofuels? Also, in the text for Wind and Solar, what about competition for land?	Comment accepted and sentence modified.
Union of Concerned Scientists	Union of Concerned Scientists	143802	Text Region	04. Energy		162	162	19	21	The report should acknowledge actions of deploying new innovative energy technologies that can both increase resilience and reduce emissions such as microgrids with wind, solar, biogas, storage and other low carbon technologies vs. focusing completely on hardening.	We thank the reviewer for this comment. The proposed, broader topics are outside the scope of Vol. 2 of the NCA, which "analyzes the impacts of global change, as described in Volume I (Climate Science Special Report), on topics and regions of the United States" (https://www.globalchange.gov/content/nca4-planning).
Union of Concerned Scientists	Union of Concerned Scientists	143803	Text Region	04. Energy		163	163	1	5	This paragraph could also acknowledge impacts of recent extreme cold weather events on the electricity system, such as frozen equipment, natural gas delivery problems, frozen coal piles, etc, which are discussed later in the chapter.	Comment accepted and sentence modified.
Union of Concerned Scientists	Union of Concerned Scientists	143804	Figure	04. Energy	1	163				This figure could also acknowledge impacts of recent extreme cold weather events on the electricity system and increased competition and supply constraints for oil and natural gas for heating.	We appreciate this suggestion but space is limited.
Union of Concerned Scientists	Union of Concerned Scientists	143805	Text Region	04. Energy		163	163	6	13	This paragraph should acknowledge actions of deploying new innovative energy technologies that can both increase resilience and reduce emissions such as microgrids with wind, solar, biogas, storage and other low carbon technologies vs. focusing completely on hardening.	Comment accepted and sentence modified.
Union of Concerned Scientists	Union of Concerned Scientists	143806	Text Region	04. Energy		167	167	13	15	The report should mention exposure of substations to coastal flooding from storm surge and sea level rise as major concern for power outages. This report could also be referenced on the topic: McNamara, J., S. Clemmer, K. Dahl and E. Spanger-Siegfried. 2015. Lights Out? Storm Surge, Blackouts, and How Clean Energy Can Help. Cambridge MA: Union of Concerned Scientists. Online at: https://www.ucsusa.org/sites/default/files/attach/2015/10/lights-out-ful...	Comment accepted and sentence modified.
Union of Concerned Scientists	Union of Concerned Scientists	143807	Text Region	04. Energy		168	168	18	18	Heat outages could also be more destructive, cutting out cooling.	Comment accepted and sentence modified.
Union of Concerned Scientists	Union of Concerned Scientists	143808	Text Region	04. Energy		170	170	4	10	This paragraph should mention microgrids as a new technology that can help improve resilience and reduce outages, particularly for critical infrastructure.	We thank the reviewer fo the comment, and have adopted the suggestion.
Union of Concerned Scientists	Union of Concerned Scientists	143809	Text Region	04. Energy		171	171	5	5	It may be worth noting that islandable microgrids could help alleviate the escalation of outage impacts	Islandable microgrids are addressed in the chapter. No change to existing text.
Union of Concerned Scientists	Union of Concerned Scientists	143810	Text Region	04. Energy		171	171	18	20	Could add clause at the end of line 19 …."and technological measures to increase system flexibility." The report should acknowledge actions of deploying new innovative energy technologies that can both increase resilience and reduce emissions such as microgrids with wind, solar, biogas, storage and other low carbon technologies vs. focusing completely on hardening.	No change to existing text.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Union of Concerned Scientists	Union of Concerned Scientists	143811	Text Region	04. Energy		172	172	1	10	Should add Hurricane Maria to the list in line 2. Should also mention that many states impacted by Hurricane Sandy created resilience funds to invest in microgrids with solar, storage and other clean energy technologies for cricitical infrastructure as discussed in McNamara, J., S. Clemmer, K. Dahl and E. Spanger-Siegfried. 2015. Lights Out? Storm Surge, Blackouts, and How Clean Energy Can Help. Cambridge MA: Union of Concerned Scientists. Online at: https://www.ucsusa.org/sites/default/files/attach/2015/10/lights-out-ful…	Comments 81, 85, 87 touch on similar themes of broadening discussion beyond emphasis on infrastructure hardening including finance measures, storage, smart grids, and distributed generation. Suggested new language is tracked in attached revision on page 172 to place great emphasis on these points.
Union of Concerned Scientists	Union of Concerned Scientists	143812	Text Region	04. Energy		172	172	4	4	Would suggest changing to 8.7 million customers vs. households.	Comment accepted and text has been modified.
Union of Concerned Scientists	Union of Concerned Scientists	143813	Text Region	04. Energy		172	172	30	30	Add new paragraph that addresses grid resilience interventions that are not related to hardening. This should include reference to smart devices on the grid that enable more flexible control and limit the extent of an outage, such as synchrophasors and smart switches. Could also mention the option of retiring and relocating energy assets to locations that are less exposed to climate impacts.	Other comments touch on similar themes of broadening discussion beyond emphasis on infrastructure hardening including finance measures, storage, smart grids, and distributed generation. Suggested new language is tracked in attached revision on page 172 to place great emphasis on these points.
Lesley	Jantarasami	143870	Figure	04. Energy	4.1	167				Recognizing that there is not much room for additional text in the Hydropower (should be one word, not two) text box, could a bullet be added that acknowledges the potential for climate impacts to endangered species (e.g., salmon [discussed in Chapters 7 or 9]) to also result in changes to hydropower operations? There is a typo in the first bullet of the Pipelines text box. In the Wind and Solar text box, the first bullet mentions "changes in wind patterns and solar radiation" without a full explanation anywhere in the chapter about which aspects of climate change are being referred to. Are wind patterns referring to future projections related to storms? The phrasing implies that climate change is somehow changing solar radiation, but I don't think that's what the authors meant to say here. It may also be worth mentioning that there are likely to be important regional differences in how climate change affects wind and solar energy production.	Comment accepted and text and figure modified.
Carole	LeBlanc	143892	Whole Chapter	04. Energy						Referenced in chapter 15 and again in regional chapters 21 and 24, the role of gender is mentioned but not explained. Respectfully ask consideration of inserting language: In, Putting Women in Power: An Analysis of Enabling Factors for Increasing Women‰Ûªs Participation in the Clean Energy Sector of the Global North, Maggie Roth focuses on the disparate participation of women in the burgeoning fields of solar, wind, geothermal, hydropower, biofuels and ocean/tidal power in the developed countries of North America and Europe. This disparity may be due to factors such as a lack of requisite education, since data shows that while women compose 58% of college graduates, they represent only 4% of graduates in science, technology, engineering and math (STEM). The correlation between gender-sensitive energy policies in countries with a higher percentage of female STEM graduates is not straightforward, however. Besides clarifying the issues of education and policy, the paper recommends continued investment and research in clean energy as well as workplace flexibility, combating industry-based stereotypes, mentoring for leadership and training opportunities to further enable women‰Ûªs participation in the sector. Finally, Ms. Roth makes pointed recommendations for policymakers, women themselves, academia and corporations.	The authors believe this topic is out of scope for the chapterand is best addressed in the Mitigation and Adaptation Chapters
Lesley	Jantarasami	143900	Whole Chapter	04. Energy						Throughout the chapter and traceable accounts, the text differentiates between hydrological and agricultural drought, but doesn't really explain what the difference is for a lay audience.	Upon reflection it was determined that there was no need to distinguish between agricultural and hydrologic drought. Making the distictnion in would likely cause more confusion than clarity. The distinction in type of drought as it relates to the energy sector was determined to not be critical.
Lesley	Jantarasami	143917	Text Region	04. Energy		173	173	9	11	This is an important conclusory sentence for the chapter, and it would be helpful to unpack it a bit more or provide additional explanation to support the statement. For example, it's not really clear what the "several key barriers" are. Key Message 3 also indicates that "barriers remain" without identifying what those are. The reader is also left to wonder how much of the insufficiency of resilience actions are due to the rapid pace of change in the energy sector (e.g., from significant technology advancements in renewable energy, energy storage, and energy efficiency) vs. due to the pace of climate change. In addition, is it future projected climate changes that the chapter authors conclude the energy sector is not totally prepared for, or is it also current observed climate impacts?	Provided more detail on the barriers and the underlying factors driving those barriers.
Lesley	Jantarasami	143927	Traceable Account	04. Energy		175	175	29	31	Suggest separating this bullet into two because climate change-related wildfire impacts is a complex issue (see Forestry chapter) that is quite distinct from agricultural drought impacts on biofuels. The wildfire bullet should specify what the damage and risks are to the energy system from climate change-related wildfire impacts. If the authors decide to keep their current approach of providing likelihood and confidence statements for each specific climate projection, they should also provide one for wildfire impacts separately from biofuels.	Comment accepted and sentence modified.
Lesley	Jantarasami	143939	Traceable Account	04. Energy		174	180	33	19	The Traceable Accounts section could use a closer look and overall editing to bring it up to level of some of the other chapters. Within each Key Message, the traceable accounts subsections should build on one another to provide a cohesive narrative of the authors decision-making process. As written, none of the "Description of Confidence and Likelihood" sections provide clear explanations of why the scientific evidence outweighs the uncertainties and allows the authors to draw the conclusions they did regarding likelihood and confidence. In addition, under KM#1, it isn't clear if the likelihood and confidence statements for each specific climate projection in the "Description of Evidence" subsection are conclusions of the cited papers themselves, or if the authors are drawing their own likelihood and confidence conclusions for the individual projections. Generally, Traceable Accounts only use the likelihood and confidence language for the statements in the Key Messages for which the authors have surveyed the breadth of the literature. The description of the evidence generally focuses on how much evidence (and its quality) exists for each of the individual statements or conclusions within the key message (consider using the term "conclusions" rather than calling the key messages "claims" like on line 16 of page 175 or line 20 on page 176). It is the "Description of Confidence and Likelihood" section that should explain the rationale for why the authors feel confident in their key messages and/or feel that a particular projection is likely; this section should be based only on the language in the key message. For example, KM#1 makes a likelihood statement on page 177, lines 23-24, but the key message itself contains no likelihood. The Traceable Accounts should also not bring in new information that is not described in the body of the chapter; the authors should cross-reference the information and either add it into the the chapter text or delete it.	The authors appreciate the comment but in general believe that they have appropirate adopted and implemented the NCA4 guidance for developing the traceable accounts.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144222	Text Region	04. Energy		162	162	6	6	Regarding "affecting", since "affected" has already been used, how about changing this to "that can damage" , the form also changing as otherwise it would seem that there needs to be a comma there (i.e., reading: threatening Ìã, affecting Ìã, and creating) for a list instead of the phrase apparently being a type of consequence of "outages". In any case, I'd urge a bit of clarification.	The langauge was modified to address the comment.
Michael	MacCracken	144223	Text Region	04. Energy		162	162	10	11	In assessments, it is generally best not to use the word "may" as that can mean anything from a likelihood of 1 to 99%. Good practice is to choose words from the defined likelihood and confidence lexicon, so perhaps rephrase to something like: "While some of these changes are designed(and likely) to increase reliability and resilience, others are likely to create additional vulnerabilities."	Comment accepted and sentence modified.
Michael	MacCracken	144224	Text Region	04. Energy		162	162	15	15	I'd suggest changing "are more" to "are becoming more"	Comment accepted and sentence modified.
Michael	MacCracken	144225	Text Region	04. Energy		162	162	24	25	Not to mention just living life at home, shopping, computing, etc. I guess my sense is this listing is a bit limited with respect to people living their lives instead of just where their resources come from.	This comment does not appear to raise a question or suggest a revision.
Michael	MacCracken	144226	Text Region	04. Energy		162	162	30	30	Again, it would be best to scrub the text of "may"--here one could say "that are likely to affect" (so, more likely than not)	Comment accepted and text modified.
Michael	MacCracken	144227	Text Region	04. Energy		162	162	32	33	It seems to me it would be better to say something like "Low lying energy facilities and systems located near coasts and rivers are at elevated risk of flooding from sea level rise, more intense hurricanes, and extreme precipitation." So, add along rivers where flooding can occur. And the issue is facilities that are low lying.	Comment accepted and sentence modified.
Michael	MacCracken	144228	Text Region	04. Energy		162	162	34	34	AGAIN, I would urge scrubbing the chapter (entire report) of "may" and replace the word by options from the defined lexicon. I won't mention further occurrences, but a search and replace needs to be done for the who chapter (and report)	Comment accepted and entire text modified.
Michael	MacCracken	144229	Text Region	04. Energy		162	162	35	35	I'd suggest this will be the case not only in summer months, but also in the spring and fall--indeed, what is happening is a lengthening and intensification of the warm season and shortening of the cold season.	Comment accepted and sentence modified.
Michael	MacCracken	144230	Text Region	04. Energy		162	162	35	36	It might be worth mentioning that precipitation and evaporation changes are likely in many reasons to reduce river flows and other water resources available for cooling of the power plants--so not just their efficiency--and this will apply to nuclear facilities as well (availability of water for cooling is going to be going down)	Comment accepted and sentence modified.
Michael	MacCracken	144231	Text Region	04. Energy		162	162	36	36	Need to insert a verb, so "decrease efficiency of the transmission grid"	Comment accepted and sentence modified.
Michael	MacCracken	144232	Text Region	04. Energy		163	163	1	1	Can delete "portion of the"	Comment accepted and sentence modified.
Michael	MacCracken	144233	Text Region	04. Energy		163	163	2	2	"affect" is a pretty non-descriptive word--how about saying something like "will limit" or "will reduce"	Comment accepted and sentence modified.
Michael	MacCracken	144234	Text Region	04. Energy		163	163	4	4	Correct spelling to "drier"--here again, use of "may" is just uninformative--here could probably say "will" or "will very likely"	Comment accepted and sentence modified.
Michael	MacCracken	144235	Text Region	04. Energy		163	163	7	7	I'd suggest saying "are starting to take" as there is clearly a lot more to be done.	While the authors believe more resilience actions are needed, they also agree that activity have been underway for some time, and isnt just starting as the comment would suggest.
Michael	MacCracken	144236	Figure	04. Energy	1	163				I'd suggest another reason for additional energy demand will be for transportation (electric cars, buses, etc.). Under Pipelines, change "undermines" to "undermine" (also in this box, it might be said electricity for pumps can be cut off. The first bullet under Thermoelectric is primarily tied to Oil/Gas/Coal, which is not really obvious.	Comment accepted and sentence modified.
Michael	MacCracken	144237	Text Region	04. Energy		165	165	18	20	I'd suggest that an additional vulnerability is along rivers, especially as major precipitation systems run up against the mountains and unload lots of water. Indeed, a large fraction of the deaths and damage from hurricanes are in these regions, so saying just coastal regions is too limited and misleading.	Comment accepted and sentence modified.
Michael	MacCracken	144238	Text Region	04. Energy		165	165	27	28	The problem is that the increased open water times are often during the late fall to early spring when there can be lots of storm activity stirring up large waves. Indeed, the retreat of sea ice is allowing winds to stir up waves and enhance coastal erosion. In addition, with partial sea ice cover, the wind can move large sheets of sea ice around that can disrupt oil platform and other operations--indeed, this is why Russian is, as I understand it, thinking it will be needing to have icebreakers around platforms to protect them from such wind-blown sea ice. I'd suggest at least indicating that there are also complications that can arise (even ignoring the consequences of methane leaking upward from the sediments, etc.).	We appreciate this suggestion, but we also recognize that while there are always challenges to any production/transportation activity, evidence is clear that as the Arctic ice cap retreats, shipping lanes are opening that rival, or at least complement, conventional routes during summer months.
Michael	MacCracken	144239	Text Region	04. Energy		165	165	30	31	It is not just temperature that is rising--so is absolute humidity, and it takes something like 20 times as much energy to cool moist air a degree as to cool dry air--so the energy demand is going to go up disproportionately as the wet bulb temperature rises. Taking actions to seal buildings and keep down interior moisture sources is going to become more and more important. In addition, the air conditioning need is going to not just be during the summer--the warm season will be getting longer and longer as the cold season shrinks. So, saying just summer months is too narrow.	The comment (e.g. reference to summer months) is accepted and the sentence modified.
Michael	MacCracken	144240	Text Region	04. Energy		165	165	31	33	Actually, an interesting influence will be that the length and intensity of the heating season will tend to shrink--and since a lot of home heating is by natural gas (or other liquid or gaseous fossil fuels), it would seem that CO2 emissions might slowly drop (though of course population is growing).	This comment does not appear to raise a question or suggest a revision.
Michael	MacCracken	144241	Text Region	04. Energy		165	165	33	35	It might help to say that combustion efficiency goes down due to warmer air being less dense--help the reader understand why. And could explain transmission problems in warmer weather--lines sagging, and so on.	Comment accepted and sentence modified.
Michael	MacCracken	144242	Text Region	04. Energy		166	166	5	5	Again, would be good practice to reword to get rid of "may"	Comment accepted and sentence modified.
Michael	MacCracken	144243	Text Region	04. Energy		166	166	13	15	Don't you need to say it is increasing occurrence and intensity of extreme weather that is the principal contributor--or is the increase occurring because there is just more stuff out there that is vulnerable to extreme weather (and if so, why is it not being built to be more resilient than the earlier built infrastructure)? In addition, it would be clearer if phrases of sentence were reversed.	Comment accepted and sentence modified.
Michael	MacCracken	144244	Text Region	04. Energy		166	166	17	17	My understanding is that the wind systems in Texas survived the recent hurricane better than the existing fossil energy systems--so why are renewable resources being highlighted here ahead of fossil systems, or at all? Indeed, reading the whole paragraph, most of the examples apply to fossil fuel facilities and not renewables, so why are renewables highlighted as problematic?	Comment accepted and sentence modified.
Michael	MacCracken	144245	Text Region	04. Energy		166	166	23	23	Which is a good reason to go to underground high-voltage/direct current cable system for long distance transmission of electricity (just as is done for pipelines).	This comment does not appear to raise a question or suggest a revision.
Michael	MacCracken	144246	Figure	04. Energy	1	167				Is figure going to appear twice? See my comments on same figure on earlier page.	By design, each chapter has an Executive Summary that summarizes the whole chapter by pulling text from the underlying chapter.
Michael	MacCracken	144247	Text Region	04. Energy		168	168	6	7	Of course, if sea level rise is as much as indicated, the demand will be down a lot as many people will have evacuated.	This comment does not appear to raise a question or suggest a revision.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144248	Text Region	04. Energy		168	168	3	4	Somewhere here, it needs to be mentioned that sea level rise can extend way inland due to the small grade of many rivers--and that could have effects on power plants that are way inland (think the Chesapeake Bay system, Hudson River, and many other rivers crossing the coastal plains.	The following language addresses the comment: "Low lying energy facilities and systems located along inland waters or near the coasts are at elevated risk of flooding from more intense precipitation, rising sea levels and more intense hurricanes."
Michael	MacCracken	144249	Text Region	04. Energy		168	168	16	17	To get rid of "may" here, could change sentence to say, in effect, something like 'Unless [this or that action is taken], more frequent ìä events are likely to make ìä' Providing such extra information really has the potential to be helpful to the reader. So getting rid of "may" can be done in ways that also provide more information and use the lexicon, etc. Sentence from lines 21 to 24 could also be rewritten to get rid of "may" in a similar way. [Just a note that all this focus on scrubbing "may" is a result of how well-known columnist David Ignatius misinterpreted text in a draft version of the first national assessment, making the consequences seem much worse than was intended; others reading "may" have in past said that well then the result "may not" happen and thought an item not worth mentioning. Avoiding these problems is why the likelihood and confidence lexicons were developed, and though it takes a bit more effort to consider phrasing of the sentences, it can be worth doing to avoid confusion and explanation later that can take a lot more time.]	We thank the reviewer for the suggestions and have reworded the sentence in line with suggestions.
Michael	MacCracken	144250	Text Region	04. Energy		169	169	2	2	Here "may" can simply be changed to "is likely to" and be perfectly fine.	We appreciate the reviewer's suggested wording change and have adopted a similar change which we feel best conveys the meaning.
Michael	MacCracken	144251	Text Region	04. Energy		169	169	11	12	Here "may" can simply be changed to "would likely" and be perfectly fine and on next line just drop "may have to" as not necessary.	We appreciate the reviewer's suggested wording change and have adopted a similar change which we feel best conveys the meaning.
Michael	MacCracken	144252	Text Region	04. Energy		169	169	21	22	In both places "may" could be change to "are likely to"	We appreciate the reviewer's suggested wording change and have adopted a similar change which we feel best conveys the meaning.
Michael	MacCracken	144253	Text Region	04. Energy		169	169	28	28	Another "may" to change	We appreciate the reviewer's suggested wording change and have adopted a similar change which we feel best conveys the meaning.
Michael	MacCracken	144254	Text Region	04. Energy		169	169	35	35	Here "may" could be change to "but also have the potential to affect" and then at the sentence add a phrase "unless [examples of actions] are taken."	We appreciate the reviewer's suggested wording change and have adopted a similar change which we feel best conveys the meaning.
Michael	MacCracken	144255	Text Region	04. Energy		169	169	36	36	Here "may improve" could just be "generally improves" or something similar (indeed, subsequent sentences give examples of things that can be effective and are being done).	We appreciate the reviewer's suggested wording change and have adopted a similar change which we feel best conveys the meaning.
Michael	MacCracken	144256	Figure	04. Energy	2	170				In a report such as this, a bit strange to have a figure that does not give any indication of energy sources other than fossil fuels. I would urge also noting that electricity is needed for generating Petroleum (refining, etc.)	We thank the reviewers for noting the perceived inbalance and we have adjusted the figure to better portray the intended meaning.
Michael	MacCracken	144257	Text Region	04. Energy		170	170	14	14	Here "may" really could well be "will"--is there any question about this? So, for reader, if now "may" means "will" they might well interpret the word that way elsewhere, which I don't think is intended.	We thank the reviewer fo the comment, and have adopted the suggestion.
Michael	MacCracken	144258	Text Region	04. Energy		171	171	2	2	Here "may result" would better be something like "contributes to"--it has to, someone has to pay the cost of this.	Accept suggested edit to change language to "contribute to".
Michael	MacCracken	144259	Text Region	04. Energy		171	171	6	7	Here sentence might be "Unless care is taken [maybe also mention some steps to take], a more automated grid has the potential to increase ìä " This is actually a key point to make--Bill Hooke of AMS gives as an example of how going to sewage treatment plants along rivers that can flood increases vulnerability for flooding can take down sanitation system for a whole city, whereas previously the vulnerability was just to a few outhouses. So, yes, what can seem like a major improvement can lead to much bigger, widespread, and long-lasting impacts if it goes down. Same thing in stock market if invest in one stock instead of diversify. I'd suggest it might be worth devoting a couple of sentences or paragraph to this issue.	Proposed language tracked in the revised draft to address this point around unanticipated impacts of measures.
Michael	MacCracken	144260	Text Region	04. Energy		176	176	35	35	The phrase "less certain" implies that there are degrees to the word "certain" and this really makes no sense. One can have degrees of confidence and of uncertainty, but not certainty. Regarding "However, … certain", it could be changed to something like "However, confidence is generally lower for other climate parameters derived from model-based climate change projections," So, just as good practice requires scrubbing the word "may", good practice does not introduce degrees of certainty--or what does certainty mean?	Comment accepted and sentence modified.
Michael	MacCracken	144261	Text Region	04. Energy		174	180	1	19	Only skimmed, assuming points made on main text will be carried over. Now, on to review another chapter.	This comment does not appear to raise a question or suggest a revision.
Kathryn	Hatcher	144770	Traceable Account	04. Energy		177	177	27	34	Check author guidance for Traceable Accounts to see if it is acceptable to put a likelihood statement on a sentence that is not a projection of future impacts. Generally it doesn't really make sense to do this for a sentence in the present tense ("are affecting"). Also, please double check that this key message matches the chapter text - it does not appear to be verbatim since "there is strong evidence" was dropped.	We thank the reviewer for the comment. The requested consistency check and revisions have been made.
Angelica	Marchi	144772	Traceable Account	04. Energy		178	178	29	31	This is great information, but check that the chapter text itself actually discusses multiple benefits (and add if it doesn't). Microgrids, etc. are discussed in the text box as examples of hardening, but there really isn't much discussion of multiple benefits. The Traceable Accounts should not bring in new information that is not described in the body of the chapter.	We thank the reviewer for these comments. The body of the chapter has been revised to include the "multiple benefits" content from the traceable accounts, with "microgrids" having been added in response to another comment.
Lesley	Jantarasami	144773	Traceable Account	04. Energy		179	179	18	21	This is great information, but check that the chapter text itself actually discusses this growing constituency (and add if it doesn't). The Traceable Accounts should not bring in new information that is not described in the body of the chapter.	The following sentence was added to the text in the chapter (Page 171 after line 37): 'Municipal, states, and tribal communities are also addressing climate change-related risks (DOE 2015a; 2015d) as in the case of the Rockefeller Foundation's 100 Resilient Cities and C40 Cities that is empowering communities to collaborate, share knowledge, and drive meaningful, measurable, and sustainable action on resilience (Rockefeller Foundation 2017, C40 Cities, 2017)."
Alessandra	Jerolleman	144775	Traceable Account	04. Energy		180	180	5	7	This is great information, but check that the chapter text itself actually discusses uncertainty about the rate of GHG stabilization. If it doesn't, this should absolutely be added to the chapter. The Traceable Accounts should not bring in new information that is not described in the body of the chapter.	The following sentences were added to the text at page 173 line 11: "Impediments to such action include the lack of a clear mitigation strategy, and where mitigation measures are pursued uncertainty concerning their effectiveness and thus knowing the magnitude and timing of additional resilience investments. "
Lesley	Jantarasami	144776	Traceable Account	04. Energy		180	180	16	18	This sentence says the authors have very high confidence in their conclusion about insufficiency, yet this is not actually part of Key Message 3. Consider adding this point to the KM, as it seems like an important conclusion soundly based in the literature cited by the authors.	Comment accepted and sentence modified.
Christen	Armstrong	141024	Whole Chapter	06. Forests						My report on the Amazon rain-forest devastation is done with extensive peer review and will be published soon. In my report I prove these things: The oceans are not a sink for carbon dioxide. The rain-forest burning the biomass waste from 2 billion acres since 1950 is responsible for 40 to 60 ppm of the carbon dioxide rise 1950. If we stop this and delay the burning for 10 years then the rain-forest will heal and the ppm level will go down. Also we need to plant 100 million native trees and shrubs in 2018 and this will help bring it down in 10 years. We have worked long enough to limit the production side of carbon dioxide and now we need to fix the consumption side.	This comment does not appear to raise a question or suggest a revision.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Louis	Iverson	141556	Text Region	06. Forests		223		2		Be clear on whether Alaska is included - numbers don't match total acres in some accounts.	This point was clarified as suggested.
Louis	Iverson	141557	Text Region	06. Forests		223		15		add 2017 data?	The 2017 data are not yet official, but could perhaps be added at a later date.
Louis	Iverson	141558	Text Region	06. Forests		226		8		"human-ignited wildfire is expected to decrease slightly" A possible reason for this projection would be great, as it doesn't seem logical with increasing human pressures.	We appreciate the review comment, and have added some additional text to clarify the statement.
Sally	Sims	141560	Text Region	06. Forests		231		7		as pertaining to the no evidence for tree shifts latitudinally, please check out the 2016 Wiens publication, and quoted in the Ecosystems chapter "Over half of terrestrial plant and animal species studied in temperate North America have either reduced their range at lower latitudes and elevations or expanded at higher latitudes and elevations (Wiens 2016)." Wiens, J. J. 2016. Climate-related local extinctions are already widespread among plant and 30 animal species. PLoS biology 14:e2001104.	We revised the text to note that while some studies have noted changes in ranges of terrestrial plant species in general, evidence that the ranges of tree species have changed is limited.
David	Wojick	141619	Text Region	06. Forests		227	227	3	5	Here is the text: 3 Key Message 1: It is highly likely that more frequent extreme weather events will increase the 4 frequency and magnitude of severe ecological disturbances, driving rapid (months to years) 5 and often persistent changes in forest structure and function across large landscapes. Comment: This text falsely states as "highly likely" what is in fact mere speculation based on questionable computer modeling. That extreme weather events will become more frequent has yet to be established. The climate models being used are far to sensitive to human emissions, especially to CO2. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	We appreciate the review comment, but are confident in our inferences based on the scientific literature, and have not significantly altered Key Message 1. As a highly influential scientific assessment (HISA), NCA is developed in compliance with IQA guidance issued by NOAA as the report's Administrative Lead Agency. K41
David	Wojick	141620	Text Region	06. Forests		227	227	5	8	Here is the text: 5 It is 6 also likely that other changes, resulting from gradual climate change and less severe 7 disturbances, will alter forest productivity, health, and the distribution and abundance of 8 species at longer time scales (decades to centuries). Comment: This text falsely states as "likely" what is in fact mere speculation based on questionable computer modeling. That these adverse impacts from climate change are likely has yet to be established and they may well never occur.	We appreciate the review comment, but are confident in our inferences based on the scientific literature, and have not significantly altered this portion of the text. K41See the Climate Science Special Report for detailed information.
David	Wojick	141621	Text Region	06. Forests		231	231	10	11	Here is the text: 10 Key Message 2: It is highly likely that climate change will mostly decrease the ability of forest 11 ecosystems to provide ecosystem services to society. Comment: This text falsely states as "highly likely" what is in fact mere speculation based on questionable computer modeling. Moreover, the claim is extremely vague and is not explained.	See the Climate Science Special Report for detailed information.
David	Wojick	141622	Text Region	06. Forests		231	231	11	13	Here is the text: 11 Tree growth and carbon storage are 12 expected to decrease in most locations as a result of higher temperature, more frequent 13 drought, and increased disturbances. Comment: the expectation stated is mere speculation, based mostly on questionable computer modeling that is far too sensitive to human CO2 emissions.	See the Climate Science Special Report for detailed information.
Dave	White	141953	Whole Chapter	06. Forests						The amazon rain forest devastation is the cause of 50 ppm of the recent atmospheric CO2 rise. My report on that has been scientifically peer reviewed. Also I am invited as an oral speaker at the 2018 Climate Conference in May because of the truth in my paper. If we plant trees and shrubs by my all government policy we will increase CO2 consumption by 2-3 billion tons of CO2 annually. My site is cctruth.org	This comment does not appear to raise a question or suggest a revision.
Rachel	Gregg	142436	Text Region	06. Forests		236	236	20	23	The phrasing is backward. Lower prices results in lower timer product output, which results in fewer opportunities to sell at a profit.	The referenced text is correct. We believe that the reviewer may misunderstand something about the text or about how markets work. An additional sentence was added to increase understanding.
Rachel	Gregg	142437	Text Region	06. Forests		223	223	32	34	This sentence as written is difficult to understand. Please rewrite.	This sentence was made more specific by referring to *forest* ecosystem services.
Juanita	Constible	142466	Whole Chapter	06. Forests						The Forests chapter does a good job at updating the general knowledge base around the impact of climate change on U.S. forests across numerous regions and ecosystems. It is clear from the chapter that though much has been learned about U.S. forests' response to a changing climate, there is still much to be learned as species adapt or fail to adapt to rising temperatures and changing weather patterns. In general, examples were illustrative and the science was appropriately characterized and summarized.	We greatly appreciate the reviewer's comment.
Juanita	Constible	142467	Whole Chapter	06. Forests						The Forests chapter would benefit from greater use of specific examples in the text (as opposed to the use of case studies) following conclusory statements about impacts throughout the chapter. The net take-away from the current text is that climate change is impacting our forests in a number of very significant ways, but these impacts are not presented at a scale that will allow readers to fully understand what they might look like in their regions or ecosystems.	We have made an effort to provide greater specifity and more examples throughout the revised text.
Juanita	Constible	142468	Text Region	06. Forests		222	222	2	3	The sentence should contain a more complete presentation of the differing views among scientists as to the CO2 uptake of aging forests vs. young, juvenile, and mature forests, and including the important role of aging forests in keeping soil carbon pools in the soil.	We appreciate this review comment, but emphasize that the sentence refers only to *rates of carbon uptake* , not carbon storage. Older trees may or may not have net gain in carbon uptake, but there is no question that the rate declines over time.
Juanita	Constible	142469	Figure	06. Forests	5	222				Adaptation options presented for responding to drought, etc. could be construed as favoring a plantation-based management regime that could undermine forest resilience. Figures and any text discussing adaption to these vulnerabilities must acknowledge that maintaining species diversity among individual stands is a critical component to forest resilience, while prioritizing certain species over others and creating non-diverse stands has often been found to reduce forest resilience.	We do not feel that Figure 6.1 communicates what the reviewer suggests. It simply that some well-documented options that have been shown to increase resilience to disturbance and would also be effective for climate change (which includes more fire). Nothing is mentioned about "creating non-diverse stands". No change was made.
Juanita	Constible	142470	Text Region	06. Forests		233	233	6	8	The sentence should contain a more complete presentation of the differing views among scientists as to the CO2 uptake of aging forests vs. young, juvenile, and mature forests, and including the important role aging forests play in keeping soil carbon pools in the soil.	This portion of the discussion was revised considerably to improve accuracy and clarity regarding carbon issues.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142471	Text Region	06. Forests		233	233	13	21	This paragraph discussing the carbon balance dynamics of harvested wood products fails to present the complexity of this issue and the high level of uncertainty that remains regarding the presumed global carbon pool created by wood products in use. Citation to a single source, now six years old, is also problematic, as this area has received significant study in the intervening years. The paragraph can also be read as making a casual policy recommendation--"Maintaining the net global surplus of wood products depends on a sustained or increasing rate of harvest removals"--without presenting a counterpoint (i.e., that such increases in removals could have the consequence of increased stress on forests that are already contending with the impacts of climate change discussed in this chapter). Further, this paragraph should be revised for clarity. It is currently difficult to discern whether certain conclusory statements have to do with carbon balance issues (likely) or simply with wood product use (unlikely).	This portion of the discussion was revised considerably to improve accuracy and clarity regarding carbon issues. The literature citations are highly relevant and accurately reflect the state of science.
Juanita	Constible	142472	Figure	06. Forests	5	235				Adaptation options presented for responding to drought, etc. could be construed as favoring a plantation-based management regime that could undermine forest resilience. Figures and any text discussing adaption to these vulnerabilities must acknowledge that maintaining species diversity among individual stands is a critical component to forest resilience, while prioritizing certain species over others and creating non-diverse stands has often been fount to reduce forest resilience.	This portion of the chapter contains no implication regarding forest plantations or any specific silvicultural regime. We simply cite adaptation options that are cited in the scientific literature and being applied on forest lands.
Juanita	Constible	142473	Text Region	06. Forests		235	235	22	29	The discussion of current practices that are deemed "climate-smart" would benefit from an examination of the literature that may find these practices to be harmful. Of particular concern is "stand density management," which this paragraph suggests may be used to justify "greater reductions in stand density." While this practice may indeed help a stand become more resilient to fire, insects, and drought, it is not clear that such a practice would lead to a net ecosystem benefit. Clarity as to this tradeoff would make policy recommendations of this sort stronger.	This comment is inconsistent with the author team's thorough assessment of the science. Consistent with its Congressional mandate, this assessment is a technical report and does not include policy discussions of climate mitigation or adaptation.
Juanita	Constible	142474	Text Region	06. Forests		236	236	4	7	This sentence reads as an endorsement of plantation management regimes. These regimes are highly contentious and are typically accompanied by significant to severe environmental consequences. While the statement here is true, the context in which it is presented makes it read like an endorsement by the authors. If this is the case, it is highly recommended that literature on the benefits and the harms of plantation-based forest management be included in the chapter.	We believe that this sentence is true and well-supported by scientific literature and management practice. No endorsement is provided -- consistent with its Congressional mandate, this assessment is a technical report and does not include policy discussions of climate mitigation or adaptation.
Juanita	Constible	142475	Text Region	06. Forests		240	240	2	11	The presentation of uncertainties here can be read to undermine "Key Message 1" in a way that brings the confidence levels presented into question. While the uncertainties presented are important to note, it seems that they should be presented in terms of their overall impact on the broad conclusions drawn instead of as a 1:1 comparison between findings and uncertainties (which seems inaccurate).	We appreciate the review comments, and have revised the language slightly to ensure consistency with the key message.
Juanita	Constible	142476	Text Region	06. Forests		243	243	22	28	The presentation of uncertainties here can be read, through the lens of a policymaker, to justify inaction. If the authors view management for climate adaptation as important, it should be made more clear to what extent there is confidence that certain adaptation measures should be taken where possible.	We appreciate the review comments, and have revised the language slightly to ensure consistency with the key message.
Mikko	McFeely	142843	Text Region	06. Forests		221	221	24	26	Tree mortality is cited as an example of a large scale major disturbance, but there is no information to put this into a landscape or historical context (i.e., is this abnormal? If so, how abnormal?). Suggest including proportion of landscape that was affected by tree mortality or how out of NRV these numbers are relative to historic mortality rates.	We agree that additional context would be helpful, and have added two sentences to clarity the historical context for insects and wildfire
Mikko	McFeely	142844	Text Region	06. Forests		221	221	27	28	Differences in effects are noted between water limited and energy limited forests, but no definition or examples of different forest types that fit into these categories is provided. A map or more detail on how these forest classifications are geographically distributed would be helpful.	We appreciate this review comment and have added some examples to clarify the discussion.
Mikko	McFeely	142845	Text Region	06. Forests		221	222	33	3	There is no explicit mention of the value for forests as provisioning water for municipal water supplies, yet this is a very important provision that humans depend on (e.g., from USFS website, USFS forestlands are the largest source of municipal water supplies in the Nation). Suggest including explicit reference to this.	We appreciate this review comment and have added a specific mention of the importance of water supply.
Mikko	McFeely	142846	Text Region	06. Forests		221	222	19	16	The summary does not mention variation of climate change impacts on different forest types or regions and the resulting variation in impacts to ecosystem services. Not all regions and forest types will experience the same or equal changes resulting from climate change. While this may seem obvious, it's important to acknowledge that any broad nation wide generalization will not apply in all places or systems. Also, a brrief description of the variation in vulnerability (and factors that may contribute to vulnerability) of different geographies or forest types would also be helpful to include.	We agree that some clarification is needed on this topic, and have added some discussion that addresses variation in response to climate change, plus an example. We have included a parenthetical to Regional chapters where more detail is available.
Mikko	McFeely	142847	Text Region	06. Forests		223	223	1	1	Why is the term Forest Sector used rather than forests? Sector often refers to an economic group, but the section is primarily focused on the status of forests, not the economic output of a forest based economy.	Sector is a standard term used in the National Climate Assessment to refer to the broad spectrum of topics related to forests. It does not imply anything about economic issues.
Mikko	McFeely	142848	Text Region	06. Forests		223	226	1	21	The case studies provide good examples of specific changes in disturbance that are possible in some areas. However, changes in disturbance will vary, both in type and in magnitude, with variations in regional biophysical conditions and forest type. there is currently no explicit discussion of this variation in this section. I suggest including additional discussion on factors that may influence variation in climate change impacts across the nation's forests and if (and why) any regions or forest types may be expected to be more or less vulnerable than others.	We agree that some clarification is needed on this topic, and have added some discussion that addresses variation in response to climate change, plus an example (see response to comment #142846).
Mikko	McFeely	142849	Text Region	06. Forests		228	228	11	12	Figure 6.3 may show that while the proportion of acres in low, mod, high burn severity classes has not changed much over time, the total number of acres in high and moderate severity burn has increased (along with total acres burned). It seems this has to have some impact on ecosystems. The sentence that currently references Figure 6.3 does not address this. Recommend adding discussion on possible ecosystem implications resulting from a greater total amount of high and moderate severity burned acres.	We appreciate the review comment, and have added some additional text and literature citations in the Figure 6.3 caption in order to clarify issues regarding area burned and fire severity.
Mikko	McFeely	142850	Text Region	06. Forests		228	228	12	14	This sentence is misleading. It indicates that a fuel break is only one scenario for post fire. In some cases, reburn risk may increase. Suggest acknowledging potential for reburn as well as fuel break creation in a post fire landscape.	We specifically used the term "may" to imply that multiple outcomes are possible with respect to post-fire fuel breaks. No change was made.
Mikko	McFeely	142851	Text Region	06. Forests		230	230	17	26	There is no mention on changes in phenology (e.g,. Chilling requirements for bud burst) that may also be affected by warming temperatures. This could also greatly alter forest composition and function. Discussion seems very limited in scope, only mentioning reductions in growth and prodcutivity. Recommend broadening discussion of potential forest changes in structure and composition resulting from climate change.	The topic of phenology is mentioned in the very next paragraph. We added structure and fucntion of forests to the list of things that may be affected by climate change.
Mikko	McFeely	142852	Text Region	06. Forests		232	232	1	5	Figure shows disturbance agents across nation. However, it is cited in text as an example of how changes in disturbance will result in changes to carbon storage. The figure does not illustrate this point well. Suggest providing additional detail and specific examples about how different disturbances can alter carbon storage.	We appreciate the review comment, and have added some discussion to provide a clearer connection between disturbance, as illustrated in the figure, and carbon dynamics.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	142853	Text Region	06. Forests		234	234	5	6	This is not a universally true statement. See 2013 Lundquist et al (Lower forest density enhances snow retention in regions with warmer winters.) Suggest modifying statement to either more specifically clarify the point being made or include exceptions to the generalized statement.	This portion of the discussion was revised considerably to improve accuracy and clarity regarding forest density, snow, and water.
Mikko	McFeely	142854	Text Region	06. Forests		235	236	16	2	Paragraph implies that active forest management tools are the only strategies available for climate mitigation and adaptation. While needed in many places, active forest management tools are not always applicable or appropriate. Protection of intact forest ecosystems (i.e., limiting development and harvest) is also a valid and important tool for maintaining resilience in forest ecosystems in many places. Recommend including forest protection as a strategy for maintaining forest resistance and resilience.	We do not feel that this section implies that active management are the only appropriate tools -- we simply mention them as commonly used, well documented, and effective approaches. We agree with the reviewer that in many areas, management may not be possible or desirable. For example, forest thinning requires cost-effective access (which may be limited in remote locations) as well as markets to sell the thinned products for commercial thinning operations.
Mikko	McFeely	142855	Text Region	06. Forests		243	243	7	14	This paragraph is not applicable to all forest types and language needs to be added to clarify when and where, and in what forest types, such actions may be appropriate. For example, in old growth PNW western Cascade and coastal forests, there is no evidence that density management or prescribed burning would be useful tools for reducing future risks from wildfire or insects. Using such tools to effectively reduce these disturbance risk in this forest type would fundamentally change the natural forest structure and function that provide many of the ecosystem services generated by these forests.	We appreciate the review comments, and have revised the text in recognition of different practices being appropriate in different forest types.
Mikko	McFeely	142856	Text Region	06. Forests		228	228	14	16	The text in this section is critically important for the whole chapter in emphasizing how impacts to forests will be diverse and varied. It is important to acknolwedge local forest conditions in influencing how climate change could affect wildfire or disturbance risk. Suggest highlighting this sentence in the executive summary of the chapter to emphasize the point.	We revised the text to acknowledge that responses will be varied and diverse.
Mikko	McFeely	142857	Text Region	06. Forests		233	233	22	22	This section of text should start by describing why water resources from forests are important and what users rely on them. Suggest starting the Water Resource text with the following sentence: Forested watersheds provide critical water resources for multiple purposes, including municipal water supplies, agriculture and irrigation, tribal resources, and in stream flows for endangered species and ecosystem health.	This was revised to provide greater emphasis on the value of water supplies, as suggested.
Mikko	McFeely	142858	Text Region	06. Forests		235	235	17	18	This text should acknowledge the heterogeneity in forest types, and therefore impacts. Suggest changing text to: …understanding of the effects of climate change on different types of forests…	Revised as suggested.
Mikko	McFeely	142859	Text Region	06. Forests		228	228	16	20	Prescribed burning may be a perfectly acceptable tool in some fire prone systems, but it is not something that should be considered a universal tool for reducing fire risk in all forest types (i.e., it is generally not an appropriate tool in the western Cascade and coastal forests of the PNW). Please use language to clarify that certain tools should be used only where they are ecologically appropriate.	We appreciate the review comment, and have revised this portion of the text to improve clarity and ensure the focus is on Southern forests in this case.
Mikko	McFeely	142860	Text Region	06. Forests		230	230	7	15	This paragraph oversimplifies our understanding of interaction of disturbance agents, particularly insects and fire, and perpetuates misconceptions and overly applied generalizations. Please cite Miegs et al (2015) results (Thus, although both bark beetles and defoliators alter fuels and associated fire potential, the windows of opportunity for increased or decreased fire likelihood are too narrow or the phenomena themselves too rare for a consistent signal to emerge across PNW conifer forests) as an example of the complexity and variation of disturbance interactions.	This section was revised considerably to improve accuracy and clarity; however, the appropriate references for the revised text did not include the Miegs reference.
Social Science	Coordinating Committee	143215	Whole Chapter	06. Forests						The chapter as a whole goes into great detail about forest ecosystem dynamics, but treats society largely as a black box. E.g. 'ecosystem services are provided to society'. 'adaptation depends on social and economic conditions'. It would be helpful to unpack these general statements with respect to forest-society interactions, on which there is a broad literature. Forest dependent communities, outdoor recreationists, small woodlot owners, and larger forestry operations may have different climate change impacts, values towards forests, and adaptation actions.	We appreciate the review comment, and we have tried to provide at least an overview of these issues. This topic is addressed in much greater detail in the Regional chapters of the report.
Social Science	Coordinating Committee	143216	Text Region	06. Forests		230	231	17	18	Please highlight specifically potential impacts of climate change on below-ground forest biomass and ecosystems. What are implications of below-ground ecosystem changes for overall forest health? E.g. mycorrhizae and nutrient cycling.	Belowground effects are potentially important, but the current state of science is not sufficiently substantive to support definitive statements about the effects of climate change.
Carole	LeBlanc	143385	Whole Chapter	06. Forests						Additional language for your consideration: Sustainable Forestry Initiative Certification (SFI) and Carbon Markets‰ÛÒOpportunities and Barriers for SFI Program Participants in Maine, by Alison Truesdale, details the study of Maine‰Ûªs SFI-certified landowners‰Ûª participation in carbon credit programs. The study is the result of collaboration between Maine‰Ûªs Implementation Committee of the SFI and Keeping Maine‰Ûªs Forests (KMF). California has the dominant cap-and-trade carbon credit market in North America, paying the highest prices for forestry projects that offset carbon emissions from the state‰Ûªs industries. Upon surveying the nine SFI participants in Maine, a heavily forested state, seven responded and reported to KMF that they had considered getting carbon credits through the California market, but had presently decided against it. Factors influencing their decision included costs, risks and the 100-year commitment required by carbon projects as not worthwhile at current credit prices. In particular, regulatory ambiguity of covered insured losses with regard to spruce budworm infestation, expected to occur in Maine two to three times within 100 years, may be too risky for current and prospective program participants.	This comment does not appear to raise a question or suggest a revision.
Aimee	Delach	143596	Whole Chapter	06. Forests						Similarly, the ‰ÛÏForests‰Û chapter, while providing a comprehensive overview of the various impacts of climate factors on forest systems, communities at the urban-wildlife interface, and ecosystem services, little attention is given to the effects on forest-dependent wildlife. For species that are dependent upon vulnerable and irreplaceable forest types like old growth fir (e.g., spotted owl), require a complex mix of seral stages (e.g., Canada lynx), or have obligate relationships with certain tree species/communities that are themselves threatened by climate change (e.g., species that depend on whitebark pine seeds), climate change poses a significant threat to their future. These effects should be explored more fully. The ‰ÛÏCoasta‰Û chapter also primarily focuses on impacts to the human environment in coastal regions; we did however appreciate the attention given to nature-based climate change adaptation in this chapter.	The review comment is correct that we generally do not address animal species, although we do mention habitat (for plants and animals) and added an example in the Traceable Accounts. Most information on animals is included in the Ecosystems, Ecosystem Services, and Biodiversity chapter and Regional chapters.
Shaye	Wolf	143659	Whole Chapter	06. Forests						The Chapter authors must ensure that the statements are supported by the referenced citations, since this often is not the case, and ensure that this review does not leave out key studies and concepts, for example, managed wildfire, defensible space, and restoration of ecological disturbance regimes as adaptation options. The Chapter authors should also be aware that they use ‰ÛÏfuels‰Û on numerous occasions to describe key forest ecosystem components like downed woody debris, understory plants, and trees. However, these ecosystem components are more than just potential ‰ÛÏfuels‰Û for wildfire. They provide essential functions such as habitat, carbon cycling, and water storage, and it is misleading to talk about trees and other forest vegetation only as ‰ÛÏfuels.‰Û	We feel that the chapter provides a well-rounded discussion of the different components and values of forest ecosystems from multiple perspectives. It is appropriate to refer to vegetation components as fuels when discussing fire issues.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Shaye	Wolf	143661	Whole Chapter	06. Forests						Natural disturbance processes are important for forest ecosystem health and must be placed in context. A Key Message of the chapter is that ‰ÛÏsevere ecological disturbances‰Û‰ÛÒ specifically, wildfire and insect outbreaks -- will increase in frequency and magnitude, and pose risks to forest health and condition. However, the chapter should put current and projected levels of wildfire and insect outbreaks in context. The chapter should make clear that (1) these ecological disturbances are natural components of forest ecosystem health, and (2) wildfire and insect outbreaks in forests do not appear to be occurring at levels that exceed historical levels, nor are they necessarily projected to be. In discussing wildfire in forests, the Chapter should acknowledge that (1) wildfire is a natural and necessary part of US forest ecosystems that is important for forest ecosystem health. Research has increasingly recognized the importance of biodiverse, ecologically significant, and unique ‰ÛÏcomplex early seral forest‰Û (also called ‰ÛÏsnag forest habitat‰Û) created by high-severity fire. Hundreds of scientific studies document the high levels of native biodiversity and wildlife abundance in complex early seral forest created when patches of high-severity fire occur in mature conifer forest (and where this unique wildlife habitat not been subjected to common post-fire management, such as post-fire logging and artificial tree planting, and herbicide spraying). Many of the native wildlife species found in complex early seral forest are primarily or almost exclusively found in such habitat, due to the high abundance of snags (standing dead trees) and downed logs and/or the abundance of shrub patches and young natural regeneration of conifers and oaks. Complex early seral forests created by high-severity fire support some of the highest levels of native biodiversity found in temperate conifer forests (Hutto et al. 2008, Swanson et al. 2010, DellaSala et al. 2014, Hutto et al. 2016). The Chapter should also acknowledge that (2) there is currently substantially less fire of all severities in the great majority of western U.S. mixed-conifer, mixed-evergreen, and yellow pine forests than there was historically, and that most western forests are experiencing a fire deficit compared with pre-settlement conditions (Mouillet and Field 2005, Stephens et al. 2007, Marlon et al. 2012, Odion et al. 2014, Hanson et al. 2015, Parks et al. 2015). For example, Parks et al (2015) concluded that ‰ÛÏmany forested areas in the western US experienced a fire deficit from 1984 to 2012, likely due to fire exclusion by human activities.‰Û Odion et al. (2014) similarly found multiple lines of corroborating evidence that there is currently much less high-severity fire in western	We agree that additional context would be helpful, and have added two sentences to clarity the historical context for insects and wildfire.
Shaye	Wolf	143664	Whole Page	06. Forests		223				The State of the Forest Sector section should acknowledge that logging is the largest source of disturbance to forest ecosystems and discuss the adverse effects of logging on forest ecosystem health and services. The chapter fails to acknowledge the important point that the largest source of disturbance to US forests is historic and current logging practices, which are well-documented to have adverse effects on forest ecosystem structure, services, and health. The chapter fails to discuss the significant impacts of historic and current logging practices‰ÛÓincluding clear-cutting, salvage logging, high-grading, and plantation forestry‰ÛÓthat remove massive amounts of forest biomass, cause forest fragmentation and degrade forest ecosystem health, and reduce forest carbon storage. This is particularly troubling because the scale of disturbance from logging is enormous. For example, Harris et al. (2016) estimated that the majority of carbon losses from US forests between 2006 and 2010 were caused by wood harvest, rather than natural disturbance processes including wildfire, insect outbreaks, and wind damage: logging contributed 92% of the carbon losses in southern forests, 66% in western forests, and 86% in northern forests. The significant ecological harms from clear-cutting and post-fire salvage logging have been well established (Lindenmayer and Noss 2006, Thorne et al. 2018). As summarized by Lindenmayer and Noss (2006), salvage logging can ‰ÛÏreduce or eliminate biological legacies (e.g., burned trees, logs), modify rare post-disturbance habitats, influence populations, alter community composition, impair natural vegetation recovery, facilitate the colonization of invasive species, alter soil properties and nutrient levels, increase erosion, modify hydrological regimes and aquatic ecosystems, and alter patterns of landscape heterogeneity,‰Û at 949. Harris, N.L. et al. 2016. Attribution of net carbon change by disturbance type across forest lands of the conterminous United States. Carbon Balance and Management 11:24. The study concluded that ‰ÛÏincreasing the US net forest C sink would require shifts in current forest management practices.‰Û Thorn, S. et al. 2018. Impacts of salvage logging on biodiversity: A meta-analysis. Journal of Applied Ecology 55: 279-289. Lindenmayer, D. B. and R. F. Noss. 2006. Salvage logging, ecosystem processes, and biodiversity conservation. Conservation Biology 20: 949-958;	We appreciate that the reviewer is concerned about the biophysical effects of logging on forest lands. However, this chapter focuses on the effects of climate change on forests, including both direct (e.g., temperature) and indirect (e.g., wildfire) effects that may be exacerbated in the future. Most of the reviewer's comments are beyond the scope of the chapter.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Shaye	Wolf	143667	Whole Page	06. Forests		223				In the context of climate change, logging can have detrimental effects on forest ecosystem services such as carbon storage. This should be acknowledged by the Chapter in the State of the Forest Sector section and Adaptation section. Harvest of live trees from the forest not only reduces current standing carbon stocks, but also reduces the forest‰Ûªs future rate of carbon sequestration and its future carbon storage capacity, by removing trees that otherwise would have continued to grow and remove CO2 from the atmosphere. Numerous studies indicate that protection from logging increases forest carbon storage, while thinning forests to reduce fire activity decreases forest carbon stocks and results in increased carbon emissions to the atmosphere that can persist for decades. For example, Tan et al. (2015) found that, by 2050, the climate change scenario that most heavily emphasized protection of forests from logging (B1) resulted in the highest levels of forest carbon storage and rates of carbon sequestration, while the scenarios that emphasized forest cutting (A1B and A2) reduced the proportional contribution of federal forestlands to the nation‰Ûªs overall carbon storage levels (see Table 2). Similarly, a study by Depro et al. (2008) found that carbon storage on public forests is maximized when protection from logging is greatest; a ‰Û÷‰Û÷no timber harvest‰Ûª‰Ûª scenario eliminating harvests on public lands resulted in an increase up to 43% over current sequestration levels on public timberlands, while moving to a more intense harvesting policy resulted in a significant decline in carbon sequestration. Campbell et al. (2012) concluded that thinning forests to avoid high-severity fire could actually reduce forest carbon stocks and increase overall carbon emissions. Because the probability of a fire on any given acre of forest is relatively low, forest managers must treat many more acres than will actually burn, and thinning ends up removing more carbon than would be released in a fire. The researchers estimated that thinning operations typically tend to remove about three times as much carbon from the forest as would be avoided in wildfire emissions. They cautioned that ‰ÛÏcurrent claims that fuel-reduction treatments function to increase forest C sequestration are based on specific and sometimes unrealistic assumptions regarding treatment efficacy, wildfire emissions, and wildfire burn probability.‰Û¦ The study concluded that ‰ÛÏwe found little credible evidence that such efforts [fuel-reduction treatments] have the added benefit of increasing terrestrial C stocks‰Û¦ and ‰ÛÏmore often, treatment would result in a reduction in C stocks over space and time.‰Û¦	The issue of relevance of logging and thinning has been clarified elsewhere in the chapter.
Shaye	Wolf	143671	Whole Page	06. Forests		223				The State of the Forest Sector section should acknowledge the dominant role of human activity in driving wildfire activity since this is critical for designing and implementing effective adaptation strategies. A study by Syphard et al. (2017) relating climate variables to fire activity across the US found that where human presence is more prominent, climate was less important in explaining fire activity meaning that ‰ÛÏhumans may not only influence fire regimes but their presence can actually override, or swamp out, the effect of climate.‰Û¦ A study by Balch et al. (2017) found that human-started wildfires accounted for 84% of all wildfires, tripled the length of the fires season, and were responsible for nearly half of all area burned. These studies highlight the importance of understanding the human influence on fire activity when setting forest and fire management and policy. Balch, J.K. et al. 2017. Human-started wildfires expand the fire niche across the United States. PNAS 114: 2946-2951. Syphard, A.D. et al. 2017. Human presence diminishes the importance of climate in driving fire activity across the United States. PNAS 114: 13750-13755.	We assume that the reviewer refers to *contemporary* fires, not historical fires. In response, we added a sentence and literature citation that address human imacts on fire in the context of multiple stressors. A broader discussion of human influences is beyond the scope of the chapter.
Shaye	Wolf	143673	Text Region	06. Forests		222	222	8	9	Key terms must be defined. On pages 222 and 223, the Chapter states ‰ÛÏA key challenge is to keep forests as forests, ensuring that the amount and health of forests will not decline significantly in the future.‰Û¦ While we support this statement, key terms like forest ‰ÛÏhealth‰Û¦ should be defined. For example, many studies provide evidence that restoration of natural disturbance processes and keeping carbon circulating in the forest are essential for restoring forest health, rather than commercial logging that removes forest carbon and reduces resilience through fragmentation and degradation.	We appreciate this review comment and have revised the sentence to improve clarity.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Shaye	Wolf	143679	Text Region	06. Forests		225	225	5	18	Box 6.1.: Large-scale tree mortality in the Sierra Nevada must be put in context and statements must be supported by their citations. As one of its case studies, Box 6.1 highlights the recent tree mortality rates in the Sierra Nevada estimated by the Forest Service as 102 million new snags since 2010. However, for these mortality statistics to be meaningful, it is critical to place current snag densities into the context of historical levels and within the context of management objectives. The current amount of complex early seral forests, or ‰ÛÏsnag forest habitat,‰Û created by native bark beetles, drought, and fire is estimated to be lower than natural, historical levels (Swanson et al. 2011, DellaSala et al. 2014) and not in excess of the upper bounds of the natural range of variability in Sierra Nevada forests. Historically, at any given point in time, 14% to 30% of conifer forests were comprised of complex early seral forests, including ponderosa pine and mixed-conifer forests, in the Sierra Nevada (Baker 2014, Hanson and Odion 2016). Secondly, the Chapter asserts repeatedly that fire suppression has created overly dense forests that need density reduction treatments (see pages 227, 229, 235). The Chapter strongly implies that reductions in tree density due to natural processes such as beetles, fire and drought have purely negative ecological consequences, while similar or greater reductions due to mechanical thinning operations are purely positive. The basis for this contradictory position is not clear. Third, the Chapter makes a series of claims about the consequences of Sierra Nevada tree mortality that are not supported by the cited studies. The Chapter on page 225 states: ‰ÛÏThis change in stand structure and composition has increased the likelihood of crown fires (forest fires that spread from treetop to treetop), altered local hydrology (with more water availability but also higher peak flows), and negatively affected ecosystem services (such as a reduction in long-term timber supply and decreased recreation opportunities)‰Û citing Hicke 2016, Pfeifer 2011, Adams 2012. However, these statements are not supported by these references. Key references include: DellaSala, D.A. et al. 2014. Complex early seral forests of the Sierra Nevada: what are they and how can they be managed for ecological integrity? Natural Areas Journal 34:310-324. Swanson, M.E. et al. 2011. The forgotten stage of forest succession: early-successional ecosystems on forested sites. Frontiers in Ecology and Environment 9: 117-125.	The case study on tree mortality in the Sierra Nevada was revised considerably to ensure accuracy and clarity.
Shaye	Wolf	143871	Text Region	06. Forests		227	227	12	15	At 227, the Chapter states: ‰ÛÏA century of fire exclusion in fire-prone forest ecosystems in the United States (especially in the West) has created landscapes of dense forests with not only high flammability but also heavy surface and canopy fuel loads (Keane 2009).‰Û First, the cited study by Keane et al. (2009) doesn‰Ût support this statement, but rather discusses the use of the concept of historical range and variability in landscape management. Secondly, the Chapter should acknowledge that there is more complexity when discussing changes in density and flammabilty. For example, in California, forests are much less dense in terms of basal area than they were historically, largely due to past and current logging. Sierra Nevada forests are estimated to be about 30% less dense, and Tranverse and Peninsular Range forests were 40% less dense, in terms of basal area in the 2000s compared to the 1930s (McIntyre et al. 2015 at Figure 1a). Moreover, studies indicate that California‰Ûªs mixed-conifer and ponderosa pine forests historically had a wide range of densities. For example, a reconstruction of historical forest structure in Sierra mixed-conifer forests based on 1865-1885 survey data suggests that historical forests "were open and park-like in places, but generally dense, averaging 293 trees/ha‰Û with smaller pines and oaks numerically dominant, as indicative of mixed- rather than low-severity fire regimes (Baker 2014). An assessment of US Forest Service forest survey data from 1910 and 1911 for central and southern Sierra Nevada ponderosa pine and mixed-conifer forests similarly indicates that historical forests had a high variability in density, again indicative of varied disturbance intensities and frequencies (Hanson and Odion 2016). Empirical studies have also found that forest areas in California that have missed the largest number of fire return intervals are not burning at higher fire severity. Specifically, six empirical studies found that the most long-unburned (most fire-suppressed) forests burned mostly at low/moderate-severity, and did not have higher proportions of high-severity fire than less fire-suppressed forests. Forests that were not fire suppressed (e.g., those that had not missed fire cycles, i.e., Condition Class 1, or ‰ÛÏFire Return Interval Departure‰Û class 1) generally had levels of high-severity fire similar to, or higher than, those in the most fire-suppressed forests, as found by Odion et al. 2004 (Klamath-Siskiyou), Odion and Hanson 2006 (Sierra Nevada), Odion and Hanson 2008 (Sierra Nevada), Odion et al. 2010 (Klamath Mountains), Miller et al. 2012 (Sierra Nevada), and van Wagtendonk et al. 2012 (Sierra Nevada).	The citation was corrected to be Keane et al. (2002) and added to the literature cited. The comment about California forests is very specific to one location, and while this *might* have been true for *some* California forests in *some* locations, especially those that were logged, it is certainly not true for most forests in the U.S., especially conifer forests. Therefore, we did not revise the existing text. We agree with the notion that fires are not burning at higher severities in many forests; this is why we used the term "intensity", not "severity". No change was made.
Shaye	Wolf	143877	Text Region	06. Forests		228	229	1	7	The caption in Figure 6.3 states that it is likely that fire severity has not changed during the past few decades. The Chapter should also discuss this important point in the text with supporting citations. As indicated in the caption in Figure 6.3, fire severity does not appear to be increasing in US forests, and this is supported by scientific research. Most recently, Keyser and Westerling (2017) tested trends for high severity fire occurrence for western United States forests, for each state and each month. The study found no significant trend in high severity fire occurrence during 1984-2014, except for Colorado. The study also found no significant increase in high severity fire occurrence by month during May through October, and no correlation between fraction of high severity fire and total fire size. A literature review by Doerr and Santin (2016) concluded: ‰ÛÏFor the western USA, [current studies] indicate little change overall [in high-severity fire trends], and also that area burned at high severity has overall declined compared to pre-European settlement.‰Û Parks et al. (2016) projected that even in hotter and drier future forests, there will be a decrease or no change in high-severity fire effects in nearly every forested region of the western U.S., due to reductions in combustible understory vegetation over time. Keyser, A. and A.L. Westerling. 2017. Climate drives inter-annual variability in probability of high severity fire occurrence in the western United States. Environmental Research Letters 12: 065003. Doerr, S.H. and C. Santin. 2016. Global trends in wildfire and its impacts: perceptions versus realities in a changing world. Philosophical Transactions Royal Society B 371: 20150345. Parks, S.A. et al. 2016. How will climate change affect wildland fire severity in the western US? Environmental Research Letters 11: 035002.	We appreciate the review comment, and have added some additional text and literature citations in the Figure 6.3 caption in order to clarify issues regarding area burned and fire severity.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Shaye	Wolf	143884	Text Region	06. Forests		230	230	7	15	The Chapter fails to provide an accurate analysis of the scientific research on insect outbreaks and fire interactions. On page 230, the Chapter states that ‰ÛÏtree mortality associated with insect outbreaks increases production of dead fuels, which can influence wildfire intensity (and amount of heat energy released).‰Û The Chapter then provides an example of fire intensity increasing short-term after beetle outbreak, citing a single study (Hicke 2012). However, multiple studies have found that trees killed by beetles and drought do not increase fire severity or extent; high-severity fire reduces forest susceptibility to future beetle outbreaks; and widespread and severe beetle outbreaks restrict subsequent outbreaks. Several empirical studies that have investigated the effects of actual fires in areas with known pre-fire snag levels from recent drought and bark beetles, have found trees killed by bark beetles and drought do not influence fire severity or extent. Bond et al. (2009) was conducted in mixed-conifer and ponderosa/Jeffrey-pine forests of the San Bernardino National Forest in southern California, where fires occurred immediately after a large pulse of snag recruitment from drought/beetles. Bond et al. (2009) ‰ÛÏfound no evidence that pre-fire tree mortality influenced fire severity.‰Û Hart et al. (2015) investigated whether there is a relationship between snag levels from drought/beetles and the rate of fire spread in conifer forests across the western U.S. Hart et al. (2015a) found the following: ‰ÛÏContrary to the expectation of increased wildfire activity in recently infested red-stage stands, we found no difference between observed area and expected area burned in red-stage or subsequent gray-stage stands during three peak years of wildfire activity, which account for 46% of area burned during the 2002‰ÛÒ2013 period.‰Û In other words, in both the initial stage of snag recruitment, when dead needles are still on the trees (‰ÛÏred-stage‰Û), and in the later stage, years later, after needles and some snags have fallen (‰ÛÏgray-stage‰Û), fire did not spread faster or burn more area in forests with high levels of snags from drought and native beetles. This was also true specifically in ponderosa pine forests, where there was no significant effect on fire spread of tree mortality from drought/beetles, and where fire spread was nearly identical regardless of snag levels (see Figure 3D).	We appreciate the review comment, but it is difficult to reconcile the comment with the information currently in the chapter. Although a wide range of additional iterature could be discussed, we feel it is more effective to focus on specific issues related to mountain pine beetles, their effects, and fire in the brief space that we have. We are confident that the statement in the chapter is correct. Note that we do not mention severity, only *intensity*. Much of the reviewer's comment focuses on severity, which is not a component of the discussion in the chapter.
Shaye	Wolf	143885	Text Region	06. Forests		231	231	22	23	The section on forest carbon dynamics emphasizes that ‰ÛÏincreasing disturbances‰Û will lead to a loss of forest soil carbon. The Chapter should define which disturbances it is including, since logging and land conversion should be included in this list.	The sentence was revised to include timber harvest. Other revisions were also made in the subsequent sentences to improve accuracy and clarity.
Shaye	Wolf	143886	Text Region	06. Forests		233	233	17	21	It is unclear what point is being made in the paragraph on wood products storage: ‰ÛÏmaintaining the net global surplus of wood products depends on a sustained for increasing rate of harvest removals, or a shift toward products that exist for longer periods of time before they are no longer suitable for reuse or recycling.‰Û Wood products do not permanently store carbon but release carbon over time at various rates depending on the type of product and other factors, which should be discussed. Is it also seems like the chapter is making an oblique management recommendation here to maintain the current rate of wood products production without providing an explanation of the basis for or implications of this recommendation.	This portion of the discussion was revised considerably to improve accuracy and clarity regarding carbon issues. Nothing is implied regardint the production of wood products.
Shaye	Wolf	143887	Text Region	06. Forests		234	234	4	10	The Chapter should provide a accurate discussion of the role of disturbances on water flows in forests. The Chapter depicts the influence of wildfire on water resources as purely negative, for example, stating that that wildfires ‰ÛÏincrease erosion and sedimentation in Western rivers.‰Û However, a recent study by Boisrame (2016) found that restoring a frequent, mixed severity fire regime to the Illilouette Creek Basin in Yosemite National Park had numerous ecohydrological benefits, including increased soil moisture and streamflow, decreased drought stress, and increased landscape diversity. Moreover, the effects on erosion following fire are typically short-term in contrast to the more persistent damage to watersheds caused by logging and logging roads, including increases in erosion and sedimentation and degradation of water quality and aquatic habitats (Gucinski et al. 2001, Trombulak and Frissell 2000). Grazing also causes long-term damage to water resources. However, the chapter makes no attempt to discuss the effects of disturbances from logging and grazing on water resources. Boisrame, G. 2016. Wildfire Effects on the Ecohydrology of a Sierra Nevada Watershed. PhD Dissertation. University of California, Berkeley. Boisrame, G. et al. 2016. Managed wildfire effects on forest resilience and water in the Sierra Nevada. Ecosystems DOI: 10.1007/s10021-016-0048-1. Gucinski, H. et al. 2001. Forest roads: a synthesis of scientific information, USFS PNW GTR-509. USFS Pacific Northwest Research Station, Portland. Trombulak, S.C. and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology14: 18-30	This portion of the discussion was revised considerably to improve accuracy and clarity regarding forest density, snow, and water. A comprehensive discusison of all factors that affect hydrology and water supply is beyond the scope of the chapter. More detail is available in the Water chapter and Regional chapters.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Shaye	Wolf	143891	Text Region	06. Forests		235	235	22	26	The Chapter‰Ûªs claim that stand density management and surface fuel reduction will increase forest resilience to increased temperature, drought and disturbance is not supported by the scientific literature or the references cited. At 235 the Chapter states: ‰ÛÏmany ongoing practices that address existing forest management needs‰ÛÓstand density management, surface fuel reduction, and control of invasive species‰ÛÓare also considered climate-smart because they reduce risk by creating resilience to increased temperature, drought, and disturbance.‰Û¦ ‰ÛÏFor example, forest managers are considering greater reductions in stand density to increase forest resistance and resilience to fire, insects, and drought.‰Û¦ Figure 6.5 also states that adaptation options for ‰ÛÏincreasing drought severity and incidence of insect outbreaks‰Û¦ include ‰ÛÏreduce forest stand density to increase tree vigor.‰Û¦ However, the state of the science on this issue is more complex. Current research suggests that forest management treatments focused on thinning trees to increase resilience can be counter-productive, and many studies recommend restoring natural disturbance processes to increase resilience. Studies indicate that increased density does not necessarily equate to a lack of resilience, as measured by tree mortality and physiological stress levels. In the mixed conifer forests of California‰Ûªs Lake Tahoe Basin, a recent study found ‰ÛÏa nuanced relationship between stocking level [density], forest mortality and drought effects‰Û¦ (Van Gunst et al. 2016). In mid- to upper-elevation forests, increased density was associated with decreased probability of mortality, especially during wetter periods, whereas increased density was more associated with increased probability of mortality in lower elevation forests and drier climate periods. The researchers suggested that ‰ÛÏno single density-reduction forest management strategy will increase forest resilience under all climate periods and in all forest types.‰Û¦ A study in the Douglas fir forests of northeastern Washington found that competition [i.e., higher density] did not affect tree responses to extreme drought (Carnwath and Nelson 2016). Importantly, trees with more competition from neighbors appeared to have higher drought resistance (i.e., a significantly higher proportion of sapwood area in latewood, which is a trait associated with drought resistance). The authors suggested that ‰ÛÏa tree‰Ûªs ability to cope with environmental variability is driven not just by the proximate effects of neighbours on resource availability, but also by phenotypic plasticity and long-term adaptations to competitive	We respectfully disagree with the reviewer's comment on this issue. Our inferences are based on hundreds of publications in the scientific literature, based on both empirical data and modeling, that demonstrate the effectiveness of stand density management, only a few of which are cited here. The scientific literature on climate change adaptation reinforces the value of stand density management. No change was made.
Shaye	Wolf	143894	Text Region	06. Forests		234	236	11	27	The Chapter‰Ûªs section on Adaptation (pp. 234-236) must include important science-based forest adaptation strategies that have been recommended in the scientific literature -- managed wildfire and protecting defensible space around structures as the most effective way to protect lives and homes. Figure 6.5 lists adaptation options for ‰ÛÏincreasing wildfire area burned and fire season length‰Û¦ as ‰ÛÏprescribed burning and managed wildfire,‰Û¦ but managed wildfire is oddly not discussed anywhere else in the chapter and this should be fixed. There is no mention of defensible space anywhere in the chapter, which should also be fixed. The chapter promotes fuel reduction as climate change adaptation measures. However, recent studies highlight the limitations of fuel reduction approaches in altering fire behavior, particularly because (a) fuel treatments are largely ineffective under extreme fire weather conditions that create the largest fires and the vast majority of annual area burned, (b) there is a low probability that areas receiving fuels treatment will overlap with wildfires, and (c) fuel treatments are costly and often infeasible to implement widely. As summarized by DellaSala et al. (2017): ‰ÛÏOn public lands, current fire policy promotes thinning over large landscapes (e.g., USDA Forest Service 2002, US Congress 2003, USDA Forest Service 2009, US Congress 2015), which is costly (Schoennagel and Nelson 2011), infeasible over large areas (Calkin et al. 2013, North et al. 2015a, Parks et al. 2015), and largely ineffective under extreme fire weather conditions (Lydersen et al. 2014, Cary et al. 2016).‰Û¦ Similarly, Zachmann et al. (2018) found: ‰ÛÏThe combination of transient treatment effects, variability in the effectiveness of different treatment methods (Kalies and Yocom Kent, 2016; Martinson and Omi, 2013; Prichard et al., 2010), and operational and funding constraints (North et al., 2015) limits the practicality of frequent treatments at the landscape scale; and there is growing recognition that fuels reduction alone may not be able to effectively alter regional wildfire trends (Schoennagel et al., 2017).‰Û¦ Due to the limitations of fire suppression and fuel treatment approaches, many fire ecologists and managers are recommending a ‰ÛÏmanaged wildfire‰Û¦ approach of allowing more naturally ignited fire to burn in remote regions and focusing fire suppression more narrowly to lands surrounding towns in combination with the creation of defensible space around structures. For example, DellaSala et al. (2017) made the following recommendations, consistent with other recent studies:	This comment is inconsistent with the author team's thorough assessment of the science.
Michael	MacCracken	144288	Text Region	06. Forests		223	223	3	3	Regarding the 130M acres in "urban areas", does this total really include "suburban" areas as well? Might this be the total in what are called Metropolitan Statistical Areas or something similar? This total just seems very large for what most people would call urban areas (New York City, LA, Boston, etc.). And what counts as a forest--the District of Columbia has a policy of keeping many areas green with trees--do these (i.e., tree cover in urban areas) really count as forests? Indeed, I am a bit confused about how forests can be said to be in urban areas as opposed to something more generally named. Please clarify.	We have revised and clarifed the text.
Michael	MacCracken	144289	Figure	06. Forests	1	224				I would think that under "Climate Change" in the top box one needs to include evaporation or enhanced evaporation or something, as a real key influence on forests will be a greater rate of evaporation.	We appreciate the review comment, and have revised the figure to address evaporation.
Michael	MacCracken	144290	Text Region	06. Forests		229	229	26	27	But not the very extensive pine barrens of New Jersey? That seems to me a strange omission.	We appreciate this review comment; however, southern pine beetle has historically been present in the New Jersey Pine barrens and so it's presence is not likely attributable to warming.
Michael	MacCracken	144291	Text Region	06. Forests		230	230	3	3	Good practice is to avoid use of the word "may" and use words from the lexicon, a practice that started with the First National Assessment, of which one of your authors was a major participant on (and best wishes to her). Probably change here to "are likely to"	We appreciate this comment, and have revised the language throughout the chapter where appropriate.
Michael	MacCracken	144292	Text Region	06. Forests		230	230	27	27	Again, need to scrub "may" and use the lexicon, even if say "It is possible that the direct effects lä will be obscured". Also replace "may" on lines 30, 34, 36--the chapter was doing so well on avoiding "may" up to this point (basically, it provides no useful indication of likelihood between 99%). Now I must recommend a real search of the chapter and commitment to eliminating use of the word.	We appreciate this comment, and have revised the language throughout the chapter where appropriate.
Michael	MacCracken	144293	Text Region	06. Forests		231	231	10	11	Might the first sentence be simplified to: "Climate change is very likely to decrease lä" The current phrasing seems awkward, and is "highly likely" part of the lexicon?	This was revised as suggested.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144294	Text Region	06. Forests		231	231	23	23	"may" to "is likely to"--and is not "will be" quite strong--don't you really want "are virtually certain to be" (although I really don't like qualifying the word "certain"--one is either "certain" or not.	This was revised to imply greater certainty.
Michael	MacCracken	144295	Text Region	06. Forests		232	232	11	11	I think it would be better phrased as "for a net gain of forest area of 0.09% per year so units are consistent with line 10	This was revised as suggested.
Michael	MacCracken	144296	Text Region	06. Forests		233	233	3	3	Is this really "Net storage"? Or is this gross carbon uptake?	This was restated as net storage.
Michael	MacCracken	144297	Text Region	06. Forests		234	234	29	29	"may" to "is likely to"	Revised as suggested.
Michael	MacCracken	144298	Whole Chapter	06. Forests						Very nice chapter overall. I don't recall, however, seeing anything about mangrove forests--are they covered somewhere else? I also did not see any discussion of forest wildlife (animals, birds, etc.--such as what happens as climate change shifts optimal locations for particular protected species, etc.) and effects on them, and possible changes in their effects on forests, etc. (well, I did see that reintroducing beavers might help)--I did later see that wildlife was covered in the next chapter--this point might be made near start of chapter just to alleviate the wondering.	A sentence was added to address potential effects on mangroves. The review comment is correct that we generally do not address animal species, although we do mention habitat (for plants and animals) and added an example in the Traceable Accounts. Most information on animals is included in the Ecosystems, Ecosystem Services, and Biodiversity chapter and Regional chapters.
Michael	MacCracken	144299	Text Region	06. Forests		238	244	1	3	"Traceable Accounts" section only lightly scanned, moving on to next chapter, but hope relevant comments for main part of chapter would carry over.	Main points will be represented in the Traceable Accounts section.
Patricia	Tillmann	144782	Text Region	06. Forests		221	221	25	26	Please update to include data from the 2017 wildfire season	At this point, data from the 2017 wildfire season are preliminary. It might be possible to include these data prior to publication if they are confirmed as final.
Rachel	Cleetus	144783	Text Region	06. Forests		221	222	37	1	Please check this against the EPA's GHG inventory information? See https://www.epa.gov/sites/production/files/2017-02/documents/2017_executive_summary.pdf , p. ES-7	We appreciate this review comment, have checked the information carefully, and have added a citation to the appropriate USEPA document for 2017.
Rachel	Cleetus	144784	Text Region	06. Forests		223	223	11	13	The incidence of beetle infestations themselves may also be connected to changing climatic conditions. See https://www.ucsusa.org/sites/default/files/attach/2014/09/Rocky-Mountain-Forests-at-Risk-Full-Report.pdf which includes these citations: Bark beetle outbreaks erupted near the turn of the twenty-first century across western North America, including the Rocky Mountains. These outbreaks differed from previous ones in several ways: ‰Û¢ Severity and extent. Recent bark beetle infestations have killed more trees at a faster pace, for longer periods, and across more of North America since record keeping began a little over a century ago (Bentz et al. 2009; Kaufmann et al. 2008; Raffa et al. 2008). The widespread and simultaneous onset of epidemic-level infestations suggests regional‰ÛÓnot local‰ÛÓcauses (Chapman et al. âÊ2012). ‰Û¢ Increased stress from heat and drought. Exceptionally hot, dry conditions have stressed and weakened trees, reducing their defenses to beetle attacks, primarily the production of resin to flush out the insects (Bentz et al. 2009; Raffa et al. 2008). Previous droughts without such high temperatures did not produce comparable outbreaks (Creeden, Hicke, and Buotte 2014; Adams et al. 2009). According to leading scientists, ‰ÛÏThe West‰Û³s changing climate‰ÛÓrising temperatures and decreasing precipitation‰ÛÓhas created weather conditions that are ideal for bark beetle outbreaks‰Û (Bentz et al. 2009). ‰Û¢ More overwinter survival of beetles. Beetles protect themselves from the deep cold of Rocky Mountain winters	This comment does not appear to raise a question or suggest a revision.
Rachel	Cleetus	144785	Text Region	06. Forests		227	227	19	20	Please update to add data from the 2016 and 2017 wildfire seasons. See https://www.usda.gov/media/press-releases/2017/09/14/forest-service-wildland-fire-suppression-costs-exceed-2-billion It is also critical to note that rising expenditures on fire suppression are also pulling funds away from activities that could help lower fir risk in future years such as forest and fuels management. See https://www.fs.fed.us/sites/default/files/2015-Fire-Budget-Report.pdf	At this point, data from the 2017 wildfire season are preliminary. It might be possible to include these data prior to publication if they are confirmed as final.
Rachel	Cleetus	144786	Text Region	06. Forests		228		18		Add health related information from the wildfires section here: https://health2016.globalchange.gov/ And this is a good recent study: https://www.epa.gov/sciencematters/research-shows-health-impacts-and-economic-costs-wildland-fires	We appreciate the review comment, and there is already a statement in the text about smoke and human health. Additional detail on health-related issues is beyond the scope of the report, so we did not include additional citations. More information on health-related issues for smoke can be found in Chapters 13 and 14.
Rachel	Cleetus	144787	Text Region	06. Forests		228		1		Please add information on these additional costs/impacts of wildfires: - More information on the public health costs of wildfires. Also add this reference: As the fire season lengthens and fires get larger, by mid-century emissions of soot may increase by 46 to 70âÊpercent, with 10 to 27âÊpercent more black carbon compared with today (Yue et al. 2013). - Damage to critical infrastructure such as roads and power lines - Damage to watersheds - Elevated risks of mudslides in post-fire denuded landscapes - Loss of cultural heritage assets and landscapes - Threats to the safety and well-being of firefighters - Loss of tourism revenues	We appreciate the review comment, which suggests that many other issues could potentially be discussed in this section. There is already a statement in the text about smoke and human health. Because a large number of issues are already discussed in the chapter, including several more is beyond the scope of this section. No changes were made.
Rachel	Cleetus	144788	Whole Chapter	06. Forests						Please review and include references from https://www.ucsusa.org/sites/default/files/legacy/assets/documents/global_warming/playing-with-fire-report.pdf	Many of the issues discussed in the suggested report are included in the chapter, but no direction is provided by the reviewer on which references they think should be included. No change made.
Rachel	Cleetus	144789	Whole Chapter	06. Forests						Please review and include references from https://www.ucsusa.org/sites/default/files/attach/2014/09/Rocky-Mountain-Forests-at-Risk-Full-Report.pdf	Many of the issues discussed in the suggested report are included in the chapter, but no direction is provided by the reviewer on which references they think should be included. No change made.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Rachel	Cleetus	144790	Text Region	06. Forests		241		2		Please add an estimate of the CO2 emissions from US wildfires in recent years--for example, from the 2017 wildfires in California--to provide a sense of scale of those emissions, which themselves are contributing to climate change. See, for example: http://www.sierranevada.ca.gov/our-board/board-meetings/2016dec/aixiwipattchb.pdf According to this news story, quoting the Forest Service http://www.sfchronicle.com/bayarea/article/Huge-wildfires-can-wipe-out-California-s-12376324.php: In 2013, for example, California's economy cut 3.89 million metric tons of emissions, while wildfires produced as many as 22.4 million metric tons, according to the Forest Service. The Rim Fire alone, started near Yosemite National Park that August by a runaway campfire, emitted between 10 million and 15 million metric tons.	While large pulses of CO2 can be generated after large wildfires, trees regrow and take up carbon following disturbance. Hence, over a large enough spatial and temporal scale, fire is a small factor, especially compared to human CO2 emissions. No change made. Estimates of CO2 from fires in the United States: implications for carbon management Christine Wiedinmyer and Jason C Neff Carbon Balance and Management20072:10 https://doi.org/10.1186/1750-0680-2-10
Jay	Peterson	140848	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		257	257	9	9	delete the word 'change'	Thank you for the comment. We have deleted this word.
Sally	Sims	141565	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		262		34		"Projections suggest continued primary production increases over the next century under a higher scenario (11%‰ÛÒ59% under RCP8.5;" I strongly disagree that this will be the case under RCP8.5. The papers cited do not adequately take mortality from 'hot droughts' into account, especially under RCP 8.5 after about 2050. Friend et al does recognize that the impact of drought negates increases in NPP due to CO2 in certain areas of the globe, including western NA. Droughts have been increasing across the US (see Peters, M., L. Iverson, and S. Matthews. 2014. Spatio-temporal trends of drought by forest type in the conterminous United States, 1960-2013 [scale 1:12,000,000]. Res. Map NRS-7. U.S. Department of Agriculture, Forest Service, Northern Research Station., Newtown Square, PA.) and are projected to increase greatly into future (we have 2 papers in press on this) are the 11-59% for US, or global?	We agree that there is large uncertainty in existing projections of terrestrial primary production. We have modified the text to emphasize this even more strongly and unequivocally. We also now specifically mention heat wave, drought, fire and insect effects with references, directing the reader to the Forest Chapter for more details. We must, however, acknowledge that existing model projections suggest an increase in primary production with the factors they do consider
Sally	Sims	141569	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		274		18		"There is still uncertainty in how climate change will 20 impact productivity (Norby and Zak 2011, Rykaczewski and Dunne 2011, Bopp et al. 2013, 21 Franks et al. 2013a, Laufk¦tter et al. 2015, Wieder et al. 2015, Smith et al. 2016), but the 22 potential for large changes is clear, so management and monitoring approaches should 23 acknowledge this potential." as per my previous comment on the Friend paper suggesting increases throughout the century, I strongly recommend that you tone that statement down to look more like this one, but that emphasis that with increasing drought, adaptation needs to align with protecting against massive mortality due to 'hot droughts'	We agree that there is large uncertainty in existing projections of terrestrial primary production. We have modified the text to emphasize this even more strongly (see response to comment above)
Sally	Sims	141570	Whole Page	07. Ecosystems, Ecosystem Services, and Biodiversity		257				Line 6-8: After United States. Next sentence should read. Marine, terrestrial, and freshwater species are responding to climate change by expressing different traits, altering behaviors, shifting ranges, and changing the timing of biological events. Climate change will likely outpace the rate at which some species can adapt. Line 9: Delete and after interactions, Lines 26-28: This sentence is not coherent. Suggested text: The impacts of climate change vary by region and species. Confidence has increased for many projected climate impacts.	Thank you for the comment. We have significantly changed this section, so this comment is no longer relevant.
Sally	Sims	141571	Whole Chapter	07. Ecosystems, Ecosystem Services, and Biodiversity						Be consistent throughout this section in including aquatic or freshwater when discussing impacts that include marine, terrestrial, and aquatic (or freshwater) habitats. Use either freshwater or aquatic consistently.	We have updated our use of the term "aquatic" so that it refers to aquatic environments broadly (i.e., terrestrial and *aquatic* environments), and have used "freshwater" to distinguish from marine environments.
Sally	Sims	141573	Whole Page	07. Ecosystems, Ecosystem Services, and Biodiversity		259				Lines 12-14 should read: The impacts of climate change vary by region and species. Confidence has increased for many projected climate impacts.	We have updated this sentence to: Our understanding of climate change impacts and responses of biodiversity and ecosystems has improved since NCA3, and the expected consequences of climate change will vary by region, species, and ecosystem type
Sally	Sims	141574	Whole Page	07. Ecosystems, Ecosystem Services, and Biodiversity		267				Comment Ch 7, page 267: Add text to Key Messages and end of this section to discuss multi-stakeholder initiatives to address mid- to large-scale ecosystem restoration and its overlap with connectivity and as a factor in restoring ecosystem health. For example, floodplain restoration meets multiple goals. Add regional approaches to the discussion of federal frameworks. [See suggested text, next paragraph.] Add text to Ch 7, page 267, line 12: Suggested text: Work on large-scale ecosystem restoration, habitat connectivity, and ecosystem services is building momentum through collaborations among federal, state, tribal, educational institutions, nongovernmental organizations, and partnerships (such as the USFWS Regional Landscape Conservation Cooperatives). Large ecosystems such as the Great Lakes, Chesapeake Bay, Everglades, Connecticut River, Platte River Basin, and others, and their embedded human communities are benefiting from evolving collaborations that engage traditional and new natural resource stakeholders in ecosystem restoration for multiple benefits (https://lccnetwork.org/; http://largelandscapes.org).	Thank you for the comment. We have added in this suggested text.
David	Wojick	141616	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		257	257	3	11	This Key message doesn't seem well thought out. It seems like a lot of ideas in one key message.	We have made substantial changes to the key messages by expanding from 2 to 4 key messages and limited the scope of each message.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
David	Wojick	141623	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		265	265	2	3	Here is the text: 2 Key Message 1: The resources and ecosystem services that people depend on for livelihoods, 3 protection, and well-being are increasingly at risk from the impacts of climate change. Comment: This text falsely states a speculative conjecture as an established physical fact. It is not known that climate change poses increasing risks. This conjecture is based primarily on questionable computer models that are far too sensitive to human activities, especially CO2 emissions. Actual climate change may well be beneficial. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	Volume I of the Fourth U.S. National Climate Assessment was prepared and Volume 2 is being prepared in compliance with Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (P.L. 106-554) and information quality guidelines issued by the Department of Commerce / National Oceanic and Atmospheric Administration pursuant to Section 515 (http://www.cio.noaa.gov/services_programs/info_quality.html). For purposes of compliance with Section 515, these documents are deemed a "highly influential scientific assessment" (HISA) and contain expert assessments of the relevant scientific literature that are peer-reviewed by the National Academy of Sciences. The report graphics follow the ISO 19115 standard which includes the necessary information to achieve reproducibility. Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: "The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation)."
David	Wojick	141624	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		265	265	7	10	Here is the text: 7 Climate change may outpace the rate at which species can adapt. 8 Projections suggest many shifts could substantially alter species interactions, create 9 mismatches in resources, and reconfigure ecosystems with uncertain consequences for 10 ecosystem function and services. Comment: This text falsely states a speculative conjecture as an established physical fact. This referenced projections are based primarily on questionable computer models that are far too sensitive to human activities, especially CO2 emissions. Actual climate change may well be beneficial.	Volume I of the Fourth U.S. National Climate Assessment was prepared and Volume 2 is being prepared in compliance with Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (P.L. 106-554) and information quality guidelines issued by the Department of Commerce / National Oceanic and Atmospheric Administration pursuant to Section 515 (http://www.cio.noaa.gov/services_programs/info_quality.html). For purposes of compliance with Section 515, these documents are deemed a "highly influential scientific assessment" (HISA) and contain expert assessments of the relevant scientific literature that are peer-reviewed by the National Academy of Sciences. The report graphics follow the ISO 19115 standard which includes the necessary information to achieve reproducibility. Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: "The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation)."
Alexey	Shiklomanov	141728	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		257	259	18	14	The ‰ÛÏSummary Overview‰Û as written has run-on sentences and is not very clear, and should be revised. In addition, the authors should consider using the ‰ÛÏIntroduction‰Û paragraph as the executive summary, and beginning the chapter with the ‰ÛÏState of the Sector‰Û section to avoid redundancy.	We have made substantial changes to the introduction and have removed the run on sentence. We followed the guidance from USGCRP which required the use of verbatium text taken from the State of the Sector and Key Messages.
David	Wojick	141729	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		264	264	5	37	The information contained in the Regional Roll up section does not add significantly to the chapter or the report as a whole. All of the case studies mentioned are discussed in far more detail in the regional chapters. Rather than try to convey these case studies in several sentences, authors should consider pointing readers to the biodiversity and ecosystem related topics covered in the regional chapters (e.g. For examples of how climate change is impacting regional fisheries, see the Alaska and Northeast chapters). Authors could also consider moving Figure 7.1 to the Regional Roll up section and adding the case studies to the map with links to the relevant regional chapters.	Thank you for the comment, we are taking your suggestion and incorporating it into a map of the U.S. where the reader can click on a region to see the impact and adaptation efforts taking place in that region with links out the region for more detail.
David	Iinouye	141782	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		259		35		add period to "et al."	Thank you for the comment, a period was added.
David	Iinouye	141783	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		259		37		add period to "et al."	Thank you for the comment, a period was added.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
David	Iinouye	141784	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		260		7		In addition to Wiens 2016, could cite this paper, documenting altitudinal changes in bumble bee species in Colorado: Pyke, G. H., J. D. Thomson, D. W. Inouye and T. J. Miller. 2016. Effects of climate change on phenologies and distributions of bumble bees and the plants they visit. Ecosphere 7(3): DOI 10.1002/ecs2.1267	Thank you for the comment, the citation was added.
David	Iinouye	141785	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		262		7		add period to "et al."	Thank you for the comment, a period was added.
David	Iinouye	141786	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		263		18		"which" should be "that"	Thank you for the comment, the sentence was rewritten.
David	Iinouye	141787	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		264		25		"are" should be "is"	Thanks for the comment, the paragraph was rewritten.
David	Iinouye	141788	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		264		26		delete the second semicolon	Thanks for the comment, the paragraph was rewritten.
David	Iinouye	141789	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		269		15		compound adjective is missing a hyphen: "climate-induced"	Thanks for the comment, the text was rewritten.
David	Iinouye	141790	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		264		14		"which" should be "that"	Thanks for the comment, the word "which" is not contained in line 14 page 264 or in the lines immediatly before or after.
David	Iinouye	141791	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		269		37		The same issue of late spring frosts also impacts wildflowers in the Rocky Mountains. E.g., Inouye, D. W. 2008. Effects of climate change on phenology, frost damage, and floral abundance of montane wildflowers. Ecology 89:353-362.	Thank you for the comment, which we agree is relevant to the chapter and an important aspect of changing phenology. We have incorporated text to reflect this example, although we determined that more recent and relevant citations are available to support this idea.
David	Iinouye	141792	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		270		13		This study was able to partition the adaptive response to climate change by a wildflower into plasticity and evolutionary components: Anderson, J. T., D. W. Inouye, A. McKinney, and T. Mitchell-Olds. 2012. Phenotypic plasticity and adaptive evolution contribute to advancing flowering phenology in response to climate change. Philosophical Transactions of the Royal Society 279(1743): 3843-3852.	Thank you for the comment. We added this reference to the adaptive capacity section and mentioned the role of both plasticity and biological adaptation in response to climate change.
David	Iinouye	141793	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		271		31		add hyphen: under-predicted	Thanks for the comment, a hypen was added.
Susanne	Moser	141794	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		269		24		Here and a few other places, e.g., Page 270 Line 23, there are split infinitives.	Thank you for the comment. We think that split-infinitives are fine.
Christen	Armstrong	141920	Whole Page	07. Ecosystems, Ecosystem Services, and Biodiversity		260				shouldn't you include a discussion of complete lost of certain iconic habitats‰Û_like coral reefs? And how that will affect ecosystem?	Coral reefs, which provide shoreline protection and support fisheries and recreation, are also threatened by ocean warming acidification. The loss of recreational benefits associated with coral reefs in the U.S. is projected to be $140 billion by 2100 (Ch. 9: Oceans).
David	Wojick	141921	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		264	264	9	12	cross reference Chapter 9 which also covers heat waves	We have changed this section significantly so this comment is no longer relevant.
David	Peterson	142397	Whole Chapter	07. Ecosystems, Ecosystem Services, and Biodiversity						This chapter has an ambitious, perhaps impossible scope, covering a broad range of issues. The general tone is somewhat biased, in that most of the effects of climate change are interpreted in a negative, rather than a neutral, context. This could be remedied by including a broader range of scientific literature that supports positive and neutral outcomes, rather than the current focus on only the literature that supports negative outcomes. Note especially the up-front use of the word ‰ÛÏimpacts,‰Û rather than the more neutral ‰ÛÏeffects.‰Û Perceptions of negative changes are possible only in the context of human values, a point that needs to be stated early and often. Unfortunately, the perspective of this chapter is not consistent with the more balanced perspective of nearly all other chapters in the report.	Thank you for the comment. We added examples of potential benefits, such as extended growing season, and extened time for warm weather recreational activites. Additionally, impacts are not inhearently negative, as there are positive impacts, but we have expanded the use of the word "effect" where appropriate. Based on the extensive research done by the authors, most of the effects of climate change are expected to be negative rather than positive.
David	Peterson	142398	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		262		27		Stating that ‰ÛÏTerrestrial primary production has increased over the 20th century‰Û_ due to the fertilizing effect of increasing atmospheric CO2‰Û is extremely speculative. The substantial literature on this topic includes positive, neutral, and negative perspectives about this topic.	As described in the Graven, Wenzell, Zhu and Cambell references, there are multiple lines of evidence supporting a *global* terrestrial primary production increased in the latter 20th/early 21st century. However, we now 1) more strongly note prominent regional exceptions to this trend; 2) back off the primary attribution of this to CO2 by instead listing it as only one of many factors potentially contributing to this trend.
David	Peterson	142399	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		262		32		Stating that ‰ÛÏProjections suggest continued primary production increases‰Û_‰Û is a small slice of the literature. There is no consensus on this issue, and effects will almost certainly depend on both individual species responses and the limiting factors stated in the following lines.	We agree that there is large uncertainty in existing projections of terrestrial primary production. We have modified the text to emphasize this even more strongly (see response to comment above).
David	Peterson	142400	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		265		34		Could not earlier onset of spring also create opportunities for agriculture, particularly the ability to grow different crop species and varieties, including longer-duration varieties that would have higher yields? The latter is already happening in the upper Midwest U.S. (e.g., 90-day corn instead of 60-day corn).	Thank you for your comment. We agree that this is an important aspect of changing phenology, and have added additional text to reflect this point on pg 266. We would also note to the reveiwer that the positive impacts of a prolonged growing season are already noted elsewhere in the chapter (see pg 261).
David	Peterson	142401	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		271		9		What is meant by ‰ÛÏimportant industries‰Û here? Fisheries and forests are not industries, although the resources they provide may have commercial value.	Thank you for your comment. Fishing and forestry are commonly refered to as "industries" but we see a benefit in rewording this sentence to read as "…ecosystem productivity that supports important provisioning services including fisheries and forest harvests for food and fiber."
Linda	Heath	142432	Whole Chapter	07. Ecosystems, Ecosystem Services, and Biodiversity						This is a very comprehensive assessment of ecosystem and biodiversity changes due to climate. It would be helpful to identify the specific species which human populations are most dependent on for economic resources and the extinction risks associated with those species. There should be more of a discussion on why biodiversity is important to maintain. The specific ecosystem services for all the species and regions discussed need to be presented, all of these changes by themselves have no meaning, the "why do I care" question needs to be answered for all the expected changes.	We have greatly expanded our discussion of ecosystem services and have included examples in all sections of the report and included a new key message specifically on ecosystem services.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mark	Muyskens	143194	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		266	266	12	16	Here is the present text: 12 Key Message 2: Natural resource management will increasingly require planning for an 13 uncertain future. Adaptation strategies that are flexible and coordinated at landscape and 14 large marine ecosystem scales have rapidly progressed and their implementation is 15 continually being refined to address emerging impacts of climate change and how those 16 impacts are compounding with other stressors on our valued resources. Comment: This message is so vague that it is meaningless. However, the assumption seems to be that there are increased risks coming from climate change and extreme weather. This is speculation falsely asserted as established physical fact. There is no scientific message here. It is increasingly likely that what little human caused climate change there is will be beneficial. The fact that the CMIP5 models run hot is well known. See just as an example "Lukewarming: The New Climate Science that Changes Everything," Patrick J. Michaels and Paul C. Knappenberger, Cato Institute, 2016. https://store.cato.org/book/lukewarming	We have reviewed the source of information suggested by the comment and find that it does not meet the guidance to authors on Information Quality. This guidance assures that sources comply with Information Quality Act requirements for (1) utility, (2) transparency and traceability, (3) objectivity, and (4) integrity and security. Volume I of the Fourth U.S. National Climate Assessment was prepared and Volume 2 is being prepared in compliance with Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (P.L. 106-554) and information quality guidelines issued by the Department of Commerce / National Oceanic and Atmospheric Administration pursuant to Section 515 (http://www.cio.noaa.gov/services_programs/info_quality.html). For purposes of compliance with Section 515, these documents are deemed a "highly influential scientific assessment" (HISA) and contain expert assessments of the relevant scientific literature that are peer-reviewed by the National Academy of Sciences. The report graphics follow the ISO 19115 standard which includes the necessary information to achieve reproducibility.
Social Science	Coordinating Committee	143356	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		266	266	1	3	Are there no citations for this statement?	Thank you for the comment. We have added a reference to the CIRA2.0 report.
Social Science	Coordinating Committee	143357	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		266	266	4	10	Are there more recent citations/examples?	Thank you for the comment, we have substantially re-worked this section and have included more recent citations and examples.
Carole	LeBlanc	143406	Whole Chapter	07. Ecosystems, Ecosystem Services, and Biodiversity						While mentioned elsewhere, this chapter might also benefit from referencing Harvard's Dr. Paul Epstein, re: his seminal work on the critical connections between the emergence and re-emergence of infectious (i.e., vector-borne) diseases and climate change.	Thank you for the suggestion. We linked to the health chapter rather than adding this specific reference.
Aimee	Delach	143597	Whole Chapter	07. Ecosystems, Ecosystem Services, and Biodiversity						We do appreciate the inclusion of a chapter on ‰ÛÏEcosystems,‰Û but in our estimation it does not capture the full range of climate change impacts on species and habitats, but instead focuses mostly on phenologic mismatch, range shifts and the spread of invasive species. These are important effects, but hardly a comprehensive list. Furthermore, examples offered in the Ecosystems are weighted strongly toward species with important human uses (e.g., lobster) or human health implications (e.g., lyme disease), and give less attention to ecosystem function and biodiversity than is warranted.	Thank you for the comment. When writing this chapter we were not trying to include a comprehensive list of the full range of impacts on species as that would require an entire new volumn dedicated to ecosystems, ecosystem services and biodiversity. As an author team, we discussed the most important aspects that we should include, specifically focusing on what is new since NCA3. Additionally, in the guidance for this report, as well as from many other commenters, we were told to highlight examples that were relevent and important to humans. We do include discussions on ecosystem function and biodiversity and think we treat those topics with appropriate detail given the multitude of other topics that need to be discussed.
Shaye	Wolf	143653	Whole Chapter	07. Ecosystems, Ecosystem Services, and Biodiversity						It is not acceptable for this chapter to fail to include a key message on increasing species extinction risk from climate change. One of the most serious, and permanent, threats to biodiversity and ecosystem function from climate change is local and global species extinctions. The Ecosystems chapter of the Third NCA appropriately included a key message on extinction, and this chapter should include a similar message: ‰ÛÏLandscapes and seascapes are changing rapidly, and species, including many iconic species, may disappear from regions where they have been prevalent or become extinct, altering some regions so much that their mix of plant and animal life will become almost unrecognizable‰Û(Melillo et al. 2014 at 196).	Added statement about climate change now being accepted national and internationally as a threat to species extinction, just before the regional role up section.
Shaye	Wolf	143655	Whole Chapter	07. Ecosystems, Ecosystem Services, and Biodiversity						This chapter should include a section on observed and predicted climate-change-related population declines and extinctions. This is a major omission that must be corrected. This section should discuss the key point that US species are already experiencing climate-related population declines and local extirpations, and this is one of the most serious threats to biodiversity and ecosystem function. Key studies that should be included are: Parmesan, C. 2006. Ecological and evolutionary responses to recent climate change. Annual Review of Ecology, Evolution, and Systematics 37: 637-669. Cahill et al. (2012) identified 136 studies which indicated that climate change was associated with local extinctions or declines. This study also identified the mechanisms by which species are threatened by climate change, some of which are missing from this chapter. Cahill, A.E. et al. 2012. How does climate change cause extinction? Proceedings of the Royal Society B, doi:10.1098/rspb.2012.1890. Wiens (2016) found that climate-related local extinctions are already widespread and have occurred in hundreds of species, including almost half of the 976 species surveyed. Wiens, John J., Climate-related local extinctions are already widespread among plant and animal species, 14 PLoS Biology e2001104 (2016). Pacifici et al. (2017) estimated that nearly half of terrestrial non-flying threatened mammals and nearly one-quarter of threatened birds may have already been negatively impacted by climate change in at least part of their distribution. The study concluded that ‰ÛÏpopulations of large numbers of threatened species are likely to be already affected by climate change, and ‰Û_ conservation managers, planners and policy makers must take this into account in efforts to safeguard the future of biodiversity.‰Û Pacifici, Michela et al., Species‰Ûª traits influenced their response to recent climate change, 7 Nature Climate Change 205 (2017). Scheffers et al. (2016) meta-analysis reported that climate change is already impacting 82 percent of key ecological processes that form the foundation of healthy ecosystems and on which humans depend for basic needs. Scheffers, Brett R. et al., The broad footprint of climate change from genes to biomes to people, 354 Science 719	Added statement about climate change now being accepted national and internationally as a threat to species extinction, just before the regional role up section.
Shaye	Wolf	143656	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		257	259	18	37	The Summary Overview and State of the Sector repeat certain paragraphs verbatim. This is too repetitive, and doesn't seem to occur in other chapters.	Based on guidance from USGCRP, the Executive Summay (in which the Summary Overview is contained) is supposed to be verbatim from the underlying text.
Shaye	Wolf	143657	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		263	263	13	15	The last sentence in the Changing Primary Productivity section is confusing and seems to state that climate change will lead to increased productivity at higher levels and increased fisheries catch. This is not what the cited references suggest.	The wording has been corrected so that the meaning is clear and consistent with the papers cited.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
George	Bakken	143665	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		276	292	1	20	Chapter 7 pp. 276 ff "References" A large fraction of the citations are incomplete throughout. I hope you have staff completing these. It would take me the better part of a week to fix as much as I could, and I'd (hopefully) be duplicating someone else's work. Here are a few from a haphazardly chosen page on toward the middle of the section (Chapter 7 p. 284): : lines 3-4 read: Laufkl¦tter, C., M. Vogt, N. Gruber, O. Aumont, L. Bopp, E. Buitenhuis, and S. C. Doney. 2015. Drivers and uncertainties of future global marine primary:6955‰ÛÒ6984. Complete citation: Laufkl¦tter, C., M. Vogt, N. Gruber, O. Aumont, L. Bopp, E. Buitenhuis, and S. C. Doney. 2015. Drivers and uncertainties of future global marine primary production in marine ecosystem models :6955‰ÛÒ6984. Alfred Wegner Institute, Germany. DOI: 10.5194/bg-12-6955-2015 Lines 5-6 read: Laws, A. N., and A. Joern. 2013. Predator‰ÛÒ prey interactions in a grassland food chain vary with temperature and food quality: 977‰ÛÒ986. Complete citation: Laws, A. N., and A. Joern. 2013. Predator‰ÛÒ prey interactions in a grassland food chain vary with temperature and food quality. Oikos:122(7):977‰ÛÒ986. Lines 7-8 read: Lefort, S., O. Aumont, L. Bopp, and T. Arsouze. 2015. Spatial and body-size dependent response of marine pelagic communities to projected global climate change:154‰ÛÒ164. Complete citation: Lefort, S., O. Aumont, L. Bopp, and T. Arsouze. 2015. Spatial and body-size dependent response of marine pelagic communities to projected global climate change. Global Change Biology: 21(1):154‰ÛÒ164. Lines 9-10 read: Lenoir, J., and J. Svenning. 2015. Climate-related range shifts ‰ÛÒ a global multidimensional synthesis and	Thank you for the comment. We have fixed the citations.
Union of Concerned Scientists	Union of Concerned Scientists	143704	Whole Chapter	07. Ecosystems, Ecosystem Services, and Biodiversity						The content on this chapter seems more focused on specific ecosystem services as they relate to biodiversity and species composition, rather than on ecosystems services and ecosystems as a whole.	Thank you for the comment. We have added a section in the State of the Sector specifically on ecosystem services and included a new key message specifically on ecosystem services as a whole.
Union of Concerned Scientists	Union of Concerned Scientists	143705	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		259	259	7	11	The clear statement on changes in the evidence from the previous NCA was much appreciated. It would be great to see more such statements throughout the report.	We greatly appreciate the reviewer's comment.
Andrew	Philipose	143925	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		266	266	23	28	Can you also give a specific example of climate change refugia and how we can utilize them? Is this suggesting building wildlife corridors like those constructed in Banff National Park, connecting habitat spaces? In the same way, can you provide an example of assisted migration mitigating the effects of habitat or biodiversity loss?	Thank you for the comment, examples have been added.
Michael	MacCracken	144300	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		260	260	5	7	The phrasing of the sentence makes it seem as if the various species had conventions of their members and decided to have a smaller range. Rephrasing is need to make clear this has bee forced on them by climate change. So, sentence might be of form "Climate change has led to reductions in the latitudinal and/or elevation ranges of over half of studied terrestrial plant and animal species in North America; this has generally involved poleward shifts in latitude and upward shifts in their elevation." The next sentence has a similar problem of making this sound intentional rather than forced.	Thank you for the comment, this sentence has been rephrased.
Michael	MacCracken	144301	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		260	260	10	12	It needs to be mentioned that ocean acidification can also affect the responses of species, and so their range.	Thank you for the comment, we have included references to ocean acidification and linked out to the Oceans chapter which discusses OA in greater detail. Additionally, we mention OA under Key Message 1, Key Message 3, and Key Message 4 and provide some more detail in those sections.
Michael	MacCracken	144302	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		260	260	13	13	I'd suggest changing "will" to "are likely to" or "are expected to"	Thank you for the comment. We have removed this sentence.
Michael	MacCracken	144303	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		260	260	15	16	Again, I would think ocean acidification needs to be mentioned as an increasing influence, including that it tends to be more influential in colder waters, so tends to limit the northward shifting option for responses.	Thank you for the comment, we have included references to ocean acidification and linked out to the Oceans chapter which discusses OA in greater detail. Additionally, we mention OA under Key Message 1, Key Message 3, and Key Message 4 and provide some more detail in those sections. We agree OS is an important topic but since it is discussed in detail elsewhere in the report, we are utlizing cross referencing to help streamline our chapter.
Michael	MacCracken	144304	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		260	260	16	20	Perhaps here is where to specifically mention ocean acidification	Thank you for the comment, we have included references to ocean acidification and linked out to the Oceans chapter which discusses OA in greater detail. Additionally, we mention OA under Key Message 1, Key Message 3, and Key Message 4 and provide some more detail in those sections.
Michael	MacCracken	144305	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		264	264	28	30	My understanding is, however, that there are also adverse impacts to some species in Alaska due to warming waters and so a greater likelihood of fish diseases. It would seem to me useful to indicate that at any given location there can be changes that could have the potential to be beneficial for the species and/or the ecosystem and others that would be detrimental--and that, overall, the disruption of the existing ecosystems, particularly the rate of change that is being forced, is likely quite problematic, but with a lot still to be learned.	Thank you for the comment. We have updated this section signficantly, and now have a map with example case studies, thus we will not go into as much detail here.
Michael	MacCracken	144306	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		266	266	8	8	Really need to scrub the word "may" as virtually meaningless and make a choice from the likelihood lexicon--in this case the choice probably depending on the period being talked about. For 2100 and high scenario, probably "virtually certain" or "will", for 2050 probably "very likely" for species having a narrow range and "likely" for species having a narrow range. And so on. But "may" really gives no hint of likelihood and timing, etc.	This section of text has been substantially reworked and no longer contains the reference to "may". However, the heart of this comment refers to the use of may generally. We have standardized the likelihood language and removed the use "may" where possible. However, there are many areas of ecology that are under researched and we were unable to ascribe strong confidence towards any likelihood language. In those instances we kept the word "may" as it accuratly describes the lack of knowledge in terms of likelihood or timing.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144307	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		266	266	24	24	Another "may" to be replaced by a word from lexicon--so perhaps say "will need to be considered" and at the end of the sentence adding a phrase such as "if the viability of the species is to be sustained."	This section of text has been substantially reworked and no longer contains the reference to "may". However, the heart of this comment refers to the use of may generally. We have standardized the likelihood language and removed the use "may" where possible. However, there are many areas of ecology that are under researched and we were unable to ascribe strong confidence towards any likelihood language. In those instances we kept the word "may" as it accuratly describes the lack of knowledge in terms of likelihood or timing.
Michael	MacCracken	144308	Whole Chapter	07. Ecosystems, Ecosystem Services, and Biodiversity						I was surprised to find so little on migrating species (mainly for birds) or on the issue of how to be dealing with protected species with very limited ranges--how might that be done? There is also really no mention of the likelihood that quite a number of species won't be able to adapt and will go extinct. The international compilations on this suggest this will be an important impact, and yet virtually no mention.	Thank you for the comment. We have added specific details on extinction under two key messages.
Michael	MacCracken	144309	Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		269	269	27	29	Two more instances of "may" to replace using words from the lexicon. Also page 270, lines 1, 8, 11, 16 …--would be good to do search of the chapter.	This section of text has been substantially reworked and no longer contains the reference to "may". However, the heart of this comment refers to the use of may generally. We have standardized the likelihood language and removed the use "may" where possible. However, there are many areas of ecology that are under researched and we were unable to ascribe strong confidence towards any likelihood language. In those instances we kept the word "may" as it accuratly describes the lack of knowledge in terms of likelihood or timing.
			Whole Chapter	07. Ecosystems, Ecosystem Services, and Biodiversity						Suggest you add more text on cascading effects,e.g. warmer temperature, especially combined with drought, sometimes increases wildfires, with cascading effects involving biodiversity and ecosystem services. A complex connection exists among many variables depending on the location. Suggested citations: Abatzoglou & Williams. 2016. Impact of anthropogenic climate change on wildfire across western US forests. PNAS. 113: 11770--11775. doi: 10.1073/ pnas.1607171113; Allen et al. 2015. On underestimation of global vulnerability to tree mortality and forest die-off from hotter drought in the Anthropocene. Ecosphere. 6: article129. doi:10.1890/ES15-00203.1; Berner et al 2017. Tree mortality from fires, bark beetles, and timber harvest during a hot and dry decade in the western United States (2003--2012). Environ. Res. Lett. 12: 065005. https://doi.org/10.1088/1748-9326/aa6f94; Enright et al 2015. Interval squeeze: altered fire regimes and demographic responses interact to threaten woody species persistence as climate changes. Fron. Ecol. Environ. 13: 265--272. http://onlinelibrary.wiley.com/doi/10.1890/140231/full; Gergel et al 2017. Effects of climate change on snowpack and fire potential in the western USA. Cl. Change. 141: 287. https://link.springer.com/article/10.1007/s10584-017-1899-y?wt_mc=alerts.TOCjournals; Harvey et al 2013. Influence of recent bark beetle outbreak on fire severity and post-fire tree regeneration in montane Douglas-fir forests. Ecology 94: 2475--2486. doi:10.1890/13-0188.1; Keeley & Syphard. 2016. Climate change and future fire regimes: Examples from California. Geosciences 6(3). http://www.mdpi.com/2076-3263/6/3/37/html; Mitchell et al 2014. Future climate and fire interactions in the southeastern region of the United States. Forest Ecol & Mgmt. 327:316-326. http://dx.doi.org/10.1016/j.foreco.2013.12.003; Sankey et al 2017. Climate, wildfire, and erosion ensemble foretells more sediment in western USA watersheds. Geophysical Research Letters. 44:8884--8892. doi:10.1002/2017GL073979. \n\n\n\n\n	Thank you for the comment. We have noted your suggestion and added more text on compounding stressors
			Whole Chapter	07. Ecosystems, Ecosystem Services, and Biodiversity						The chapter will benefit by adding more text and giving greater emphasis to the extent and effects of interactions of changes in climate with non-climate influences on species and habitat. For example, Most of the reduction in habitat and impacts to species are still due to non-climate influences, but there are increasing observations of such impacts being exacerbated by various aspects of climate change, and a greater role for climate change effects is expected in the future under projected increases in the rate and magnitude of changes in climate. An example is the Florida Keys, an area where natural communities already are greatly reduced and fragmented due to human development. Many species and subspecies of plants and animals there already are at high risk of extinction (and listed as threatened or endangered under the Endangered Species Act, for that reason). Effects of climate change, including sea level rise and associated storm surge, already are impacting much the remaining natural habitat and freshwater aquifers, and these impacts are particularly great with extreme events, e.g., hurricanes that are of greater intensity as a result of changing climate. Regardless of the climate change scenario used, the projections are for increasing sea level and storm surge over time, and given that sea level rise will continue for centuries, this is significant. The same challenges occur along parts of the Atlantic and Gulf Coasts where human developments have already had impacts and climate changes will exacerbate the effects on biodiversity and ecosystem services.	Comment accepted and revision to the text has been made.
			Whole Chapter	07. Ecosystems, Ecosystem Services, and Biodiversity						The chapter implies a far greater level of implementation of climate change adaptation work than appears to be occurring. Although there are examples of such implementation around the US, they are spotty at best and in many (perhaps most) locations there is little or no implementation of such activity. Further, at the national level there is no mechanism for tracking such work, and few states are likely to track this. There also is a need for long-term monitoring that is designed to determine the effects of climate adaptation efforts.	Thank you for the comment. We have added a key message (KM4) on adaptation and natural resource management to asses what has been done and the challenges that remain to incorporate climate adaptation planning into natural resource management
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		257	257	26	28	Two separate ideas are linked in a way that does not make sense in the sentence, Although confidence has increased for many projected climate impacts, the consequences of climate change still vary by region and species. A suggested edit is to make these two separate sentences, and delete the word still in the second part because it implies that the consequences of climate change ought to be the same across regions and species, which is not logical since the consequences will continue to vary across regions and species, and even across populations within species.	We have updated this sentence to: Our understanding of climate change impacts and responses of biodiversity and ecosystems has improved since NCA3, and the expected consequences of climate change will vary by region, species, and ecosystem type
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		258	258	2	4	The description of adaptive capacity (AC) needs to be edited to add the third main component of AC, which is movement/dispersal abilitiy. Perhaps you consider this to be covered separately in the material on range shifts, and if that is the case then an edit is needed in the material on range shifts to acknowledge that movement, including range shifts, is one component of AC, and the AC section can be edited to note that movement is a component of AC, and is covered under the range shift material. Some of the papers cited in the chapter describe thes 3 components of AC, e.g. Glick et al 2011, (p.22) and Beever et al 2015. Note also that the discussion of AC on p. 262, line 3-4, mentions that disperal ability is a "common indicator" of AC but this wording adds confusion since dispersal ability is one of the three components of AC, and involves range shifts. Text on AC elsewhere in the chapter also needs to be edited	Thank you for your comment. We have edited the description of adaptive capacity to include dispersal ability

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		259	259	2	2	As written, the first sentence in this section implies that Earth's biodiversity has value only to the extent that it provides ecosystem services. A recommended edit is to add a phrase which recognizes that for many people, biodiversity has intrinsic value, regardless of whether there is a link to providing 'vital services to human health and well-being."	Thank you for the comment. We have added a reference to existence value of biodiversity into key message 3.
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		259	259	11	12	The phrase significant effort has been made toward incorporating adaptation measures in to land and water management - can easily be interpreted as implying far more widespread effort and actual implementation than exists, particularly in areas where there is active resistance to accepting the reality of climate change. Suggested edit is to add …, although there undoubtedly are many locations where such efforts have not yet been made. For the sake of full disclosure and transparnecy, it also would be appropriate to add a sentence to acknowledge that the federal role in such designing, imlementing, or support such efforts is now unclear in light of recent changes in policies and budget priorities across federal agencies with regard to activities related to climate change.	We have removed this sentence but have expanded discussion of adaptation efforts and changes to natural resource management, both in terms of what is currently happening and areas of need. This includes some actions taken by federal agencies. However, we do not discuss the role of the federal government or any entity has in designing, implementing, or supporting efforts as that could be viewed as policy perscriptive, which is outside the scope of this report.
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		259	259	13	14	Two separate ideas are linked in a way that does not make sense in the sentence, Although confidence has increased for many projected climate impacts, the consequences of climate change still vary by region and species. A suggested edit is to make these two separate sentences, and drop word "still" in the second part because it implies that the consequences of climate change ought to be the same across regions and species, which is not logical since the consequences will continue to vary across regions and species, and even across populations within species.	Thank you for the comment. We have changed the text to: Our understanding of climate change impacts and responses of biodiversity and ecosystems has improved since NCA3, and the expected consequences of climate change will vary by region, species, and ecosystem type
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		259	259	21	27	The description of adaptive capacity (AC) needs to be edited to add the third main component of AC, which is movement/dispersal. Perhaps you consider this to be covered separately in the material on range shifts, and if that is the case then an edit is needed in the material on range shifts to acknowledge that movement, including range shifts, is one component of AC, and the AC section can be edited to note that movement is a component of AC, and is covered under the range shift material. Some of the papers cited in the chapter describe movements - which includes range shifts, as one of the three components of AC, e.g. Glick et al 2011, (p.22) and Beever et al 2015.	Thank you for the comment. We changed the name of the 'Adaptive Capacity' section to 'Changing traits' and focused only on additional forms of AC. Additionally, we acknowledged that dispersal is a form of adaptive capacity in the Range shifts section. Finally, we cross referenced range shifts in the now-called 'Changing traits' section.
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		260	260	2	23	A recommended edit is to add a sentence to this section which acknowledges that movements, including range shifts, are a component of adaptive capacity, although the topic is being treated separately from the other material on adaptive capacity. Some of the papers cited in the chapter describe movements - which includes range shifts, as one of the three components of AC, e.g. Glick et al 2011, (p.22) and Beever et al 2015.	Thank you for the comment. We changed the name of the 'Adaptive Capacity' section to 'Changing traits' and focused only on additional forms of AC. Additionally, we acknowledged that dispersal is a form of adaptive capacity in the Range shifts section. Finally, we cross referenced range shifts in the now-called 'Changing traits' section.
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		260	260	2	23	Although it is beyond the scope of the chapter to provide a comprehensive review or metaanalysis, it will help many readers who are conservation practitioners to have some additional citations to pursue, particularly since this is an important topic for which the scientific literature is large and growing. Suggestions (mostly just for US situations) are: Fei et al 2017. Divergence of species responses to climate change. Science Advances. 2017,3: e1603055; MacLean and Beissinger. 2017. Species' traits as predictors of range shifts under contemporary climate change: A review and meta-analysis. Global Change Biology. 23:4094-4104. https://doi.org/10.1111/gcb.13736; Ralston et al 2017. 2017. Population trends influence species ability to track climate change. Global Change Biology. 23: 1390--1399. doi:10.1111/gcb.13478; Santos et al 2017. The relative influence of change in habitat and climate on elevation range limits in small mammals in Yosemite National Park, California, U.S.A. Climate Change Responses. 4:7. doi: 10.1186/s40665-017-0035-6; Socolar et al 2017. Phenological shifts conserve thermal niches in North American birds and reshape expectations for climate-driven range shifts. PNAS. doi:10.1073/pnas.1705897114; Tingley et al 2012. The push and pull of climate change causes heterogeneous shifts in avian elevational ranges. Global Change Biology. 18: 3279--3290. doi:10.1111/j.1365-2486.2012.02784.x; Whitney et al 2017. Forecasted range shifts of arid-land fishes in response to climate change. Rev Fish Biol Fisheries. 27:463--479. doi:10.1007/s11160-017-9479-9; and Wolf et al. 2016. Altitudinal shifts of the native and introduced flora of California in the context of 20th-century warming. Global Ecology and Biogeography. doi:10.1111/geb.12423.	Thank you for the comment, most of these citation have been added.
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		260	260	18	23	Suggest you add text which acknowledges there are limitations on the extent to which range shifts are possible, and in some locations this is due to habitat fragmentation resulting from human activities such as urbanization, transportation networks, dams that block movement in freshwater aquatic system, and so on; although this is indirectly addressed to some extent in lines 18-23, it is an important point that needs to be made clearly and directly, and it also can be related to climate change adaptation efforts such as the need to retain, restore, or establish climate cooridors and stepping stones to facilitate range shifts. Relevant citations: Early and Sax. 2011. Analysis of climate paths reveals potential limitations on species range shifts. Ecology Letters. 14: 1125--1133. doi: 10.1111/j.1461-0248.2011.01681.x; Parmesan et al 2015. Endangered Quino checkerspot butterfly and climate change: Short-term success but long-term vulnerability? J. Insect Conserv. 19:185--204. doi:10.1007/s10841-014-9743-4	Thank you for the comment, this point, and some of these citations, have been added.
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		261	261	7	23	This section will benefit from the addition of text changes in the abundance of bark beetles (both native and non-native) due to warmer winters and extension of warm weather in spring and fall, as the beetles impacts on forests in recent years have been substantial, and in some locations this is continuing or is likely to resume off-and-on over time. For some locations this has implications related to forest composition and to the scope, frequency, and severity of wildfires, and coupled with changes in temperature and drought this relates to observed and projected changes in habitat (including spread of invasive species, replacement of some forest stands by shrublands), and thus also relates to animal biodiversity. e.g. see Berner et al 2017. Tree mortality from fires, bark beetles, and timber harvest during a hot and dry decade in the western United States (2003--2012). Environ. Res. Lett. 12: 065005. https://doi.org/10.1088/1748-9326/aa6f94	We thank the reviewer for the comment, and agree that this is an important topic. We have added a reference to this topic in the chapter section on emergent properties (pg. 272), where we have determined it is the most relevant. We reveiwed the suggested reference, but determined that more pertinent references are available, which we have cited in the chapter.
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		262	262	3	5	The description of disperal ability as a common indicator of AC need revision as it is is one of the three components of AC, and involves range shifts, so this part also ought to cross reference the sections on range shifts. Some of the papers cited in the chapter describe thes 3 components of AC, e.g. Glick et al 2011, (p.22) and Beever et al 2015.	Thank you for the comment. We changed the name of the 'Adaptive Capacity' section to 'Changing traits' and focused only on additional forms of AC. Additionally, we acknowledged that dispersal is a form of adaptive capacity in the Range shifts section. Finally, we cross referenced range shifts in the now-called 'Changing traits' section.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		263	264	16	3	The section on emergent properties appears to be as good a place as any to more fully and directly discuss changes in community composition under a changing climate. Suggested citations: Franklin et al 2016. Global change and terrestrial plant community dynamics. PNAS. 113(14):3725-3734. https://doi.org/10.1073/pnas.1519911113; HilleRisLambers et al 2015. Implications of climate change for turnover in forest composition. Northwest Science. 89:201--218.	Thank you for this comment. We have added text to page 275 to address your comment and incorporated these references. We have also specified the tern "community compotion" in a few places throughout the emergent properties sections: Changes in community composition varies relative to invasion rates of new species, local extinction, recruitment and growth rates of individual species, as well as other factors that remain uncertain (Lewthwaite et al., 2017). In some cases, such as Pacific northwest forests, community turnover has been slow to date, likely due to low exposure or sensitivity to the direct and indirect impacts of climate change (HilleRisLambers et al., 2015), while in other places like high latitude systems, dramatic shifts in community composition have been observed (Woodward et al., 2018). Differential responses within and across communities are expected due to individual sensitives of community members. There is still high uncertainty in the rate and magnitude at which community turnover will occur in many systems; still, there is widespread agreement of high turnover and major changes in age and size structure with future climate impacts and interactions with other disturbance regimes (HilleRisLambers et al., 2015; Lewthwaite et al., 2017; Woodward et al., 2018) Lewthwaite, JMM , Debinski, DM, Kerr, JTH. 2017. High community turnover and dispersal limitation relative to rapid climate change. GLOBAL ECOLOGY AND BIOGEOGRAPHY, Volume: 26, Issue: 4, Pages: 459-471, DOI: 10.1111/geb.12553 Woodward et al., 2018. Sentinel systems on the razor's edge: effects of warming on Arctic geothermal stream ecosystems. Global Change Biology (2010) 16, 1979–1991, doi: 10.1111/j.1365-2486.2009.02052.x
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		266	267	11	11	The section on Key Message 2:Adaptation Strategies implies more widespread action than is occurring, and ought to be revised to acknowledge the spotty extent of implementation and the need to continue and spread some of the efforts made to date, as well as the uncertain role of federal agencies in light of recent changes in policy and shifts in budget priorities.	Thank you for the comment, we have added a new key message and expanded discussion of adaptation efforts and changes to natural resource management, both in terms of what is currently happening and areas of need. This includes some actions taken by federal agencies. However, we do not discuss the role of the federal government or any entity has in designing, implementing, or supporting efforts as that could be viewed as policy perscriptive, which is outside the scope of this report.
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		266	267	11	11	This section on Adaptation Strategies will benefit from the addition of text on the need for changes in how Adaptive Management is designed and implemented, as the coventional approach was designed without climate change effects in mind, and relies largely on reactive action whereas climate changes require strong proactive approaches (e.g. retaining, restoring, establishing habitat connectivity to facilitate range shifts; retaining restoring sources of cold water for streams, and other measures) as well as more flexible management approaches and development of thresholds or triggers for changing or implementing managment activities so they will occur in time to make a difference.	Thank you for the comment. We have added a new key message entirely on adaptation and natural resource management and well as the areas of uncertainty. This includes incorporating climate adaptation planning into natural resource management.
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		266	266	32	32	Given the many different climate adaptation approaches that are needed depending on the circumstances in a given area, I recommend deleting the phrase - in particular. Although limiting the spread of non-native invasive species certainly can help, it does not warrant an - in particular - as that implies it is more important than other approaches, which will not always be the case even when invasive species are present.	We could removed the term "in particular"
			Text Region	07. Ecosystems, Ecosystem Services, and Biodiversity		273	275	15	31	Suggest you add a section on Adaptation Strategies which can facilitiate Adaptive Capacity. For example, strategies which maintain, restore, or establish habitat connectivity can facilitate dispersal ability; increasing population abundance can help make it more likely that dispersal and establishment in a new location (range shift) will be successful; also increasing population abundance can help increase the likelihood of evolutionary adaptive capacity for some species. Uncertainties are similar to those for the other topics covered on p. 275, although you also could add that uncertainty about the extent of genetic diversity (absent the time and funds for genetic studies) can add to uncertainty about whether increasing abudance is likely to be an effective approach.	Negative emissions can be achieved by removing CO2 from the atmosphere directly or by employing the photosynthetic process to remove CO2 from the atmosphere
Sandra	Fatoric	140845	Text Region	08. Coastal Effects		295	295	16	16	Please add "cultural" next to "and other natural resources" as: and other natural and cultural resources	Thank you for your comment. This sentence has been amended to convey your intended meaning.
Sandra	Fatoric	140846	Text Region	08. Coastal Effects		310	310	32	32	Please add "values" before "needs, and traditional knowledge of impacted"	Thank you for your comment. The sentence has been amended to include your suggested inclusion, as it is consistent with the overall goals of community-driven climate resilience planning.
Sandra	Fatoric	140847	Text Region	08. Coastal Effects		310	310	34	35	Please add reference Fatori€à and Seekamp 2017, before Gonzalez Maldonado, 2014. Reference: Fatori€à, S. & Seekamp, E. (2017). Evaluating a decision analytic approach to climate change adaptation of cultural resources along the Atlantic coast of the United States. Land Use Policy 68, 254-263.	Thank you for your comment. The author team reviewed the paper in question. It is about the participatory process, but does not relate specifically to equity which the subject of this text section. No change made.
Dave	White	140871	Whole Chapter	08. Coastal Effects						The oceans are not rising any faster than the past when you look at the satellite data. You can see the graph from EPA at the bottom of the home page at cctruth.org. The increased evaporation if keeping that from happening. Ask Doctor William Sweet about this.	Thank you for your comment. References that the author team relied on include: Sweet, W.V., R.E. Kopp, C.P. Weaver, J. Obeysekera, R.M. Horton, E.R. Thieler, and C. Zervas, 2017: Global and Regional Sea Level Rise Scenarios for the United States. NOAA Technical Report NOS CO-OPS 083. NOAA/NOS Center for Operational Oceanographic Products and Services; which concludes, among other findings, that the projections and results presented in several peer-reviewed publications provide evidence to support a physically plausible GMSL rise in the range of 2.0 meters (m) to 2.7 m, and recent results regarding Antarctic icesheet instability indicate that such outcomes may be more likely than previously thought. USGCRP, 2017: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp, doi: 10.7930/J0J964J6, which concludes, among other findings, that global mean sea level (GMSL) has risen by about 7–8 inches (about 16–21 cm) since 1900, with about 3 of those inches (about 7 cm) occurring since 1993 (very high confidence). Human-caused climate change has made a substantial contribution to GMSL rise since 1900 (high confidence), contributing to a rate of rise that is greater than during any preceding century in at least 2,800 years (medium confidence). As a result, no changes to the text regarding this comment have been made.
Amanda	Babson	140893	Text Region	08. Coastal Effects		296	296	1	12	Doesn't make sense - rewrite so you are listing 3 oceans and then explain inclusion of Great Lakes.	Thank you for your comment. The in-text verbiage has been amended to make this clearer.
Amanda	Babson	140894	Text Region	08. Coastal Effects		297	297	2	2	It's not the structures that are eroding, it's the land around them. Suggest rewrite to say "structures are projected to be impacted by erosion%ûÒ"	Thank you for your comment. The in-text verbiage has been amended to make this clearer.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Amanda	Babson	140895	Text Region	08. Coastal Effects		308	308	11	11	Cultural heritage and its potential loss for these communities could be added here.	Thank you for your comment. This sentence is designed to focus on the underserved and underrepresented communities rather than specific impacts to cultural traditions. However, the author team did add the component of cultural heritage to the discussion of community-driven resilience planning as well as in the traceable accounts. Other sections of this chapter, as well Chapter 15 (Tribal and Indigenous Communities), go into more depth regarding challenges to preserving cultural traditions or heritage.
Amanda	Babson	140896	Text Region	08. Coastal Effects		316	316	11	12	Suggest adding something like "The efficacy of nature based infrastructure to continue to provide storm protection under future sea level and climate conditions is an additional source of uncertainty."	Thank you for your comment. This verbiage has been added to the traceable account to better indicate the future steps that will need to be taken with regards to NNBI projects.
Amanda	Babson	140897	Figure	08. Coastal Effects	8.1	297				How is it there is virtually no difference in costs with adaptation between RCP 4.5 and RCP 8.5? It makes me seriously doubt the source. Adaptation to substantially greater amounts of SLR (RCPs diverge meaningfully after mid-century) has to cost more. The explanation in the caption, of the different values at 2100 relative to each other doesn't help clarify for me.	Thank you for your feedback. The author team has verified that the numbers are accurate, but agree that the language is unclear as written. It has been revised to enhance clarity.
Amanda	Babson	140898	Figure	08. Coastal Effects	8.2	298				The figure title is Coastal Effects and caption says its about effects, but the content text and how it is referenced in the above text is about how coastal areas are beginning to take actions to mitigate the effects. I see that the figure symbols and the accompanying table which I interpret as the alt text for 508 compliance is about effects, so I suggest amended the title and caption to indicate that it is about regional coastal effects and adaptation examples. Editorially, my suggestion is this figure is trying to do too much and it makes more sense with the structure of the chapter to have one figure here about coastal effects and a separate figure in section 8.3 with the adaptation examples.	Thank you for your comment. The figure title has been amended. Additionally, the figure and table will look substantially difference once the NCA goes to production. The table synthesizes the findings from the rest of the regional chapters that focus on coastal impacts.
Christen	Armstrong	141051	Text Region	08. Coastal Effects		294		29		Seems like 2010 is an outdated number considering it is closer to your projected year, 2020 and is before people started writing the NCA3.	Thank you for your comment. The figures in question have been updated to 2016 and the 2020 figures have been deleted.
Jeremy	Martinich	141052	Text Region	08. Coastal Effects		296		11		"U.S. coasts span three oceans‰ÛÓthe Gulf of Mexico, the Great Lakes, and Pacific and Caribbean islands" This makes it sound like you are naming the three oceans as the great lakes, the gulf of mexico, and the islands. In addition, I am not sure why you are calling out those four and ignoring other major water bodies?	Thank you for your comment. The sentence has been amended for clarity.
Monica	Mazurek	141056	Text Region	08. Coastal Effects		304	304	6	10	This is a confusing run-on sentence. Consider re-wording.	Thank you for your comment. The sentence has been amended for clarity.
Robert	Kopp	141168	Text Region	08. Coastal Effects		296	296	11	12	"the Gulf of Mexico, the Great Lakes, and Pacific and Carribean Islands" is not a list of the three oceans spanned by US coasts.	Thank you for the comment. This sentence has been amended for clarity.
Robert	Kopp	141169	Text Region	08. Coastal Effects		304	304	7	7	"probable to occur" is not using formal probability language properly.	Thank you for the comment. This sentence has been amended for clarity.
Robert	Kopp	141170	Text Region	08. Coastal Effects		304	304	14	14	I believe the authors mean the "current" 100-year flood, not the "contemporary" one (which could be interpreted as contemporaneous with the 2100 sea-level rise).	Thank you for your suggestion. The word has been changed.
Robert	Kopp	141171	Text Region	08. Coastal Effects		305	305	1	5	The American Climate Prospectus (Houser et al., 2015; cited here as Gordon, 2014) did not use the NCA sea-level scenarios, and therefore its results cannot be presented as being associated with the "Intermediate" scenario. It did analyze property falling below mean sea level and falling below mean higher high water for RCP 2.6, 4.5 and 8.5. The central 66% probability ranges for property falling below MSL in RCP 8.5 are $66-$106 B in 2050 and $238-$507B in 2100. The associated sea-level rise projections are the full PDF for RCP 8.5 developed by Kopp et al 2014.	Thank you for your comment. The text has been edited to reflect your concerns.
Robert	Kopp	141173	Text Region	08. Coastal Effects		305	305	5	5	Throughout the report, the document refers to results from the American Climate Prospectus or the Risky Business Report, cited alternatively as Gordon, 2014; Risky Business, 2014; Houser et al. 2014; and Houser et al. 2015. The American Climate Prospectus is the peer-reviewed technical analysis, whereas the Risky Business Report is a summary for policymakers; I would therefore suggest citing the ACP instead of the Risky Business Report. The final version of the ACP was published in 2015 by Columbia University Press; the 2014 version is a Rhodium Group report. Citations should be to Houser et al. 2015: T. Houser, S. Hsiang, R. Kopp, K. Larsen and others (2015). Economic Risks of Climate Change: An American Prospectus. New York: Columbia University Press, 384 pp.	Thank you for the citation clarification. Its reference has been updated throughout the chapter.
Robert	Kopp	141174	Text Region	08. Coastal Effects		310	310	28	28	Hsiang et al 2017 assesses the potential impact of sea-level rise via coastal flooding; it does not assess the resources being to adapt to or mitigate coastal climate change" or their sufficiency.	Thank you for your suggestion.The citation has been removed; although it documents the cost, it does not address adaptation and mitigation costs directly.
Robert	Kopp	141175	Whole Chapter	08. Coastal Effects						This chapter has the potential to be a useful reference on the strategies that are being or could be used to adapt to sea-level rise, but the current discussion of coastal adaptation is limited to 2 paragraphs, plus one figure and a box on Norfolk. It would be helpful to discuss the range of possible adaptation options currently practiced and under consideration in the text.	Thank you for your comments on the chapter. In order to provide a broad overview of the effects facing the coasts, the author team took a high-level view of the situation facing all coastal regions. To that end, a detailed investigation of multiple adaptations is not feasible. Other regional chapters with a large coastal presence (e.g. Hawaii, Caribbean, Southeast) go into more depth about local adaptations and projects, as does the adaptation chapter. Linkages among the chapters will be made in the final version of the chapter.
Robert	Kopp	141176	Traceable Account	08. Coastal Effects		313	313	18	25	Note that the meaning of the probability language in CSSR Chapter 12, which is softened by confidence language ("very high confidence in lower bounds; medium confidence in upper bounds for 2030 and 2050; low confidence in upper bounds for 2100"), is a bit different than the unalloyed language here. Given the limitied degree of confidence, particularly in the upper bounds, it seems a bit awkward to cite highly precise probabilites here. Note that, when these probabilities were presented in the CSSR and in Sweet et al 2017, they came with clear caveats. Per the Table 12.4 caption: "Probability of exceeding the Interagency GMSL scenarios in 2100 per Kopp et al. New evidence regarding the Antarc c ice sheet, if sustained, may significantly increase the probability of the intermediate-high, high, and extreme scenarios, particularly under the higher scenario (RCP8.5), but these results have not yet been incorporated into a probabilistic analysis." Note that, subsequent to the completion of the CSSR, Kopp et al 2017 (doi: 10.1002/2017EF000663) conducted a more formal combination of Kopp et al 2014 and DeConto and Pollard 2016. They found that DeConto and Pollard 2016 increased the central 90% of simulations for RCP 8.5 in 2100 from 0.5-1.2 m to 0.9-2.4 m (median increasing from 0.8 to 1.5 m); for RCP 4.5 from 0.4-1.0 m to 0.5-1.6 m (median from 0.6 to 0.9 m); and for RCP 2.6 from 0.3-0.8 m to 0.3-1.0 m (median from 0.5 to 0.6 m).	Thank you for your comment. The author team agrees with the reviewer and has deleted the probability and clarified the language.
Robert	Kopp	141177	Traceable Account	08. Coastal Effects		314	314	13	13	This statement could be falsely interpreted as saying that we have high confidence in the magnitude of the threat, as opposed to correctly stating that we have high confidence in the existence of the threat.	Thank you for the comment. The text has been edited for clarity.
Sally	Sims	141575	Whole Page	08. Coastal Effects		294				Lines 18-19: Adapting to degradation of habitat integrity and quality may enhance community and ecosystem resilience and decrease both direct and indirect impacts. The sentence above needs to be clarified. Not clear how adapting to degradation of habitat integrity and quality builds resilience. Do you mean, build habitat quality where possible and adapt to changing conditions where not possible? What habitat degradations are you referring to: nutrient pollution, habitat and biodiversity loss, and overfishing?	Thank you for your comment. The author team agrees and the language has been amended to enhance clarity.
Sally	Sims	141576	Figure	08. Coastal Effects	8.1	297				Data points are missing for the orange line, RCP 8.5 Costs with Adaptation.	Thank you for your comment. The author team has amended the figure caption to make the distinction between the two lines clearer.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Chris	Narducci	141606	Text Region	08. Coastal Effects		305		29		remove first at	Thank you for the comment. This change has been made.
Christen	Armstrong	141615	Text Region	08. Coastal Effects		306	306	1	10	Seems like so bold, high impact statements considering you are only citing 1 or 2 papers. There is a lot of literature out there about the lost of coastal wetlands.	Thank you for your comment. The author team added the greenhouse gas inventory as a citation.
David	Wojick	141625	Text Region	08. Coastal Effects		303	303	1	8	Here is the text: 1 Key Message 1: America‰Ûªs trillion-dollar coastal property market and public infrastructure are 2 threatened today by the ongoing increase in the frequency, depth, and extent of tidal flooding 3 due to sea level rise, with cascading impacts to the larger economy. Higher storm surges due 4 to sea level rise and the increased probability of heavy precipitation events exacerbate the 5 risk. Under a higher scenario (RCP8.5), many coastal communities will be transformed by 6 the latter part of this century, and even under lower scenarios (RCP4.5 or RCP2.6), many 7 individuals could suffer significant financial impacts as chronic high tide flooding leads to 8 higher costs and lower property values. Comment: This text falsely states speculative conjectures as established physical facts. As indicated by the references to IPCC scenarios, these conjectures are based primarily on questionable computer projects which are far too sensitive to human activities, especially to CO2 increases. The referenced sea level rise may well be natural and is highly dependent on local conditions, not climate change. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	Thank you for your comment. References that the author team referenced that back their key messages include: Sweet, W.V., R.E. Kopp, C.P. Weaver, J. Obeysekera, R.M. Horton, E.R. Thieler, and C. Zervas, 2017: Global and Regional Sea Level Rise Scenarios for the United States. NOAA Technical Report NOS CO-OPS 083. NOAA/NOS Center for Operational Oceanographic Products and Services; which concludes, among other findings, that the projections and results presented in several peer-reviewed publications provide evidence to support a physically plausible GMSL rise in the range of 2.0 meters (m) to 2.7 m, and recent results regarding Antarctic icesheet instability indicate that such outcomes may be more likely than previously thought. USGCRP, 2017: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp, doi: 10.7930/J0J964J6, which concludes, among other findings, that global mean sea level (GMSL) has risen by about 7–8 inches (about 16–21 cm) since 1900, with about 3 of those inches (about 7 cm) occurring since 1993 (very high confidence). Human-caused climate change has made a substantial contribution to GMSL rise since 1900 (high confidence), contributing to a rate of rise that is greater than during any preceding century in at least 2,800 years (medium confidence). As a result, no changes to the text regarding this comment have been made.
David	Wojick	141626	Text Region	08. Coastal Effects		305	305	30	33	Here is the text: 30 Key Message 2: Fisheries, tourism, human health, and public safety depend upon healthy coastal 31 ecosystems. However, coastal ecosystems are being transformed, degraded, or lost due to 32 climate change impacts, particularly sea level rise and higher numbers of extreme weather 33 events. Comment: This text falsely states speculative conjectures as established physical facts. No climate change impacts are known to have occurred at this time. Sea level rise and extreme weather are both natural and not climate change.	Thank you for your comment. References that the author team referenced that back their key messages include: Sweet, W.V., R.E. Kopp, C.P. Weaver, J. Obeysekera, R.M. Horton, E.R. Thieler, and C. Zervas, 2017: Global and Regional Sea Level Rise Scenarios for the United States. NOAA Technical Report NOS CO-OPS 083. NOAA/NOS Center for Operational Oceanographic Products and Services; which concludes, among other findings, that the projections and results presented in several peer-reviewed publications provide evidence to support a physically plausible GMSL rise in the range of 2.0 meters (m) to 2.7 m, and recent results regarding Antarctic icesheet instability indicate that such outcomes may be more likely than previously thought. USGCRP, 2017: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp, doi: 10.7930/J0J964J6, which concludes, among other findings, that global mean sea level (GMSL) has risen by about 7–8 inches (about 16–21 cm) since 1900, with about 3 of those inches (about 7 cm) occurring since 1993 (very high confidence). Human-caused climate change has made a substantial contribution to GMSL rise since 1900 (high confidence), contributing to a rate of rise that is greater than during any preceding century in at least 2,800 years (medium confidence). As a result, no changes to the text regarding this comment have been made.
Susanne	Moser	141820	Whole Chapter	08. Coastal Effects						Overall, it was refreshing reading this chapter compared to some of the others in NCA4, which are deeply flawed. This here is quite good already, so I have only a few comments. Generally, do a "may" word check - the first two messages in particular include this vague language. We were not allowed to use such words in NCA3. I would assume you can't get that past the final review with the White House either…	Thank you for your comment. The author team has updated the language in question.
Susanne	Moser	141821	Text Region	08. Coastal Effects		303	303	8	9	The key message includes a vague statement on how adaptation "may" decrease losses and cascading economic impacts. But this to be rather weak compared to the numbers given in Figure 8.1. BTW, please check the correctness of the take away message and of the numbers in the figure caption of 8.1. It seems to me the key message here is that stringent mitigation is the greatest cost saving of all. That seems to make the difference between 3.6 trillion vs. 820 billion, no? And secondarily there are the cost savings/damages avoided if adaptation measures were taken. The difference between no adaptation and with adaptation seems surprisingly small. Or am I missing something? Maybe the issue is that the two greens are really hard to distinguish. Anyway, there is something really weird about the graphic versus the text. Please check carefully and maybe extend the vertical scale to show the curves more distinctly.	Thank you for the comment. This sentence has been amended for clarity.
Susanne	Moser	141822	Text Region	08. Coastal Effects		297		3		Seems like citing the 2000 FEMA/Heinz Center study is a bit dated for making a statement about "the next ten years" (i.e., by 2010, which have already passed).	Thank you for your feedback. The author team has amended the language such that the timeline is more appropriate.
Susanne	Moser	141823	Text Region	08. Coastal Effects		298	302	3		Nice to have the table, but - like in its NCA3 predecessor - I would strongly urge you to have all these examples referenced. Will make your chapter a lot stronger.	Thank you for your comment. The final figure will be better sourced back to the NCA4 regional chapters, which is where this information was derived.
Susanne	Moser	141824	Figure	08. Coastal Effects	8.4	308				The figure caption is unclear - you need to clarify which of the two concepts is visualized in which part of the figure.	Thank you for your comment. The figure caption has been amended to more clearly denote which is the "equity" condition and which is the "equality" condition and how it directly relates to KM#3.
Susanne	Moser	141825	Text Region	08. Coastal Effects		309	309	12	17	I think it's important that you broaden out this statement with additional examples from other places. It always worries me that we limit "place attachment" and "culture" to Indigenous peoples, as if the rest of us had none. Louisiana (indigenous and not) as a bayou culture; Miami has a beach culture, as does California and southern Maine. people don't want to move from the Jersey shore as much as they don't want to leave from Puget Sound.	Thank you for your comment. The section in question has been amended to include details on the other types of coastal communities and their ties to their region. The author team agrees that this concept goes beyond Indigenous Peoples.
Susanne	Moser	141826	Text Region	08. Coastal Effects		310	310	19	22	Are you aware of the significant efforts that DOI has undertaken after Hurricane Sandy to assess the performance and effectiveness (adaptation success) of post-Sandy recovery efforts. The effort has led to a framework and important insights about measuring adaptation success. Some useful frameworks and indicators. I believe their framework report is now published. Meanwhile the National Estuarine Research Reserve system has been in a pilot phase of developing Successful Adaptation Indicators and Metrics; those efforts have not yet yielded publications, but the project is described at the NERRS Science Collaborative website (http://graham.umich.edu/media/files/NSC-SAIM.pdf) and provides project description. 5 pilots have been completed.	Thank you for this comment. The author team has added the climate resilience toolkit to the report, which compiles multiple resources including the DOI and NERR work.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Susanne	Moser	141827	Text Region	08. Coastal Effects		310	310	23	28	A study has just been completed that is maybe one of the most detailed examinations of community adaptation funding challenges ever undertaken in the US or elsewhere. I will send a copy via the review email to USGCRP for your consideration.	Thank you for your suggestion. This report will be published beyond the USGCRP report deadline.
Piyush	Garg	141828	Text Region	08. Coastal Effects		318	329	1		Referencing format is highly uneven. Careful copyedit needed	Thank you for the comment. The document will be thoroughly copyedited in the subsequent stages of the process.
David	Wojick	141923	Whole Page	08. Coastal Effects		299				should include Ocean acidification and hypoxia as issues for the southeast region	The author team has collaborated with the Southeast chapter to address this comment and determined that this is not a high priority for that chapter; however, the Agriculture and Rural Communities chapter (Ch. 10) does include information on nutrient-rich runoff which can lead to hypoxia.
Erica	Brown	142035	Figure	08. Coastal Effects	2	298				The title of this figure should better represent the figure itself; i.e., it depicts coastal effects as well as selected adaptation measures. There is no need for a table to replicate what is in the figure.	Thank you for your comment. The figure and table will look substantially different once the NCA goes to production. The table was used for the public comment process only and will not be included in the final figure.
Allison	Crimmins	142137	Text Region	08. Coastal Effects		294	294	3	11	This is an exceptionally well-written key message, and very responsive to the author guidance to frame these in a risk-based manner. However, it is really long. I would suggest deleting the adaptation sentence (last sentence) since KM2 and KM3 already cover this-- and keeping this one key finding focused on the topic of increased flooding and associated economic risks. It just tried to cover too much. Maybe combine the first two sentences to cut down on words: "America's trillion-dollar coastal property market and public infrastructure are threated today by the ongoing increase in the frequency and severity of tidal flooding and higher storm surges due to sea level rise and changes in extreme precipitation, with cascading impacts to the larger economy."	Thank you for your comment. The author team has reviewed the key message and your editorial suggestions. The team has decided to keep the language as written to provide the full context about the threats and actions that can mitigate them.
Allison	Crimmins	142138	Text Region	08. Coastal Effects		294	294	12	19	This is a nice key message, but way way too long. The last two sentences seem to be redundant, so I'd suggest dropping the last sentence at least. I would suggest rewriting as "Fisheries, tourism, human health, and public safety depend on the coastal ecosystems that are being transformed, degraded, or lost due to climate change. Restoring and conserving coastal ecosystems and adopting nature-based infrastructure solutions can enhance resilience the effects of sea level rise and extreme weather, and help ensure continued health of coastal communities and environments."	Thank you for your suggested edit. The author team has accepted it and amended the language accordingly.
Allison	Crimmins	142139	Text Region	08. Coastal Effects		294	294	20	26	The first half of this key message is great. The second half is repetitive and speculative. I would suggest deleting "These questions challenge existing legal frameworks:" since you then go on to say they will test legal frameworks in the very next breath. I strongly suggest dropping the last questions, as this is purely speculative and I doubt it is bourne out in the scientific literature assessed for this chapter. It is also unnecessary, since you just said in the previous sentence that coastal communities will be among the first to test these legal frameworks- so by legal definition, they will be setting the precedent. Deleting these two part of the KM will make it more concise and bolder.	Thank you for your suggested edit. The author team has accepted it and amended the language accordingly.
Allison	Crimmins	142140	Text Region	08. Coastal Effects		294	294	28	29	Should this sentence cite NOAA?	Thank you for your comment. The language has been amended and the appropriate citation added.
Allison	Crimmins	142141	Text Region	08. Coastal Effects		295	295	11	12	Very glad you included mental health impacts. May want to cite the mental health chapter of the health assessment here (Dodgen et al 2016). Since one of your key findings was about social inequity, it would be nice to include a summary sentence on that topic in this summary overview.	Thank you for your feedback. The author team agrees and has added language about the specific mental health impacts of climate- and weather-related disasters to the summary and included the Dodgen et al. 2016 citation.
Allison	Crimmins	142142	Text Region	08. Coastal Effects		296	296	11	12	While I like m-dashes, this one seems to imply that the three oceans you are talking about are the gulf of Mexico, great lakes, and islands. Not that they are in addition to the three oceans. Maybe replaces with "as well as"	Thank you for your suggestion. This sentence has been amended for clarity.
Allison	Crimmins	142143	Text Region	08. Coastal Effects		296	296	15	18	Rather than using the caption to repeat the numbers from the table, I suggest you just say what an economic powerhouse the coasts are. I think you can get across that the coasts punch above their weight without the numbers.	Thank you for your suggestion. The table caption has been shortened to include only the "headline" and the reference. The author team agrees that this facilitates readability.
Allison	Crimmins	142144	Text Region	08. Coastal Effects		297	297	8	10	With such a high premium on space in these chapters, a sentence like this one could be deleted. It doesn't really say much. Also the term "mitigate" could be confusing, as the figure it points to is about adaptation, not mitigation (I get you're using mitigate risks colloquially as in to alleviate risks, but in a climate report this is easily confused)	Thank you for your suggestion. The author team agrees with your comment that the use of "mitigate" in these circumstances could be confusing. As a result, the sentence has been amended for clarity.
Allison	Crimmins	142145	Figure	08. Coastal Effects	2	298				This makes for a great regional roll-up and would be an interesting online interactive, but there is an awful lot of text here! I'm guessing the table is just the text in the figure, but it also seems to be missing citations. These should be added to each bullet point. I would recommend that the authors cut back on text substantially, potentially limited each sector to one or two bullet points. Remove text that is not specifically calling out a state or city. Then in the remaining text, see if you can delete some of the extra words not needed in a figure. For example, in the Northeast, say "New York and New Jersey Port Authorities provide guidelines for engineers…." [citation] and "Binghamptom, NY and Boston ,MA promote…" [citation] instead of "the cities of", etc. These should just be examples, not comprehensive. I would also recommend a similar level of detail for each bullet point. Some say adaptation plans are generally in the works and some are whole paragraphs about one organization and whether their handouts are publicly available. Some have specific dates and numbers, others don't (e.g. the northwest says "during the drought". what drought? when? So everything is fine now?). The Hawaii one is way different from the others, while the first bullet of Alaska is an incomplete sentence. I'd suggest more concise, specific but not detailed bullets. Also the title needs work- these are not "Coastal Effects"- this map is primarily showing adaptation efforts with only icons to represent coastal effects. It may even be more useful to name one effect and one adaptation effort addressing that impact per region, than to try to include every single effect and adaptation program you could find.	Thank you for your comment. The figure and table will look substantially different once the NCA goes to production (as you note, it will be interactive in the online version). The table was used for the public comment process only and will not be included in the final figure. The print version of the chapter will include a limited range of climate change impacts and adaptation examples; the interactive version online will include the full range of climate change impacts per region (as enumerated in the NCA4 regional chapters). The author team has reviewed the examples and consulted with the regional chapters to ensure that only the most relevant adaptation examples are retained. Regarding citations: the information in the graphic was pulled from each of the regional chapters and will be cited as such in the final version.
Allison	Crimmins	142146	Text Region	08. Coastal Effects		303	303	17	17	I'm surprised that there are only two citations here on storm surge and that at least one is rather old. What about recent BAMS reports or papers out of NOAA, or even the NOAA state fact sheets? Even NCA3. And of course, this is very likely in the CSSR.	Thank you for your suggestion. A reference to Chapter 12 of the Climate Science Special Report has been added.
Allison	Crimmins	142147	Text Region	08. Coastal Effects		304	304	15	16	You just finished saying this hugely catastrophic thing is still in the realm of possibility, but then you conclude this well-written paragraph with a rather weak statement about risk management approaches (yawn). I urge the authors to be more bold and use language similar to the CSSR to simply say "Such low-probability, high consequence risks can not be ruled out". This is a much punchier headline and the following text and Key Messages get at the whole adaptation risk planning blah blah management stuff.	Thank you for your suggested edit. The author team has amended the language to incorporate it into the last sentence.
Allison	Crimmins	142148	Text Region	08. Coastal Effects		306	306	4	5	The EPA Indicators report (2016) also has values for wetland land loss, and I'm guessing the NOAA state factsheets do as well.	Thank you for your comment. The author team added the Climate Change Indicators Report (2016) as a citation and documented the loss of wetlands cited in that study.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142149	Text Region	08. Coastal Effects		306	306	15	18	Thank you for your suggestions. The author team has added the NIBS citation since the new Mitigation Saves report does indeed help build the case for the economic benefits. The first citation was not added because it is focused on financing options, which is beyond the scope of the chapter.	Thank you for your comment. The author team agrees that the paragraph is equally clear with or without the acronym. Per your suggestion, it has been removed and the sentence rewritten.
Allison	Crimmins	142150	Figure	08. Coastal Effects	4	308				We've seen this image a million times on facebook, and it's a good one. But I don't understand how it belongs here in the Coastal chapter. This would be a good figure for a separate chapter on Social Inequity, or perhaps a feature page between chapters. Or even in chapter 1. But it applies to everything in this entire report, so shouldn't be stuck here. A different figure on coastal impacts/damages experienced across different socioeconomic factors (gender/ race/ income/etc.), or statistics in Puerto Rico from the hurricane would work better. It would also be nice to see some of the nuisance flooding images from the NOAA factsheets and/or EPA indicators report that show observed and projected days with flooding (e.g. the north Carolina factsheet one is pretty stunning)	Thank you for your suggestions. The author team has considered your feedback and concluded that the figure provides necessary and meaningful context about the concept of social inequity to Key Message 3. The figure has been amended slightly and more information was added in the caption to make the connection more clear. In addition, the concept of equality vs. equity is being addressed by a number of other chapters and thus it has been elevated throughout the report. Finally, the report is intended for the widest possible audience and though social media is widely used, it is not universally used. For those reasons, the figure will remain.
Allison	Crimmins	142151	Text Region	08. Coastal Effects		308	308	7	7	Thank you for your suggestion for additional citations; however this phrase has been deleted from the chapter text.	Thank you for your suggestion for additional citations. The author team has decided not to add the DOD reports since it talk about "threat multipliers" in a military sense rather than the social sense as captured in this sentence.
Allison	Crimmins	142152	Text Region	08. Coastal Effects		309	310	20	2	The example of migration after Katrina was in NCA3. It would be excellent if the authors could find information on the diaspora of Puerto Ricans this year. Though it is early and there may not be final data yet, even reporting estimates would be eye opening.	Thank you for your suggestion. The author team has agreed that because of the timing of the storm, its impacts will be best addressed at a later date once a critical mass of literature has been published.
Allison	Crimmins	142153	Text Region	08. Coastal Effects		310	310	10	35	This text is ok, but a little overly general. It seems to just say adaptation is needed, but it's hard, and somewhere there are some examples. What sort of adaptation is needed? How would it help protect against coastal impacts? What benefit would be see? How much would it cost? It would also be really interesting to note, if you can find literature on this, how frustrating it can be to talk about adaptation on the coasts, because even when adaptation or abandonment is the "right" decision to make economically, most people refuse to abandon their property (not to mention federal money keeps bailing them out, so why move?). This makes trying to project future damages to coastal property really challenging, because you'd think you could just make a rule in the model that when it is cheaper to abandon than adapt, people choose to abandon. But of course, no such rational actors. There is this odd psyche of people unwilling to "be beaten" by nature and they'll "be survivors" and just keep rebuilding, even when it makes no sense to do so. These types of topics could replace things like page 310 lines 17-22, which is already covered in the regional rollup. Even lines 10-15 is already covered elsewhere in the chapter.	Thank you for your comments. The National Climate Assessment is a scientific document that provides a basis for decision making, but does not prescribe policy or specific adaptation measures. Discussion of these topics is beyond the scope of the assessment. The wide range of costs, adaptation types, and communities affected make it impossible to go into detail in a chapter such as this one. You will find greater detail about particular projects in the regional chapters. The coastal effects chapter looks more at the broad trends that are facing all of the coastal regions.
Allison	Crimmins	142154	Text Region	08. Coastal Effects		310	310	23	25	Where are the citations for this statement At least for the "many current plans"?	Thank you for your suggestion. The author team has added a reference that includes case studies as examples.
Allison	Crimmins	142155	Text Region	08. Coastal Effects		310	311	36	25	Really good text box. Hopefully there is a flood map from the Navy that you can use in this box (instead of the generic social equality/equity picture). This text box much more detailed than the bullet in the regional roll-up figure, so I'd suggest dropping Norfolk from the already way-too-long- text in the figure.	Thank you for your comments on the chapter. Given that Norfolk is already featured in its own section, the author team agrees that it can be omitted from this figure.
Allison	Crimmins	142156	Whole Chapter	08. Coastal Effects						Even if we (charitably) count the map figure/table text as just one page, this chapter is still 12 pages long. So, twice as long as it should be. I think a lot of redundancy could be cut by keeping adaptation to one section and not talking about it in every other section. There doesn't need to be a separate 8.3 section on adaptation, since this is already covered by the map figure and the other key message text, so that should save you a page. Dropping Figure 4 and shortening the map text and key message text will help too. But there is still a lot to cut.	Thank you for your feedback on the chapter. The length is impacted in this version by the inclusion of the cover page, executive summary, and table for Figure 8.2. Once fully formatted, the length will meet USGCRP guidelines. The authors have considered your comments regarding changes to section 8.3 and have decided to retain it to provide the necessary context for understanding the social, economic, and environmental impacts of sea level rise and flooding on the coasts and their communities. Likewise, the author team has concluded that the inclusion of Figure 8.4 provides important context for the concept of social equity.
Allison	Crimmins	142157	Whole Chapter	08. Coastal Effects						While the summary overview mentioned some psycho-social impacts, the chapter itself did not. I would suggest adding a sentence or two in about the mental health impacts of all these coastal damages, particularly when people lose or need to abandon their homes (see Dodgen et al 2016 in the health assessment).	Thank you for your comment. The author team agrees that including specific mental health impacts strengthens the chapter. Language has been added and the Dodgen et. al., 2016 citation included.
Allison	Crimmins	142158	Traceable Account	08. Coastal Effects		312	312	3	13	This is one of the better traceable account intros. Anything else to add about author selection or decisions that the author team made regarding scope? For instance, are some topics covered in other chapter and so not covered here?	Thank you for your comment. The traceable account has been updated to add additional information regarding author team selection and the strategy and decision process regarding review scope. In particular for author team structure, please refer to "Appendix 1: Report Development Process," where there is additional information about the options for author team structure. Note that there are additional all-Federal led chapters in the report.
Allison	Crimmins	142159	Whole Chapter	08. Coastal Effects						This chapter was really adaptation heavy, with every key message and section talking about adaptation in some way (most of the figures/text boxes too!). What about mitigation? I appreciated the figure that showed the difference between RCP8.5 and 4.5, but I wondered if there was a more balanced approach to talking about mitigation versus adaptation in the chapter text. Even if the answer is that a lot of mitigation would still lead to severe impacts that need to be adapted to, that would be good to say. It would be helpful to know how much of this could be avoided (or not) under alternative mitigation scenarios.	Thank you for your suggestion. Because the coasts are not able to actively engage in mitigation efforts, the author team chose to focus its language on adaptation to climate change impacts. However, please note that Chapter 2 (Our Changing Climate), Key Message 2 (Future Warming Depends on Human Emissions and Earth's Response) of the National Climate Assessment addresses this concern in more detail.
Allison	Crimmins	142160	Traceable Account	08. Coastal Effects		313	313	10	11	Because there is only one italicized confidence/likelihood statement for this very very long key message filled with multiple topics and points, I am uncertain what exactly you have high confidence/likely in. Suggest adding more statements at the end of each point (e.g. regarding damages, economic impacts, transformation of coastal communities)	The author team has reviewed the text and agree that with updates made to the key message text the confidence and likelihood statements do apply to the entire key message.
Allison	Crimmins	142161	Traceable Account	08. Coastal Effects		313	314	13	2	A little more "description" in the description of evidence base would be nice. Are these things well studied, with research dating back years and years, and everyone in consensus? Or is this new, emerging science? For example, noting that there are not many economic sectoral models that quantify damages under alternative climate scenarios (really, just Risky Business and CIRA) would be helpful to know. Letting the reader know about the contention over methodologies for projecting sea level, and how these estimates have changed (not the numbers, but just that they changed with recent scientific advancements) would also be helpful. This same section in KM2 is a good example.	Thank you for your comment. Language about the limited number of economic models and value of additional work in this area has been added. The author team decided it was appropriate to focus on the latest SLR projection science as opposed to trying to detail changes in projection methodologies. The CSSR and technical report from the Interagency Task Force on Sea Level Rise provide detail about SLR projection science.
Allison	Crimmins	142162	Traceable Account	08. Coastal Effects		314	314	25	35	Here, the authors say "very high confidence", but above in the key finding it was just "high confidence". These should be made consistent, which would help if additional confidence levels were provided for each topic within the key message.	The author team wanted to express an overall confidence level for the Key Message in the chapter text. However, the traceable account includes a reference to a specific section of that Key Message in which the author team has very high confidence.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142477	Text Region	08. Coastal Effects		305	305	22	28	An NRDC analysis found that between 1998-2014, FEMA spent $48.6 billion on Public Assistance Grants in areas subject to a federal disaster declaration. These grants were predominantly used to repair or replace public buildings ($12.6 billion), public utilities ($7.4 billion), roads and bridges ($5.5 billion), and water-control facilities like levees, dams, and pumps ($1 billion). The biggest recipients were Louisiana ($13.7 billion), New York ($9 billion), Florida ($5.1 billion), Texas ($3.8 billion), and Mississippi ($3.4 billion). (See https://www.nrdc.org/resources/need-flood-protection-standards.)	Thank you for your comment, but it does not appear to raise a question or suggest a revision for the document. The verbiage in this section has not been amended.
Juanita	Constible	142478	Text Region	08. Coastal Effects		306	306	11	14	Coastal wetlands provide flood mitigation benefits as well, which should be referenced in this section. A recent study found that in Ocean County, New Jersey, existing coastal wetlands were responsible for $625m in avoided flood damages during Hurricane Sandy. (See The Value of Coastal Wetlands for Flood Damage Reduction in Northeastern USA, Nature Climate Change, August 2017.)	Thank you for your comment. The new citation has been added.
Juanita	Constible	142479	Text Region	08. Coastal Effects		308	308	5	19	NRDC analyzed FEMA flood insurance data and found that lower value homes, presumably owned by lower income owners, suffer much higher levels of flood damage relative to the property's value. This is a clear indication of inequity in disaster losses. Among severe repetitive loss properties, less valuable homes were more likely to suffer flood damages that exceeded the property's value. Among single-family homes worth less than $250,000, the average sum of all damages ($133,923) exceeded the value of the average home ($109,882). Among single-family homes worth more than $250,000, however, average damages were some $200,000 less than the average home's value.	Thank you for your suggested citations; however, the author team did not add the NRDC issue brief as the organization tends to be policy prescriptive.
Juanita	Constible	142480	Figure	08. Coastal Effects	3	308				To highlight the inequity that exists in repeatedly flooded homes and the disproportionate damages that lower income homeowners often suffer relative to their home's value, we suggest including the graphic referenced (see Seeking Higher Ground, Fig. 2 "Less expensive homes are more likely to suffer [flood] damage that exceeds the property's value", NRDC, July 2017, available at https://www.nrdc.org/sites/default/files/climate-smart-flood-insurance-i…)	Thank you for your suggested citations; however, the author team did not add the NRDC issue brief as the organization tends to be policy prescriptive.
Karin	Bumbaco	143127	Figure	08. Coastal Effects	8.1	297				The figure is misleading and suggest removing this from the chapter. Figure caption text is plagiarized directly from the cited EPA report. In addition, "Protective Adaptation Measures" as stated in the caption are never discussed in the text.	Thank you for your feedback. The author team has considered your comment and opted to retain the figure. The figure citation has been properly footnoted and permission received to use the figure in the Coastal Effects chapter, so plagiarism is not an issue. Additionally, while the term "protective adaptation measures" is not included in section 8.1, other adaptation efforts are and examples of protective adaptation measures are detailed in Key Message 1. Thus, no change has been made.
Devin	Thomas	143130	Figure	08. Coastal Effects	8.2	298				This is a homemade graphic based entirely on subjective opinion. The figure is sourced as "NOAA", but no data sources are provided as background information for this figure. Moreover this figure is not reproducible outside of this publication. In addition, using four full pages of text as a figure caption is ridiculous. This is obviously necessary because the figure itself is squished and illegible in its current state. If this figure is to stay in the chapter, significant supporting documentation must be provided (1 for each region, 2 for each icon used within each region, and 3 appropriate cross-check with the other regional chapters). In short, strongly recommend deleting this non-reproducible figure.	Thank you for your comment. The figure and table will look substantially different once the NCA goes to production; in particular, it will be interactive in the online version. The table was used for the public comment process only and will not be included in the final figure (in either the print or online version). The figure will also be better sourced back to the NCA4 regional chapters, which is where this information was derived. With the proper citation back to the regional chapters, this figure would be reproducible.
Devin	Thomas	143131	Text Region	08. Coastal Effects		303		1		"America's trillion-dollar coastal property market…" Please provide supporting documentation or references for the use of trillion dollar.	Thank you for your comment. The standard for this report is to keep citations out of the Key Message itself. However, the citation has been added where appropriate in the Key Message narrative section.
Karin	Bumbaco	143132	Text Region	08. Coastal Effects		303		21		With respect to tropical cyclone intensity increases, while this is true there is no assumption of an associated increase/decrease probabilities of any coastal impact. That is to say just because TC's are intensifying, it doesn't mean they're always going to hit land.	Thank you for your comment. The author tem agrees that it originally worded, this passage only described intensity, not the impact due to landfall. The passage has been amended to make it more clear.
Devin	Thomas	143134	Text Region	08. Coastal Effects		304	305	17	5	Strongly suggest moving this entire paragraph to the discussion of Figure 8.1.	Thank you for your comment. The author team has considered your suggestion and opted to retain the paragraph in its original location, as it does not speak to gains from adaptation, but rather losses from impacts.
Karin	Bumbaco	143135	Text Region	08. Coastal Effects		304		25		Please explain what is meant by "with the Atlantic and Gulf coasts facing greater-than-average risk". It reads out of context with the rest of the paragraph.	Thank you for your comment. This sentence has been amended to make the wording more clear. It now explains that these regions of the country will face greater-than-average risks when compared to other regions of the U.S.
Karin	Bumbaco	143137	Text Region	08. Coastal Effects		306	306	11	14	These are the only two sentences on coastal wetlands in the entire chapter. Given their inherent importance in protecting coastal properties I would like to see a little more effort into explaining their importance and as an alternative to coastal shoreline hardening.	Thank you for your comment. The author team agrees that they are important; the chapter has been updated and amended to include additional references related to wetlands including (Narayan et al., 2016) and (Barbier et al., 2013).
Karin	Bumbaco	143139	Text Region	08. Coastal Effects		306		22		"Innovative approaches…" Please provide documentation and/or concrete examples for what is meant by innovative approaches.	Thank you for your comment. This sentence has been re-worded to focus on broad ideas related to nature-based infrastructure, rather than getting into detailed discussions of particular programs.
Devin	Thomas	143141	Figure	08. Coastal Effects	8.3	307				Each image needs to be called out specifically in the figure caption. For example, the upper left panel could be labeled "A", upper right corner "B" and so on with a corresponding description of each panel with its new label in the figure caption.	Thank you for the comment on the figure. Per your comment, subsequent versions of this figure will have individual labels for each example of NNBI habitats.
Devin	Thomas	143142	Text Region	08. Coastal Effects		308	308	7	8	"…Exacerbating many deeply ingrained inequities that precede any climate-related impacts". This needs more explanation in an effort to steer clear of any political motivations in this sentence.	Thank you for your comment. The author team has edited the sentence in question and added additional citations to support the point made.
Devin	Thomas	143143	Text Region	08. Coastal Effects		308		13		"…Pathways forward…". Please provide concrete examples by what is meant by this.	Thank you for your comment. This sentence has been amended for clarity to focus on the idea that how the communities will fare long-term after storm damage is not yet known.
Devin	Thomas	143144	Figure	08. Coastal Effects	8.2	309				This is in reference to photo 8.2 which is the same exact photo from page 295. Recommend switching things up a bit.	Thank you for your comment. The Executive Summary was produced per the guidance from USGCRP and will not immediately precede the chapter in the final version of NCA4 (as it did in the public review copy). As the final NCA4 product will solve the issue identified, no action will be taken by the author team.
Jeff	Lukas	143145	Text Region	08. Coastal Effects		294	297	28	10	The executive summary provided on page 294 is IDENTICAL to the text that actually starts this section on page 296. From a readers perspective this is incredibly redundant and suggest the authors freshen up the wording in either/both sections so that they are not in fact the same.	Thank you for your comment. This construct is per the USGCRP guidelines for the executive summary. In the final format, the executive summary will not immediately precede the chapter.
Devin	Thomas	143147	Text Region	08. Coastal Effects		309	309	12	17	This section needs its own introduction or should be removed entirely. I believe the authors are trying to address climate migration as one form of adaptation but have only called out this specific example from Newtok, Alaska. The cited reference (Bronen 2011) is a lawyer who wrote an article about the legal challenges of moving one Alaska town from A to B. As such it is a stretch to link one particular example to a whole method of adaptation.	Thank you for your comment. This section of the document has been rewritten to include other types of attachment to coastal regions, not just Indigenous Peoples - as such, the revised statement moves away from focusing specifically on climate migration.
Devin	Thomas	143149	Text Region	08. Coastal Effects		311		11		"…Residents may need to relocate (Fears 2012)". Am wondering if this reference and the cities cited within it are still a valid argument.	Thank you for your question. This discussion is ongoing in the city and their Resilience Strategy document references flooding and plans to mitigate it or adapt to it repeatedly. https://www.norfolk.gov/DocumentCenter/View/27257. The passage has been amended to better reflect the content of the article in question.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Ken	Moraff	143150	Text Region	08. Coastal Effects		311		22		"Intermediate low and extreme". This is in direct reference to the RCP 2.6/8.5. I am curious how other chapters refer to these scenarios. For the sake of consistency across the chapters and this chapter, might it be better to use the actual RCP numbers and simply refer the readers back to chapter 2 if they want to know more about them?	Thank you for the comment. The Technical Services Unit of USGCRP is tasked with ensuring consistency across the chapters.
Ken	Moraff	143154	Figure	08. Coastal Effects	1	297				The description should read "…compared to $820 billion with adaptation"	Thank you for your suggestion. The author team has verified against the source report (U.S. EPA. 2017. Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment. U.S. Environmental Protection Agency, EPA 430-R-17-001) that the number of $800 billion is accurate and has thus left the language as originally written.
Ken	Moraff	143155	Figure	08. Coastal Effects	2	298				We have many municipal adaptation efforts underway in the New England. A bullet could be added to this list to say "for further information on adaptation efforts in the Northeast, please see www.epa.gov/raine.	Thank you for your comment. The adaptation examples included in Figure 8.2 have been pulled from the NCA4 regional chapters and are not an exhaustive review of all of the adaptation examples in any one region. If this comment was also addressed and accepted by the Northeast chapter, it will be included in the figure during the update process.
Ken	Moraff	143156	Figure	08. Coastal Effects	2	298				"Icon" is used in this context as a name for specific climate change impacts. Please add a definition in the document and in each chapter.	Thank you for your comment. The author team agrees that the icons were too difficult to understand; they will be deleted in the final version and replaced with text.
Ken	Moraff	143157	Figure	08. Coastal Effects	2	298				Add "changing precipitation patterns" to the icon list as it is one of the most significant impacts for the northeast region, as stated in the Northeast chapter.	Thank you for your comment. The climate change impacts included in Figure 8.2 have been pulled from the NCA4 regional chapters. If this comment was also addressed and accepted by the Northeast chapter, it will be included in the figure during the update process.
Social Science	Coordinating Committee	143263	Figure	08. Coastal Effects	2	298				Regional cases should include citations.	Thank you for your suggestion. The cases are drawn from the regional chapters of the NCA4 document. They will be cited as such, with the full references available in the individual regional chapters.
Social Science	Coordinating Committee	143264	Figure	08. Coastal Effects	2	298				Examples in figure/table should include existing cases of managed retreat (e.g. HUD/Isle de Jean Charles case on p. 310, line 5.)	Thank you for your comment. The adaptation examples included in Figure 8.2 have been pulled from the NCA4 regional chapters and are not an exhaustive review of all of the adaptation examples in any one region. If this comment was also addressed and accepted by the Southeast chapter, it will be included in the figure during the update process.
Social Science	Coordinating Committee	143265	Figure	08. Coastal Effects	2	298				Adaptations can be categorized by implementation stage (e.g. https://toolkit.climate.gov/#steps).	Thank you for your comment on the figure. The author team considered your request and has decided against categorizing adaptation by implementation stage in favor of presenting the examples from the other regional chapters in a concise synthesis.
Social Science	Coordinating Committee	143266	Figure	08. Coastal Effects	2	298				Impact icons are too numerous to focus on. Several can be grouped (e.g. 'coastal flooding/erosion')	Thank you for your comment. The author team agrees that the icons were too difficult to understand. In the final online version, they will be deleted and replaced with text; the print version will include a limited range of climate change impacts and adaptation examples.
Social Science	Coordinating Committee	143267	Figure	08. Coastal Effects	2	298				The meaning of the 'Extreme Events' impact is unclear. Why does the Caribbean have this icon, but not the Southeast?	Thank you for your comments. The map is drawn from information in each regional chapter, so as these chapters are revised, so is the coastal effects map. If the Southeast chapter includes Extreme Events when the figure is finalized, it will be reflected here as well.
Social Science	Coordinating Committee	143268	Figure	08. Coastal Effects	2	298				Examples in the Midwest and Southern Great Plains categories should be reduced in length and more examples should be included.	Thank you for your comment on the figure. This figure cites the findings from other regional chapters; thus, the examples are drawn from the topics that those chapters have chosen to focus their key messages on.
Social Science	Coordinating Committee	143269	Figure	08. Coastal Effects	2	298				Restructure the Hawaii and Pacific Islands section to explain purpose of listed policy initiatives (e.g. Majuro Declaration). All examples should concisely describe the action.	Thank you for your comment. As addressed in the NCA4 Federal Register notice, this assessment focuses on "synthesizing and assessing the science and impacts of climate change across 15 sectors and 10 regions of the United States, and considers options to reduce present and future risk, in a policy-relevant, but not policy-prescriptive manner." As a result, the suggestion to explain the purpose of listed policy initiatives has not been accepted by the author team.
Social Science	Coordinating Committee	143270	Text Region	08. Coastal Effects		310	310	22	22	Add U.S. Climate Resilience Toolkit https://toolkit.climate.gov/.	Thank you for the suggestion. The citation has been added.
Social Science	Coordinating Committee	143271	Traceable Account	08. Coastal Effects		317	317	13	21	Major uncertainties should include more commentary on differences in state law regarding coastal impacts as well as the pace at which common law is responding to change.	Thank you for your comment. The author team agrees that this is an important point and has included language in the major uncertainties portion of the traceable accounts.
Social Science	Coordinating Committee	143272	Whole Chapter	08. Coastal Effects						The coastal chapter does not adequately address the role of vertical land movement (subsidence & uplift) on relative sea level rise or the human role in subsidence. That subsidence is a large portion of current coastal sea level rise trends should at least be noted. Replenishing ground aquifers is currently being considered in Hampton Roads, VA.	Thank you for your feedback. This level of technicality is beyond the scope of this chapter, which is intended to provide a more broad overview of climate change-related impacts on our coasts. Therefore, the language will not be amended as suggested. However, please note that Chapter 2 (Our Changing Climate), Key Message 9 (Ocean Circulation, Regional Sea Level Rise and Coastal Flooding) of the National Climate Assessment addresses this concern in more detail as does the Climate Science Special Report (Vol.1 of the National Climate Assessment). Additionally, several citations in this chapter refer to reports that do delve into these areas (e.g., Sweet et al., 2017).
Carole	LeBlanc	143379	Whole Chapter	08. Coastal Effects						It might be helpful for the Reader of this section to learn something about the role of the National Estuarine Research Reserve System. Alternatively, this topic could be addressed in a chapter devoted to a region (for example, the Wells National Estuarine Research Reserve in Maine could be mentioned in Chapter 18, Northeast).	Thank you for your comment. Work being conducted by the National Estuarine Research Reserve System and the National Estuary Program advances our understanding of ecosystem changes related to climate. Mention of research being conducted on natural and nature-based features has been included in the chapter.
John	Fleming	143639	Text Region	08. Coastal Effects		296	296	11	12	The text reads: "U.S. coasts span three oceans--the Gulf of Mexico, the Great Lakes, and Pacific and Caribbean Islands." For clarity, the sentence should read: "U.S. coasts span three oceans, the Gulf of Mexico, the Great Lakes, and Pacific and Caribbean Islands." This avoids confusion. The original sentence could be read as though "three oceans" refers to the Gulf of Mexico, the Great Lakes, and the Pacific and Caribbean Islands.	Thank you for your comment. This sentence has been amended for clarity.
John	Fleming	143641	Whole Chapter	08. Coastal Effects						Throughout the chapter, emissions scenarios are referenced to characterize potential climate change impacts, primarily RCP8.5 and/or RCP4.5. However, in many instances, only RCP8.5 is mentioned whereas in other cases potential impacts under both RCP8.5 and RCP4.5 are stated. Throughout the chapter, impacts should be assessed under not only under RCP8.5 and RCP4.5, but also under RCP2.6 since this is the only scenario consistent with keeping temperature below 2 degrees Celsius. Relying on all three will better frame the likely risks and the effort that will be necessary to prevent many adverse climate change impacts. Also, this will illustrate the benefits and necessity of reducing emissions to avoid unacceptable climate change damage. Relying solely on RCP8.5 projections discounts the horrible impacts that will occur at lower emissions trajectories such as RCP4.5, and how RCP2.6 and below should truly be the goal.	Thank you for your feedback. The author team agrees that the scenarios should be referenced more consistently where possible and has amended the language. Note: The author team received explicit intructions to use the RCP4.5 as the low-end scenario (https://scenarios.globalchange.gov/accouncement/1158)

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michelle	Tigchelaar	143800	Text Region	08. Coastal Effects		294	294	23	25	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. In Key Message 3 it says: ‰ÛÏcoastal communities will be among the first in the nation to test climate-relevant legal frameworks and policies against these impacts.‰Û These lawsuits and policies are already being tested, e.g., the 2008 Kivalina lawsuit against ExxonMobil Corporation, 2016 federal grant funding for the resettlement of the residents of Isle de Jean Charles, the listing of the polar bear as a threatened species under the Endangered Species Act in 2008, and the Massachusetts v. EPA Supreme Court case of 2007. We suggest changing the language from ‰ÛÏwill‰Û to ‰ÛÏare‰Û.	Thank you for your suggested change. The Isle de Jean Charles example is included in the text.
Union of Concerned Scientists	Union of Concerned Scientists	143820	Whole Chapter	08. Coastal Effects						This chapter includes some very important key messages that can help expand understanding of the urgency of coastal risk in important ways. As support for these messages and key findings, however, the body text is in some places lacking important (non-technical) information and explanation for the policy maker and lay audience. Many of the comments here are non-technical or reference-driven; rather they call out small changes and additions that are needed to provide an adequately helpful backdrop for those key messages, and to make them fully understandable and applicable.	Thank you for taking the time to review the chapter. This comment does not appear to raise a question or suggest a revision that the authors can adequately address from your comment.
Union of Concerned Scientists	Union of Concerned Scientists	143821	Text Region	08. Coastal Effects		294	294	12	13	Suggest stipulating this is about the "coastal" nature of tourism, human health and public safety, as these writ large don't depend on healthy coastal ecosystems.	Thank you for your comment. After consideration of this point, the author team has determined that the existing text is clear and accurate, as the sectors described in this sentence would be substantially impacted if ecosystem health degraded. The sentence has not been amended.
Union of Concerned Scientists	Union of Concerned Scientists	143822	Text Region	08. Coastal Effects		294	294	18	19	Change to "unavoidable degradation"?	Thank you for your comment. The authors have re-read this paragraph and decided that speculating on whether habitat degradation is "unavoidable" or not is beyond the scope of the National Climate Assessment. The passage has not been amended.
Union of Concerned Scientists	Union of Concerned Scientists	143823	Text Region	08. Coastal Effects		294	294	20	23	In this sentence, "communities" are both the actor and the one acted upon. Both are valid points, but they are confused in this sentence. Choose one and adjust text.	Thank you for your comment. To clarify this key message, the author team has amended the sentence to focus on vulnerable populations, not communities.
Union of Concerned Scientists	Union of Concerned Scientists	143824	Text Region	08. Coastal Effects		294	294	31	34	Suggest change to "to global trade"	Thank you for your comment. This sentence has been amended to include the suggested phrase.
Union of Concerned Scientists	Union of Concerned Scientists	143825	Text Region	08. Coastal Effects		295	295	8	9	Suggest change to "housing and infrastructure"	Thank you for the comment. This sentence has been amended to include the suggestion of housing losses as well.
Union of Concerned Scientists	Union of Concerned Scientists	143826	Text Region	08. Coastal Effects		295	295	8	12	This last assertion is both sweeping and too limited. (a) These adverse impacts certainly exist, but they affect people primarily in storm-affected areas, and increasingly in tidally-flooded ones. Hard to say they are rippling through the country. (b) some important personal- and household-scale impacts are missing. Suggest "adverse financial, social, and psychological impacts to affected citizens, and in turn, their broader communities".	Thank you for your comment. The passage has been amended to incorporate your suggestions and to improve overall readability.
Union of Concerned Scientists	Union of Concerned Scientists	143827	Text Region	08. Coastal Effects		295	295	14	15	Move "(about $1 trillion) to after "real estate". The threatened national wealth is larger (military bases, ports, airports transportation infrastructure, etc.)	Thank you for your comment. The passage has been amended to incorporate your suggestions and to improve overall readability.
Union of Concerned Scientists	Union of Concerned Scientists	143828	Text Region	08. Coastal Effects		296	296	2	2	Suggest change to "often economically vibrant"	Thank you for your comment. The in-text verbiage has been amended to make it clearer that not every portion of coastline is economically vibrant.
Union of Concerned Scientists	Union of Concerned Scientists	143829	Text Region	08. Coastal Effects		296	296	5	8	A key reason the coasts are economic engines is because of the economic productivity of these big cities, which does not depend solely (or even primarily) on defense, fishing, transpo, and tourism. Suggest something like: "The coasts are economic engines that house some of our nation's major urban centers, that support jobs…"	Thank you for your comment. This sentence has been amended to include the suggested phrase.
Union of Concerned Scientists	Union of Concerned Scientists	143830	Text Region	08. Coastal Effects		296	296	7	8	Suggest change to "global trade"	Thank you for your comment. This sentence has been amended to include the suggested phrase.
Union of Concerned Scientists	Union of Concerned Scientists	143831	Text Region	08. Coastal Effects		296	296	11	12	Either needs oceans added or clarification that water bodies in this list are not oceans.	Thank you for your comment. This sentence has been amended for clarity.
Union of Concerned Scientists	Union of Concerned Scientists	143832	Text Region	08. Coastal Effects		296	296	26	29	Comments from summary apply here: This last assertion is both sweeping and too limited. (a) These adverse impacts certainly exist, but they affect people primarily in storm-affected areas, and increasingly in tidally-flooded ones. Hard to say they are rippling through the country. (b) some important personal- and household-scale impacts are missing. Suggest "adverse financial, social, and psychological impacts to affected citizens, and in turn, their broader communities".	This comment is the same as 143826, but refers to a different section of the paper. The verbiage has been amended in both places to improve overall readability.
Union of Concerned Scientists	Union of Concerned Scientists	143833	Text Region	08. Coastal Effects		296	297	30	3	Suggest specifying what is meant by "structures" -- transportation infrastructure? Reads like it could mean buildings.	Thank you for your feedback. The author team agrees that the sentence as written is unclear. The language has been amended to enhance clarity of meaning.
Union of Concerned Scientists	Union of Concerned Scientists	143834	Figure	08. Coastal Effects	2	298				These icons are of course a mix of climate risks, stressors, vulnerabilities, and impacts. With the image, this seems fairly well baked, but it is a mix of apples and oranges, plus bananas, etc..	Thank you for the comment on the figure. It does not appear to offer a comment or a suggestion for improvement; as such, the author team was unable to take action on this comment in a way that enhances the figure.
Union of Concerned Scientists	Union of Concerned Scientists	143835	Figure	08. Coastal Effects	2	298				Sea level rise is the stressor, but it's not an impact. The impact (not already listed here) might more accurately be "coastal inundation and land loss".	Thank you for your suggestion. The author team has decided that leaving SLR as-is makes sense, given that the overall stressor is climate change, resulting in an impact of SLR. The table has not been amended. For more information regarding climate as the overall stressor, please see the Climate Science Special Report (Vol.1 of the National Climate Assessment), in particular Chapter 2 (Physical Drivers of Climate Change) and Chapter 12 (Sea Level Rise).
Union of Concerned Scientists	Union of Concerned Scientists	143836	Figure	08. Coastal Effects	2	298				To bring this list more in line as a potential impacts list, could change "critical infrastructure at risk" to "critical infrastructure damages".	Thank you for your suggestion. The author team agrees that this re-wording keeps the impacts consistent throughout. As such, this change has been made across the table to reword "critical infrastructure at risk" to "critical infrastructure damage."
Union of Concerned Scientists	Union of Concerned Scientists	143837	Text Region	08. Coastal Effects		305	305	22	24	"Infrastructure provides important lifelines for coastal communities, so impacts there would have further cascading costs for the entire nation". It's unclear from this sentence that the second statement should follow the first. What is the source of the cascade? Clarifying/additional text needed.	Thank you for your comment. The author team has amended the in-text verbiage to more clearly demonstrate a link between coastal infrastructure and inland communities that either rely on it or supply it.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Union of Concerned Scientists	Union of Concerned Scientists	143838	Text Region	08. Coastal Effects		305	305	27	27	In this instance, "exposure" is more accurate than "vulnerability".	Thank you for your comment. This edit has been included in the text.
Union of Concerned Scientists	Union of Concerned Scientists	143839	Text Region	08. Coastal Effects		305	305	30	33	Comments from summary apply here: This last assertion is both sweeping and too limited. (a) These adverse impacts certainly exist, but they affect people primarily in storm-affected areas, and increasingly in tidally-flooded ones. Hard to say they are rippling through the country. (b) some important personal- and household-scale impacts are missing. Suggest "adverse financial, social, and psychological impacts to affected citizens, and in turn, their broader communities".	This comment is the same as Comment 143832. It appears to have been submitted verbatim twice. No action has been taken on this comment. Please see the response to Comment 143832.
Union of Concerned Scientists	Union of Concerned Scientists	143840	Text Region	08. Coastal Effects		305	305	30	33	Suggest change to "due to a range of factors, including climate change…" Development, reduced sediment flow, etc. are also huge factors, as acknowledged elsewhere in this chapter. (It's also hard to think of a coastal ecosystem that has already been lost solely because of climate change.)	Thank you for your suggestion. The author team agrees and has amended the language to allow for the effects of other activities.
Union of Concerned Scientists	Union of Concerned Scientists	143841	Text Region	08. Coastal Effects		305	305	36	37	Useful to clarify here how adapting to degradation can enhance resilience. Do you mean "Where habitat integrity and quality are [degraded/inevitably degrading], adapting to those changing conditions may enhance…"?	Thank you for your comment. The language has been amended for enhanced clarity.
Union of Concerned Scientists	Union of Concerned Scientists	143842	Text Region	08. Coastal Effects		307	307	12	14	As mentioned above: In this sentence, "communities" are both the actor and the one acted upon. Both are valid points, but they are confused in this sentence. Suggest breaking out these points.	Thank you for your comment. This has been amended throughout the document. Each instance of KM3 now refers to individuals AND communities.
Union of Concerned Scientists	Union of Concerned Scientists	143843	Text Region	08. Coastal Effects		308	308	1	4	Are they tested "against these impacts" or "in response to actual or projected climate loss and damages".	Thank you for your comment. The key message text has been updated to reflect this comment.
Union of Concerned Scientists	Union of Concerned Scientists	143844	Text Region	08. Coastal Effects		309	309	5	17	This section calls out individual homeowners and tribes. For the fuller picture of climate inequity, it is important to mention residents (including renters) and communities as a whole. Whole communities are poor, in some cases, with limited access to adaptation resources, limited political voice, etc.	Thank you for your comment. The author team agrees that community members who do not own property is a unique distinction and should be included in the document. The passage has been amended to include the phrase " Additionally, communities are comprised of renters and other individuals who do not own property, leaving them out of conversations about preserving neighborhoods."
Union of Concerned Scientists	Union of Concerned Scientists	143845	Text Region	08. Coastal Effects		310	310	5	8	Suggest acknowledging/clarifying that this is also one of the few communities, under current policy, that will qualify for federal funding to move en masse.	Thank you for your suggestion. The sentence has been amended to reflect your proposed change.
Union of Concerned Scientists	Union of Concerned Scientists	143846	Text Region	08. Coastal Effects		310	310	10	11	As well as nearer-term and to a certain extent, inexorable given SLR inertia.	This comment does not appear to raise a question or offer an actionable suggestion. After consideration of this point, the author team has determined that the existing text is clear and accurate.
Union of Concerned Scientists	Union of Concerned Scientists	143847	Text Region	08. Coastal Effects		310	310	11	14	It's unclear how the costs associated with responding to NOAA coastal flood advisories is distinct from the costs associated with the actual high tide and storm surge flooding. Can this be explained?	Thank you for your comment. This sentence has been amended for clarity.
Union of Concerned Scientists	Union of Concerned Scientists	143848	Text Region	08. Coastal Effects		310	310	15	17	This is inadequately explained for the reader. How will impacts ripple far beyond coastal communities? Because of the added costs of disaster response and recovery? Because of buyouts?	Thank you for your comment. An additional citation pointing to the Coastal chapter in NCA3 has been included. In particular, see Key Message 1 (Coastal Lifelines at Risk).
Union of Concerned Scientists	Union of Concerned Scientists	143849	Text Region	08. Coastal Effects		310	310	19	22	Perhaps consider summarizing the good work by NAVFAC… Jan 2017 ÌÕ HYPERLINK "	Thank you for your comment. Unfortunately, the reference was not successfully transmitted with the rest of your suggestion. This section of the document has remained unchanged.
Union of Concerned Scientists	Union of Concerned Scientists	143850	Text Region	08. Coastal Effects		310	310	28	31	This is a bit abstract, but an example or two of the adaptation opportunities currently under consideration inserted here would be useful.	Thank you for your comment - the document has been amended to include two types of adaptation measures - raising properties or constructing seawalls. The author team agrees that these specific examples add clarity to the sentence.
Union of Concerned Scientists	Union of Concerned Scientists	143851	Text Region	08. Coastal Effects		310	310	36	38	Virginia Institute of Marine Science (VIMS). 2013. Recurrent flooding study for Tidewater Virginia. Gloucester Point, VA. Online at http:// ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf Sea Level Rise, Stormwater Management, and the National Flood Insurance Program How Norfolkì¥s best management practices can lower local flood insurance rates Anna Killius, J.D. Law School Graduate Virginia Coastal Policy Clinic at William & Mary Law School https://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/doc… Connolly, M. 2015. Hampton Roads, Virginia and the militaryì¥s battle against sea level rise. Washington, DC: Center for Climate and Security. Online at https://climateandsecurity.files.wordpress. com/2015/10/hampton-roads-virginia-and-military-battleagainst-sea-level-rise.pdf	Thank you for the suggested citations. The author team has added the reference to Connolly 2015 to the report. The other two citations were not added as other references encompassed similar ideas.
Union of Concerned Scientists	Union of Concerned Scientists	143852	Text Region	08. Coastal Effects		313	313	6	9	Flood risk reduction costs?	Thank you for your comment. The passage has been amended to clarify its meaning.
Union of Concerned Scientists	Union of Concerned Scientists	143853	Text Region	08. Coastal Effects		313	313	13	13	communities, properties and infrastructure and services….	Thank you for your comment. The author team has added the word "communities" to broaden the scope of impacts. The passage has been amended.
Union of Concerned Scientists	Union of Concerned Scientists	143854	Text Region	08. Coastal Effects		313	313	13	15	Dahl, KA, et al 2017 Effective inundation of continental United States communities with 21st century sea level rise. Elem Sci Anth, 5: 37, DOI: https://doi.org/10.1525/elementa.234	Thank you for your suggestion. The author team has added this reference.
Union of Concerned Scientists	Union of Concerned Scientists	143855	Text Region	08. Coastal Effects		313	313	26	28	the extent and number of communities as well as the amount of property… https://www.ucsusa.org/sites/default/files/attach/2017/07/when-rising-se… https://www.ucsusa.org/global-warming/global-warming-impacts/when-rising…	Thank you for your suggestion. The author team has added this reference.
Union of Concerned Scientists	Union of Concerned Scientists	143856	Text Region	08. Coastal Effects		313	313	31	31	communities (and savings)	Thank you for your comment. It is not clear that adding a parenthetical to this sentence increases its readability. As a result, the author team has left the sentence unchanged.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Union of Concerned Scientists	Union of Concerned Scientists	143857	Text Region	08. Coastal Effects		313	313	29	30	Dahl et al. 2017 found that … "The results also underscore the importance of limiting future warming and sea level rise: under the Intermediate-Low scenario, used as a proxy for sea level rise under the Paris Climate Agreement, 199 fewer communities would be effectively inundated by 2100." Dahl, KA, et al 2017 Effective inundation of continental United States communities with 21st century sea level rise. Elem Sci Anth, 5: 37, DOI: https://doi.org/10.1525/elementa.234	Thank you for your suggestion. The author team has added this reference.
Union of Concerned Scientists	Union of Concerned Scientists	143858	Text Region	08. Coastal Effects		313	313	30	32	chronic flooding maybe better than nuisance?	Thank you for the comment. The sentence that this comment is referring to has changed and no longer directly references nuisance flooding.
Union of Concerned Scientists	Union of Concerned Scientists	143859	Text Region	08. Coastal Effects		313	313	30	32	…"implementing adaptation measures to ensure that public infrastructure is resilient to current and future flood scenarios will be tremendously expensive."	Thank you for your comment. The author team agrees that this re-worded statement more accurately conveys the intended meaning. The verbiage has been amended in-text to reflect this change.
Union of Concerned Scientists	Union of Concerned Scientists	143860	Text Region	08. Coastal Effects		313	313	33	33	communities' economies	Thank you for the suggested wording change. This sentence has been revised to make it clearer that the author team was addressing the economies along the coast influencing the overall national economy,
Union of Concerned Scientists	Union of Concerned Scientists	143861	Text Region	08. Coastal Effects		313	313	33	35	More citations needed: Zillow: The Effect of Rising Sea Levels on Coastal Homes BY MELISSA ALLISON ON 2 AUG 2016 https://www.zillow.com/blog/rising-sea-levels-coastal-homes-202268/ Climate Change and Housing: Will a Rising Tide Sink All Homes? By Krishna Rao on Jun. 2, 2017 https://www.zillow.com/research/climate-change-underwater-homes-12890/ Climate Change and Homes: Who Would Lose the Most to a Rising Tide? By Lauren Bretz on Oct. 18, 2017 https://www.zillow.com/research/climate-change-underwater-homes-2-16928/ Freddie Mac https://www.housingwire.com/articles/36891-freddie-mac-climate-change-th…	Thank you for the comment. The Traceable Account have been updated to include these citations.
Union of Concerned Scientists	Union of Concerned Scientists	143862	Text Region	08. Coastal Effects		313	313	35	38	NRDC Report: Homeowners Trapped by Repeated Flooding Under Troubled Flood Insurance Program July 25, 2017 Chicago https://www.nrdc.org/media/2017/170724 Wharton and RFF - Financing Flood Losses: A Discussion of the National Flood Insurance Program http://www.rff.org/files/document/file/RFF-DP-17-03.pdf	Thank you for your suggested citations. The author team has added the Kousky report, but did not add the NRDC issue brief as the team felt it leaned too close to policy prescription.
Union of Concerned Scientists	Union of Concerned Scientists	143863	Text Region	08. Coastal Effects		314	314	35	38	Addressing Affordability in the National Flood Insurance Program http://opim.wharton.upenn.edu/risk/library/J2014_JEE_Addressing-Affordab…	Thank you for your suggested reference. The author team did not add this citation as the team felt it leaned too close to policy prescription.
Union of Concerned Scientists	Union of Concerned Scientists	143864	Text Region	08. Coastal Effects		314	314	2	2	economic	Thank you for the suggested edit. This has been made in-text.
Union of Concerned Scientists	Union of Concerned Scientists	143865	Text Region	08. Coastal Effects		314	314	2	3	This may be worded differently and/or expanded on to make a stronger case for 1) the Cost benefit of investing on the front end (pre-disaster mitigation) and 2) the multiple benefits of natural infrastructure & cost reduction 2016: http://conservationgateway.org/ConservationPractices/Marine/crr/library/… New NIBS report should be cited and described here: http://enews.nibs.org/t/r-A40041C9475B660825 40EF23F30FEDED Natural Hazard Mitigation Saves: 2017 Interim Report Download Form https://www.nibs.org/general/custom.asp?page=ms2_form	Thank you for your suggestions. The author team has added the NIBS citation since the new Mitigation Saves report does indeed help build the case for the economic benefits. The first citation was not added because it is focused on financing options, which is beyond the scope of the chapter.
Michelle	Tigchelaar	143866	Figure	08. Coastal Effects	8.4	308				This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. We think this figure is excellent, but since it‰Ûªs so relevant to all chapters, we suggest moving it to the introduction chapter.	Thank you very much for the positive feedback on the figure.The author team has considered your feedback and concluded that the figure provides necessary and meaningful context about the concept of social inequity to Key Message 3. However, the concept of equality vs. equity is being addressed by a number of other chapters; this figure is available for their reference and thus it will be elevated throughout the report.
Michelle	Tigchelaar	143867	Figure	08. Coastal Effects	8.2	298				This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. This is a nice synthesis figure, but we have some recommendations to make it better: - Take out the lengthy text from the figure that is duplicated in the accompanying table. - Make the icons larger. - Add ocean acidification icons to all locations. - For the accompanying table, we think some of the examples could be better. For example, the example for the Northwest regards the Yakima Basin, which is not near the coast. We suggest instead mentioning the Quinault nation which is moving to higher ground; the authors of the Northwest Chapter may have suggestions on this as well. The examples about Puerto Rico drought (under Caribbean) and Binghamton (under Northeast) also are not about coastal issues.	Thank you for your suggestions on the figure. It will change dramatically as it transitions to an interactive graphic that is accessible online. The layout will not appears as it does in the review document with all of the text at once. Ocean acidification has been referenced where those particular regional chapters have referred to it as an impact resulting from climate change. As the National Climate Assessment is revised and the individual regional chapters amend their writing, the figure will change as well to synthesize their examples and findings.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michelle	Tigchelaar	143868	Figure	08. Coastal Effects	8.1	297				This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. Great to have this information captured in a figure, but we don‰Ûªt understand - Why adaptation can be so effective that there is nearly no difference in the cumulative costs of climate scenarios from RCP8.5 versus RCP4.5, especially late in the 21st century - How it could be that without adaptation, there is little difference in the cumulative costs of climate scenarios from RCP8.5 versus RCP4.5, especially late in the 21st century - Why two climate scenarios are presented for 2000 - 2017; when actual data are available - Why the curves have abrupt steps	Thank you for your comments. (1) The lack of significant difference in the dollar amounts associated with the two adaptation scenarios is a result of the scale of the dollars. Because the original report rounds to only one decimal point, it would take a change of $100 billion to show a change. Because the authors do not have access to the full dollar amounts, the language has been amended for clarity. (2) It is true that some data exists (based on observations) regarding the value of properties damaged and abandoned, but the data is patchy along the entire coastline of the CONUS, and very inconsistent in quality and content. It was determined to be a huge undertaking to rectify these differences (assuming the data even exists in enough places), and in light of that, the authors used a model to represent this 2000-2017 time period. Further the model works deterministically, thus real and modeled damage can differ at fine spatial and temporal scales. (3) The step-wise nature of the graph is due to the fact that the analysis evaluates storm surge risks every ten years, beginning in 2005.
Anne	Jensen	143912	Text Region	08. Coastal Effects		295	295	1	12	Almost 1/2 of the US coastline is in Alaska, and a significant portion of that has so it would be appropriate to mention permafrost and cite Chapter 26 somehwere in this text.	Thank you for your comment. This reference to Chapter 26 has been included.
Anne	Jensen	143915	Text Region	08. Coastal Effects		296	296	8	12	Almost 1/2 of the US coastline is in Alaska. That includes coasts on the Beaufort and Chukchi Seas, which are generally considered part of the Arctic Ocean. The Bering Sea could reasonably be considered part of the Pacific. This paragraph needs to be corrected. It should also mention permafrost as its presence or absence has a major effect on coasts.	Thank you for your comment. The sentence has been amended for clarity.
Anne	Jensen	143916	Text Region	08. Coastal Effects		296	297	19	10	This appears to be almost a verbatim repeat of p. 296, lines 1-17.	Thank you for your comment. The Executive Summary will not immediately precede the chapter in the final version of NCA4, and the Executive Summary has been crafted in accordance with USGCRP guidelines.
Anne	Jensen	143918	Whole Chapter	08. Coastal Effects						The chapter really does not consider the loss of tangible cultural heritage, much of which is concentrated along the coast. This impacts tribal and indigenous communities, to be sure. However, many places which are important in broader American history are on or near the coast and will be impacted, especially under extreme scenarios. May of these sites are also important tourist attractions and economic engines for communities. This needs to be conveyed throughout the chapter.	Thank you for your comments and suggestions. The authors have focused on broad trends and a few key examples rather than provide a deep level of specificity on tourism and tribal impacts. Many of the regional chapters are able to go into greater detail about the cultural significance of coastal areas, especially to indigenous peoples.
Anne	Jensen	143919	Figure	08. Coastal Effects	2	309				This figure also appears on P. 295. There is also another figure labeled 2 on p. 298.	Thank you for your comment. The Executive Summary will not immediately precede the chapter in the final version of NCA4, and the Executive Summary has been crafted in accordance with USGCRP guidelines.
Anne	Jensen	143921	Figure	08. Coastal Effects	3	307				The caption is hard to match with the images. Not critical, but it could be less confusing.	Thank you for your suggestion. The author team has amended the figure caption title to read "[Examples of] Natural and Nature-based Infrastructure Habitats" to better convey that these are representative of possible NNBI adaptations
Anne	Jensen	143923	Table	08. Coastal Effects	1	302				The citation of the Shaktoolik berm as a good example of local adaptation is somewhat misleading. A number of Alaska Native villages have put up similar protection in the past several decades (e.g. the Point Hope "Cal Worthington berm" which used most of the abandoned vehicles as part of the structure), as have municipal entities like the North Slope Borough. They are only short term solutions. At least one seawall failed due to an early coastal storm even before the ribbon-cutting ceremony.	Thank you for your comment. The adaptation examples included in Figure 8.2 have been pulled from the NCA4 regional chapters. If this comment (with additional citations to support the commenters statements) was also addressed to and accepted by the Alaska chapter, it will be included in the figure during the update process.
Andrea	Galinski	143934	Text Region	08. Coastal Effects		294	294	9	10	‰ÛÏ.. even under low scenarios, many individuals could suffer significant financial impacts as chronic high tide flooding leads to higher costs and property values‰Û_‰Û¦ This should still be framed in terms of ‰ÛÏcommunities‰Û instead of individuals (similar to high scenarios), because the scale of the problem at hand is still large and employing the term ‰ÛÏindividuals‰Û suggests that relatively few people will be affected.	Thank you for your comment. The Key Message has been amended to reflect that entire communities will also suffer financial impacts due to flooding.
Andrea	Galinski	143935	Text Region	08. Coastal Effects		294	294	2	11	Key Message 1- This summary seems to miss the larger mark when describing future coastal flood risk. The theme mentions higher storm surges and increased probability of heavy precipitation events, but due to their catastrophic impacts (both economically and to human health), tropical storms/hurricane events deserve more emphasis (or perhaps their own key message). These events consistently rank as the costliest disasters to the national economy, and their impacts should be more fully discussed in terms of coastal impacts.	Thank you for your suggestion. The author team has considered the ways in which to include impacts of tropical storms and hurricane events, and is confident that those impacts are captured in the language of higher storm surges and increased probability of heavy precipitation events. The document now also refers to CSSR Ch. 9 to more fully describe these risks.
Andrea	Galinski	143937	Text Region	08. Coastal Effects		294	294	15	18	This sentence would be more clear as: Restoring and conserving coastal ecosystems and adopting natural and nature-based infrastructure solutions can enhance both community and ecosystem resilience to climate change and help to ensure their health and viability.	Thank you for your comment. The author team agrees that this sentence improves the overall readability of Key Message 2. The verbiage has been changed throughout the chapter to maintain consistency.
Andrea	Galinski	143938	Text Region	08. Coastal Effects		295	295	1	8	Would suggest distinguishing coastal storm surge based flooding as somewhat distinct from other threats; while these are really interconnected, the threat due to hurricane based flooding has created the largest/most significant economic impacts. For example, Hurricane Katrina, Sandy, and Ike are the top three most expensive disasters in the US as measured by NFIP payouts.	Thank you for your comment. The author team agrees that this is a major challenge for the coastal region; however, this chapter takes a broad look at many different types of impacts and threats to the coasts rather than focusing on a specific analysis of any one type of threat. The current paragraph has not been amended.
Andrea	Galinski	143940	Table	08. Coastal Effects	8.2	298				The adaptation efforts occurring in the southeast are missing an important example in coastal Louisiana. While it is understood that not all meaningful initiatives can be included, the unprecedented nature of the region‰Ûªs future climate risk assessment and ambitious 50 year/ $50 billion adaptation strategy through the ‰ÛÏLouisiana‰Ûªs Comprehensive Master Plan for a Sustainable Coast‰Û (Master Plan) are a noteworthy development. The Master Plan is formulated on a High environmental scenario (including 2.72 feet of sea level rise over the next 50 years).	Thank you for this comment. It appears to be duplicative with comment #143947. Please look there for the author team response.
Andrea	Galinski	143942	Text Region	08. Coastal Effects		306	306	22	23	Another innovative approach to explore the concept of maximizing the restoration of a functioning deltaic system (land building and natural habitats) launched in 2013 in the form of the Changing Course competition (http://changingcourse.us/). A collaboration of various public, private, and academic institutions, the competition goal was to further develop the concept of a channel realignment of the Mississippi River while continuing to meet the needs of navigation, flood risk reduction, coastal industries, and communities.	Thank you for the recommended addition. The document now includes a reference to the Changing Course competition in this section.
Andrea	Galinski	143945	Text Region	08. Coastal Effects		310	310	17	19	The text should be modified to include New Orleans in list of example of major cities making investments in adapting to sea level rise.	Thank you for your comment. The text has been amended to include New Orleans.
Andrea	Galinski	143947	Text Region	08. Coastal Effects		310	310	24	25	"…there is still little focus on the major investments or immediate implementation actions and cost-dependent trade-offs required to successfully adapt.‰Û¦ One notable exception is the Louisiana‰Ûªs Comprehensive Master Plan for a Sustainable Coast, which directs funding for the next 10 years (and next 50 years) to the high priority projects that provide the best ability to reduce coastal flood risk and build/maintain land. The plan includes a realistic and limited budget, and makes the difficult trade-offs by laying out the 124 specific projects prioritized for implementation.	Thank you for your comment and thank you for bringing this project to the authors attention. Unfortunately, due to the nature of this chapter, the authors focused on broad trends in the coastal sector rather than highlighting specific projects such as these.
Andrea	Galinski	143948	Text Region	08. Coastal Effects		316	316	7	12	Consider adding Louisiana to list of states using nature-based infrastructure to improve coastal resilience. For example, Louisiana is spearheading some of the largest and most ambitious restoration projects across the country, including several large-scale sediment diversions to reconnect the river.	Thank you for the suggested amendment. Louisiana has been added to this passage to describe states that are actively pursuing coastal resilience projects.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Sarah	Thunberg	143980	Whole Chapter	08. Coastal Effects						This is a good general assessment for estimated coastal effects, however for regional and local planning and mitigation there would need to be a much more detailed analysis. It could be beneficial to include other case studies that might help cities in their mitigation plans.	Thank you for your comments and suggestions. The authors have focused on broad trends and a few key examples rather than provide a deep level of specificity on urban planning and adaptation.
Michael	MacCracken	144310	Text Region	08. Coastal Effects		294	294	3	11	Somewhere here it needs to be pointed out that sea level will continue to rise through the 22nd century and that even mid-range scenarios will lead to very significant change, just a couple of decades later, so the issue is one that will be devastating in the future--just not clear if it will be 2, 3 or even 4 generations in the future. And does that really matter? Basically, I'd like to see the way that sea level uncertainty would better be presented is that sea level rise will exceed a particular level (1 meter, 2 meters, etc.) and the only real uncertainty is exactly when this is most likely to happen.	Thank you for your comment. This timescale goes beyond the scope of NCA4. For that information, please see table 12.5 in the CSSR report (https://science2017.globalchange.gov/)
Michael	MacCracken	144311	Text Region	08. Coastal Effects		294	294	11	11	The word "may" needs to be changed to accord with the likelihood lexicon (and this needs to be done throughout the chapter); see its use also on line 18.	Thank you for your feedback. The wording has been amended for clarity.
Michael	MacCracken	144312	Text Region	08. Coastal Effects		294	294	10	11	About all that can likely be done is to delay the situation a bit. Sea level is going to continue, so I'd urge talking about delay instead of decrease	Thank you for the comment. As written, the sentence is describing using adaption to decrease losses, not to decrease SLR itself. The sentence has not been amended.
Michael	MacCracken	144313	Text Region	08. Coastal Effects		294	294	12	12	What about also migrating birds and other species--might it not be appropriate to also mention them?	Thank you for your comment. The sentence in question ("Fisheries, tourism, human health, and public safety depend upon healthy coastal ecosystems") focuses on items that are directly impacted by changes in coastal ecosystems. While there may be effects on other species, they are not the primary focus of this sentence. No change has been made.
Michael	MacCracken	144314	Text Region	08. Coastal Effects		294	294	28	28	I think it would be appropriate to indicate that sea level rise can reach far inland by affecting rivers, estuaries, etc.--that is, the coastal region is quite broad.	Thank you for your comment. The text has been revised to include this comment.
Michael	MacCracken	144315	Figure	08. Coastal Effects	1	297				The step-stair like aspect of the curves will be quite confusing--it is purely fictitious, likely caused by the time step of the model used to make the calculation. Smoothing is needed. Also, that discounting is done at all needs to be explained as the actual damage is going to increase exponentially upward as the rate of sea level rise increases. And it needs to be said that the calculation has been done for a sea level rise scenario that does not include any significant collapse of an ice stream/shelf, etc. So, really, I'd suggest that this graph is exceedingly misleading. Were there to be a line indicating the size of the US economy using the 3% discount, the line would be level, and the fact that the line here is rising indicates that the proportion of the economy of the impacts is rising--and that point does not come across from this graph at all. Very misleading.	Thank you for your comments. The step-wise nature of the graph is due to the fact that the analysis evaluates storm surge risks every ten years, beginning in 2005. This figure is from a published report and cannot be modified. For additional information see: (U.S. EPA. 2017. Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment. U.S. Environmental Protection Agency, EPA 430-R-17-001)
Michael	MacCracken	144316	Figure	08. Coastal Effects	2	298				This figure has far too much text. And reading a couple of the write-ups, they are not about the "coastal effects of climate change" but seems to be about how groups in the various areas are responding. So, either the caption or figure needs to be changed in addition to greatly reducing the text associated with the figure, which is more like a poster than a figure for a report.	Thank you for your comment. The figure captures both the effects of climate change as well as regionally relevant adaptation examples that have been drawn from the NCA4 regional chapters. The adaptation examples will be better titled/identified in the final figure. Additionally, the table accompanying Figure 8.2 was used for the public comment process only and will not be included in the final figure rendering (either the print or online versions).
Michael	MacCracken	144317	Text Region	08. Coastal Effects		303	303	9	9	Need to change "may" and use words from lexicon, or perhaps say something like "have the potential to delay direct losses and cascading impacts in some locations for several decades"	Thank you for your suggestion. The author team has revised the section to be more clear.
Michael	MacCracken	144318	Text Region	08. Coastal Effects		305	305	36	37	To provide useful insight, there is a need to replace "may" with a word from the lexicon.	Thank you for your suggestion. The author team has revised the section to be more clear.
Michael	MacCracken	144319	Text Region	08. Coastal Effects		306	306	1	1	I would urge adding "tide-experiencing rivers" (or whatever the right word is) to the list. For example, sea level rise will have impacts well up the Hudson River, Chesapeake Bay, Sacramento-San Joaquin, etc.--so well inland	Thank you for your comment. The author team agrees that inland areas will experience impacts as a result of SLR; however, this portion of the assessment is specifically focused on the immediate coastal areas. Other regional chapters in the National Climate Assessment will go into greater detail about climate impacts on riverine areas as does chapter 12 (Sea Level Rise) of the Climate Science Special Report (Vol.1 of the National Climate Assessment). A short sentence has been added and a reference to Ch 12 in the text.
Michael	MacCracken	144320	Text Region	08. Coastal Effects		308	308	12	12	The word "these" is not really very clear--is it those from Florida and Alaska, or the underrepresented and underserved. I'd urge a bit of redoing on these lines to make clear it is the broader set. Perhaps give an example as well of a group that experienced hurricane impacts.	Thank you for your comment. The author team has re-worded the sentence to make it clear that this broad geographic range is representative of, although not inclusive of, experiences with climate change.
Michael	MacCracken	144321	Text Region	08. Coastal Effects		309	309	8	11	It seems to me that the limitations of putting houses on stilts need to be mentioned. As inundation occurs, waves can be higher; in addition, access by emergency responders during times of storms can become impossible. So, while stilts can be helpful to perhaps protect the building, they really do not alleviate the need to evacuate. So, perhaps distinguish between actions to save property and to save people, the former not always achieving the latter.	Thank you for your comment. The authors have noted your concern about the effectiveness of such adaptation measures; however, the purpose of this portion of the document is not to describe a cost/benefit analysis of each method of home modification. This passage remains unchanged in the document.
Michael	MacCracken	144322	Text Region	08. Coastal Effects		309	309	20	20	Another good example, perhaps worth also citing, was the 1927 Lower Mississippi River flood. Indeed, such events can have impacts across the entire nation due to evacuation and then no place to return to.	Thank you for your comment. The author team cites the example of Katrina, which is the most relevant national dispersion case and includes supporting literature.
Michael	MacCracken	144323	Text Region	08. Coastal Effects		310	310	14	14	How about saying "over the next several decades" to give a bit more precise information (or even "over the next few decades")	Thank you for your comment. The author team agrees that adding the word "few" does increase the readability of this sentence. It has been amended per your suggestion.
Michael	MacCracken	144324	Text Region	08. Coastal Effects		310	310	19	19	I guess building walls can be said to be adapting--it seems to me, however, that such walls are really an attempt to put off dealing with the issue.	Thank you for your comment; however, it does not appear to raise a question or offer a suggestion. The idea that building seawalls as a form of adaptation is accepted by the author team. The sentence in the document has not been changed.
Michael	MacCracken	144325	Text Region	08. Coastal Effects		311	311	1	3	Also threatens some quite historic neighborhoods and structures	Thank you for the recommended inclusion. "historical neighborhoods" has been added to this passage to extend the number of things at risk from tidal flooding.
Michael	MacCracken	144326	Text Region	08. Coastal Effects		313	313	19	21	I don't think it is really defensible to give two figure precision to the estimates made here. While a specific study might use some approach to get such specific figures, I would make sure to somehow indicate that there is considerable uncertainty regarding the specific numbers--but that the general sense of them is much clearer.	Thank you for your comment. The author team agrees with the reviewer and has deleted the probability and clarified the language.
Kyle	Gould	140827	Whole Chapter	09. Oceans and Marine Resources						Possibly discuss what effects that declining phytoplankton numbers from increased ocean temperatures and acidity will have on atmospheric oxygen content	We thank the reviewer for the comment, but the suggestion is outside the scope of this report. The reviewer describes an interesting potential connection between global ocean productivity and global oxygen concentration. The global nature of this question would make it more suitable for something like the IPCC. It will be interesting to see whether the next generation of climate models with more realistic carbon cycles are able to resolve these dynamics.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Kenric	Osgood	140865	Whole Chapter	09. Oceans and Marine Resources						I am pleased that an oceans and marine resources chapter is being included in NCA4. As pointed out in the chapter, these large areas are extremely important to the U.S. The chapter logically presents pertinent information. A few comments to consider: Consider revising or replacing the present figures. The figures do not add much, particularly figures 9.1 and 9.3. In addition, figure 9.3 currently appears twice in the chapter. Coral bleaching is mentioned in the Ocean Ecosystems section (p. 336, centered on line 13). I believe bleaching fits better in the Extreme Events section. Add a statement early in the Extreme Events section that emphasizes that it is often extreme events, on top of longer term change, that have major impacts on species and ecosystems. E.g. it‰Ûªs the duration and extent of a heat wave, a cold snap, an OA event, a hypoxic event, . . . that often has the greatest impact and these can be more extreme due to a changing baseline due to climate change. This idea is already in this section, but is not clearly brought out.	We greatly appreciate the reviewer's comments. For the figures, we are replacing Figure 1 based on other comments we received and we are adding the 2015/16 bleaching event to Figure 3. Note the reason Figure 3 appears twice is that we were asked to select a figure for inclusion with our summary. This will be published separately when the entire NCA is produced. As for bleaching, this is challenging because it is both a trend and an event (as discussed in Hughes et al. 2018). We elected to keep it in KM1 as bleaching is one of the most obvious "ecosystem disruptions" in the ocean. However, we have included the 2015/16 mass bleaching under KM3. We appreciate the suggestion to emphasize the connection between short-term cycles and long-term global trends in the formation of extreme events. We currently mention this in the introduction to KM3, in the "projected impacts" and "emerging issues" sections and in the traceable accounts. After consideration, the author team determined that the narrative flows best as written.
Dave	White	140872	Whole Chapter	09. Oceans and Marine Resources						The oceans will not rise anymore then the past. The satellite data shows the same rate. (you can see the EPA graph at cctruth.org at the bottom) Increased evaporation due to less salty water and warmer oceans is keeping the rate the same. This same evaporation increase is making more and severe storms. These increase the clouds. The clouds historically reflect 20% of the suns energy. With increased clouds more will be reflected until an equilibrium is reached.	This comment is inconsistent with the current state of the science on this topic nor does it apply specifically to this chapter. Sea level rise is covered extensively in the Climate Science Special Report (Chapter 12) and observed and projected impacts are discussed in the Coastal Effects chapter (Chapter 8). Sea levels are rising and the evidence linking sea level rise to higher carbon dioxide levels is very strong. The suggestion that clouds provide a negative feedback is well understood and parameterized in global circulation models (see CSSR Chapter 2). Other feedbacks, such as the decreased albedo due to melting Arctic ice, are more significant. See IPCC "Climate Change 2013: The Physical Science Basis", Chapters 7-8).
Curt	Storlazzi	140885	Text Region	09. Oceans and Marine Resources		332	333	12	6	The 2015-2016 El Nino that resulted in the bleaching of more than 30% of the US's 4 million acres of coral reefs from Guam to the USVI might warrant mentioning under "Marine Heatwaves"	Thank you for this suggestion. The literature on the 2015/16 El Nino was not available when we were developing this draft. It is now covered in several places in the text
Curt	Storlazzi	140886	Figure	09. Oceans and Marine Resources	9.1	337				This (and other figures) includes Puerto Rico and the USVI, but not Guam, CNMI, and American Samoa, which are part of the United States.	Based on other feedback, we elected to delete Figure 1 and replace it with a diagram describing ecosystem services from the ocean. We will expand the two additional maps to include US islands in the central and western Pacific.
Curt	Storlazzi	140887	Whole Chapter	09. Oceans and Marine Resources						A number of reports* and papers have been published that forecast changes to future winds and waves due to global climate change. These will affect marine planktonic larval dispersal** and change the ranges (spatial or depth) of many sessile or highly sedentary on the continental shelves***, respectively. *Erikson, L.H., Storlazzi, C.D., Barnard, P.L., Hegermiller, C.E., and Shope, J.B., 2016. Wave and Wind Projections for United States Coasts; Mainland, Pacific Islands, and United States-Affiliated Pacific Islands. U.S. Geological Survey data release, http://dx.doi.org/10.5066/F7D798GR http://cmgwindwave.usgsportals.net/ **Storlazzi, C.D., van Ordmondt, M., Chen, Y-L., and Elias, E.P.L., 2017. ‰ÛÏModeling coral fine-scale larval dispersal and interisland connectivity to help design mutually-supporting coral reef Marine Protected Areas: Insights from Maui Nui, Hawaii‰Û Frontiers-Marine Science, 4:381 DOI: 10.3389/fmars.2017.00381 ***Storlazzi, C.D., Brown, E., Field, M.E., Rogers, K., and Jokiel, P.L., 2005. ‰ÛÏA model for wave control on coral breakage and species distribution in the Hawaiian Islands‰Û Coral Reefs, v. 24, p. 43-55. and Storlazzi, C.D., Fregoso, T.A., Figurski, J.D., Freiwald, J., Lonhart, S.I., and Finlayson, D.P., 2013. ‰ÛÏBurial and exhumation of temperate bedrock reefs as elucidated by repetitive high-resolution seabed sonar surveys: Biological ramifications and guidance for future studies‰Û Continental Shelf Research, v. 55, p. 40-51	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information. The interaction between wind, waves, and larval dispersal, while interesting and important, are too specific for the broad review that we are charged with producing. We did add two references (Ferrario et al. 2014; Temmerman et al. 2013) to better document the value of coral reefs and other coastal ecosystems for shoreline protection.
Elizaveta Barrett	Ristroph	140905	Whole Document	09. Oceans and Marine Resources						"arctic" should be "Arctic" when it is used to modify something located in the Arctic geographical regions. Lowercase is only used as a general adjective like "arctic winds"	Arctic sea ice is now capitalized as it describes sea ice in the geographic area
Richard	Feely	140955	Text Region	09. Oceans and Marine Resources		334	334	30	30	"making the water more acidic." should be avoided since the ocean is not "acidic." You can say increasing the acidity of the water.	The term "more acidic" does not imply acidic pH conditions. Instead it implies that the pH conditions move to lower values, which are, by definition, towards the acidic side of the scale. Regardless, we have changed the term "more acidic" to acidified wherever technically accurate.
Richard	Feely	140956	Text Region	09. Oceans and Marine Resources		334	334	33	35	The statement "The availability of calcium carbonate is expressed as the term ë©." is incorrect. ë© refers to the solubility of calcium carbonate mineral phases in seawater. ë© needs to be properly defined in this chapter.	We thank the reviewer for catching the errors in the text. We have changed the text to read, "The saturation state of calcium carbonate is expressed as the term Ω. When the concentration of carbonate ions in ocean water is low enough to yield Ω<1 (referred to as "undersaturated"conditions), exposed calcium carbonate structures begin to dissolve."
Richard	Feely	140957	Text Region	09. Oceans and Marine Resources		344	344	11	11	Change to read The hatcheries now monitor pH and pCO2 in real time and adjust seawater intake to reduce acidity	The text was edited as suggested
Richard	Feely	140958	Text Region	09. Oceans and Marine Resources		348	348	9	10	Please correct superscripts and subscripts.	The text has been corrected as suggested
Richard	Feely	140959	Text Region	09. Oceans and Marine Resources		353	353	31	31	change to read.. increase their acidity	The text was edited as suggested
Richard	Feely	140960	Whole Chapter	09. Oceans and Marine Resources						Chapter 9 is not ready for publication yet! Too many times the authors do not cite the major research papers about warming, deoxygenation, acidification or biological impacts, but instead refer to their own previous assessment articles. This is NOT appropriate or fair to the scientists who conducted the groundbreaking research. They need to cite the original work and the papers that represent major updates to the original research, as is the case for the IPCC assessments. They also use inappropriate terms like "more acidic" throughout the text which implies that the oceans are already acidic in some locations. Other than at the very small regions in close proximity to hydrothermal vent fluids, this is simply not the case. Terms like "increasing acidity" would be an OK replacement. Finally, many of the references are improperly cited, incomplete, or just wrong. They to be fixed or replaced. In summary this chapter needs a lot more work!	We appreciate the suggestion and recognize the desire to credit the original papers. Our chapter was built from the oceans chapter of the Climate Science Special Report. Citing the CSSR rather than the origianl literature reflects our process as well as guidance given to the NCA authors. We have done our best to correct any incorrect citations. Finally, we disagree with the comment that "more acidic" implies that the waters are "acidic" to begin with. In fact, the broader ocean acidification research community came together to decide that "more acidic" is an acceptable term which implies directional change. However, we did make an effort to use the equally acceptable terminology proposed by this reviewer, "increasing acidity", where possible.
Richard	Feely	140961	Text Region	09. Oceans and Marine Resources		334	334	25	27	The authors need to cite the original work plus significant updates here. Major early publications were in 1999, 2003, 2004, etc. Updates were in 2005, 2009, 2015.	We appreciate the suggestion and recognize the desire to credit the original papers. Our chapter was built from the oceans chapter of the Climate Science Special Report. Citing the CSSR rather than the origianl literature reflects our process as well as guidance given to the NCA authors.
Richard	Feely	140962	Text Region	09. Oceans and Marine Resources		335	335	1	6	Jewett and Romanou (2017) is not a good reference for the original work on deoxygenation. The authors need to make the effort to cite the original papers and appropriate updates.	We appreciate the suggestion and recognize the desire to credit the original papers. Our chapter was built from the oceans chapter of the Climate Science Special Report. Citing the CSSR rather than the origianl literature reflects our process as well as guidance given to the NCA authors.
Richard	Feely	140963	Text Region	09. Oceans and Marine Resources		335	335	7	14	The authors need to cite some references to support this important paragraph.	We have added several references to the paragraph.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Richard	Feely	140964	Text Region	09. Oceans and Marine Resources		336		35		Change to read….(Gilly et al. 2013, Altieri and Gedan 35 2015; Jewett and Romanou, 2017).	We thank the author for catching this formatting error and have corrected it.
Richard	Feely	140965	Text Region	09. Oceans and Marine Resources		339	339	19	20	The productivity, distribution, and phenology of fisheries species will continue to change as 20 oceans warm and become more acidic. Note to authors: This is an improper statement. On could say…and increase their acidity.	The message has been retained but the text has been changed from 'become more acidic' to 'acidify' to respond to another reviewer comment.
Richard	Feely	140966	Text Region	09. Oceans and Marine Resources		344	344	25	26	Change…As carbon emissions drive average temperatures higher and increase ocean acidification, natural climate cycles will occur on top of ocean conditions that are warmer, more acidic, and have generally lower oxygen levels. to read…..As carbon emissions drive average temperatures higher and increase ocean acidification, natural climate cycles will occur on top of ocean conditions that are warmer, are increasing in acidity, and have generally lower oxygen levels.	The text was edited as suggested
Richard	Feely	140967	Text Region	09. Oceans and Marine Resources		352	352	33	38	Extreme corrosive (ë© < 1) or low oxygen events also occur regularly in modern coastal waters of 34 the Pacific Coast of the U.S. (Siedlecki et al. 2015; Feely et al. 2016; Chan, Barth, Blanchette, et 35 al. 2017). Deep waters brought to the coast during upwelling are generally corrosive (low ë©) and 36 have low oxygen levels. The intensity of these events is increasing due to more intense winds 37 over the past decade, and ocean acidification is making the waters even more corrosive (Chan et 38 al. 2008; Jewett and Romanou, 2017; Sutton et al. 2016; Turi et al. 2016). Note to authors: I suggest that you include some statements about corrosive conditions in the coastal waters sounding Alaska, since they are probably more corrosive in some locations than the northeast Pacific.	Text and references were updated to better include Alaskan waters:"Extreme corrosive (Ω < 1) and/or low oxygen events also occur regularly in modern coastal waters of the Pacific Coast of the U.S. (Mathis et al. (2012); Cross et al. (2013); Evans et al. (2013, 2015); Mathis et al. (2015a,b); Harris et al. (2013); Siedlecki et al. 2015; Feely et al. 2016; Chan, Barth, Blanchette, et al. 2017). Deep waters brought to the coast during upwelling are generally corrosive (low Ω) and have low oxygen levels. The intensity of these events along the upwelling margin of the Pacific coast of the US is increasing due to more intense winds over the past decade, and ocean acidification is making the waters even more corrosive (Chan et al. 2008; Jewett and Romanou, 2017; Sutton et al. 2016; Turi et al. 2016). In Alaskan waters, these events are associated with freshwater inputs and storm events (Mathis et al. (2012); Cross et al. (2013); Evans et al. (2013, 2015); Mathis et al. (2015b); Siedlecki et al. (2017)). "
Richard	Feely	140968	Text Region	09. Oceans and Marine Resources		356	356	6	14	Incorrect References Chan F, Barth JA, Bl CA, Byrne RH, C F, Cheriton O. 2017. Persistent spatial structuring of 7 coastal ocean acidification in the California Current System. :1‰ÛÒ7. 8 Chan F, Barth JA, Blanchette CA, Byrne RH, Chavez F, Cheriton O, Feely RA, Friederich G, 9 Gaylord B, Gouhier T, et al. 2017. Persistent spatial structuring of coastal ocean 10 acidification in the California Current System. Sci Rep. 7. 11 Chan F, Barth JA, Lubchenco J, Kirincich A, Weeks H, Peterson WT, Menge BA. 2008. 12 Emergence of Anoxia in the California Current Large Marine Ecosystem. Science (80-) 13 [Internet]. 319:920‰ÛÒ920. Available from: 14 http://www.sciencemag.org/cgi/doi/10.1126/science.1149016	The text has been revised to incorporate this suggestion. The references have been corrected
Richard	Feely	140969	Text Region	09. Oceans and Marine Resources		356	356	15	17	Incorrect Reference Chen K, Gawarkiewicz G, Kwon YO, Zhang WG. 2015. The role of atmospheric forcing versus 16 ocean advection during the extreme warming of the Northeast U.S. continental shelf in 17 2012. J Geophys Res C Ocean.	The text has been revised to incorporate this suggestion. The references have been changed to Chen K, Gawarkiewicz G, Kwon YO, Zhang WG. 2015. The role of atmospheric forcing versus ocean advection during the extreme warming of the Northeast U.S. continental shelf in 2012. J Geophys Res C Ocean . 120, 4324–4339, doi:10.1002/2014JC010547.
David	Albert	140970	Text Region	09. Oceans and Marine Resources		357	357	4	9	Incomplete References Comeau S, Carpenter RC, Edmunds PJ. 2013. Response to coral reef calcification: carbonate, 5 bicarbonate and proton flux under conditions of increasing ocean acidification. Proc R 6 Soc B-Biological Sci. 280. 7 Cooley SR, Rheuban JE, Hart DR, Luu V, Glover DM, Hare JA, Doney SC. 2015. An integrated 8 assessment model for helping the united states sea scallop (Placopecten magellanicus) 9 fishery plan ahead for ocean acidification and warming. PLoS One.	The text has been revised to incorporate this suggestion. The references have been changed to: Comeau, S., Carpenter, R. C., & Edmunds, P. J. (2013). Response to coral reef calcification: carbonate, bicarbonate and proton flux under conditions of increasing ocean acidification. Proceedings of the Royal Society B: Biological Sciences, 280(1764), 20131153. http://doi.org/10.1098/rspb.2013.1153 Cooley SR, Rheuban JE, Hart DR, Luu V, Glover DM, et al. (2015) An Integrated Assessment Model for Helping the United States Sea Scallop (Placopecten magellanicus) Fishery Plan Ahead for Ocean Acidification and Warming. PLOS ONE 10(5): e0124145. https://doi.org/10.1371/journal.pone.0124145
Sally	Sims	141577	Whole Page	09. Oceans and Marine Resources		331				Line 21: At end of paragraph, add: Regional collaborations, e.g., the Northeast Coastal Acidification Network and the North Pacific Landscape Conservation Cooperative, that bring together researchers, coastal resource managers, and fishing communities, are building new new knowledge exchange platforms to address coastal acidification impacts on coastal habitats and species.	Thank you for this suggestion. We have added an edited version of your requested language to the section on reducing risks on p 338.
Sally	Sims	141578	Whole Page	09. Oceans and Marine Resources		340				Line 10: The phrase place-based communities is vague. All localities are place-based. Do you mean local resource-dependent communities?	The text has been revised to incorporate this suggestion. Communities of practice (e.g., mobile fishing fleets) are not place-based; the term 'place-based' may raise more questions than it answers so we have deleted in from the text.
Heidi	Lovett	141627	Text Region	09. Oceans and Marine Resources		335	335	30	35	Here is the text: 30 Key Message 1: The Nation‰Ûªs valuable ocean ecosystems are being disrupted by increasing 31 global temperatures through the loss of iconic and highly-valued habitats and changes in 32 species composition and food web structure. Ecosystem disruption will intensify as ocean 33 warming, acidification, deoxygenation, and other aspects of climate change increase. In the 34 absence of significant reductions in carbon emissions, transformative impacts on ocean 35 ecosystems cannot be avoided. Comment: This message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	This comment is inconsistent with the author team's thorough assessment of the science. The assertions in the key message are fully supported in the literature, as described in both the main text and the traceable accounts. Comptuter models play an important role in helping us understand the likely future conditions and how these conditions relate to carbon emissions. The validity of the scientific assumptions underpinning these models have been assessed repeatedly in the literature, including Chapter 2 of the Climate Science Special Report. Addtionally, we will point the commentator to the many recent evaluations of the accuracy of climate model projections (see Cowtan et al. 2015, 10.1002/2015GL064888). Notably, many of the early climate predictions such as the prediciton in Hansen et al. 1981 that the global warming would emerge from the background of natural variaiblity by the end of the 20th Century have been come to pass.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Soren	Warland	141628	Whole Chapter	09. Oceans and Marine Resources						The following comments are submitted on behalf of the Marine Fisheries Advisory Committee (MAFAC), a NOAA federal advisory committee: ‰Ûc The authors of the NCA4 Oceans and Marine Resource Chapter did an excellent job providing an update on the impacts and risks of carbon emissions to marine ecosystems and resources in the U.S. This is a rapidly developing field and the authors captured key events and findings in a very succinct manner, using a broad range of regional examples. In addition, they offered important insights and optimism for our potential to adapt to the changes, as well as increase the resilience of marine ecosystems. The draft was well written for a general audience and the figures very much enhanced the communication of key points to a broad audience. The following points raised in the draft of Chapter 9, Oceans and Marine Resources are particularly important to retain: ‰Ûc We are living with the impacts of climate change now (e.g., extreme weather events such 100 year floods, intense hurricanes, and marine heat waves as well as long-term shifts in fish population‰Ûªs distribution and productivity). Intensity and frequency of events is increasing. (example: Key Messages, p. 331; p. 332, lines 14-20; figure 9.3.) ‰Ûc The focus on the trifecta of changes occurring in the oceans: warming, acidification, and deoxygenation is important. The cumulative impacts of these changes and their interactions will determine what species thrive in their current locations, where they may exist in the future, and which will decline or cease to exist in the future. (examples: Key Message 2, p.331 and 338-341.) ‰Ûc The fact that the oceans play a pivotal role in the global climate system is important to emphasize. The oceans have received relatively little attention in past climate assessments (both national and international); it is important to recognize their importance to the central issue of climate change and potential feedbacks. (example: Overview, p. 334, lines 11-15.) ‰Ûc The importance of identifying and continuing assessments on the most vulnerable marine ecosystems (e.g., tropical, polar, and island ecosystems in the U.S. and U.S. Territories). (examples: p. 338, lines 14-17; p. 349, lines 6-9.) ‰Ûc The importance of fostering resilience in our marine ecosystems and resources by taking specific actions. (examples: p 332, line 11; p. 338, line 24; p. 341, lines 4-8.)	We greatly appreciate the thoughtful comments and are pleased with the MAFAC's general support for our initial draft of the chapter. While the wording has changed in places, we have retained the major themes that the MAFAC found especially appealing.
David	Wojick	141680	Text Region	09. Oceans and Marine Resources		338	338	21	23	Here is the text: Ocean warming, acidification, and deoxygenation are projected to increase changes 22 in fishery-related species, reduce catches in some areas, and challenge effective management 23 of marine fisheries and protected species. Comment: This text is merely a series of speculative projections falsely stated as established physical facts. These projections appear to be based primarily on the use of questionable computer models. The fact that the CMIP5 models run hot is well known. See just as an example "Lukewarming: The New Climate Science that Changes Everything," Patrick J. Michaels and Paul C. Knappenberger, Cato Institute, 2016. https://store.cato.org/book/lukewarming The USGCRP was informed of these deficiencies after NCA3. Apparently they have now chosen to ignore this information. See for example https://www.cato.org/publications/the-missing-science-from-the-draft-national-assessment, April 2013	This comment is not consistent with the state of the science on these issues. The CSSR Chapters 1 and 4 provide the rationale and the confidence for use of the suite of models used in NCA4. They also present an evaluation of the model skill to support use of the models and projections. The NCA also has strict requirements that the conclusions of the assessment should be built from peer-reviewed sources. The reports highlighted in the comment to do not meet this standard.
David	Wojick	141681	Text Region	09. Oceans and Marine Resources		341 (note wrong page listed this is actually on pg 331 in the KM3 statement)	341	2	3	Here is the text: 2 These unusual events will become more 3 common and more severe in the future Comment: This text falsely states speculative projections as established physical facts. These projections appear to be based primarily on the use of questionable computer models. We do not in fact know that these unusual events will become more common or more severe in the future.	This comment is not consistent with the state of the science on these issues. The CSSR Chapters 1 and 4 provide the rationale and the confidence for use of the suite of models used in NCA4. They also present an evaluation of the model skill to support use of the models and projections. Our conclusion that continued climate change will make extreme events more likely is based on the attribution studies for the recent marine heatwaves and the high confidence of future warming established in the CSSR.
adrienne	sutton	141691	Whole Chapter	09. Oceans and Marine Resources						Overall, one thing that stands out in Chapter 9 is the effective summary of the potential ocean impacts from multiple environmental stressors and how that may translate to economic impacts in multi sectors.	We greatly appreciate the reviewer's comment.
adrienne	sutton	141692	Figure	09. Oceans and Marine Resources	9.3	332				What about Caribbean marine heat waves impacting Florida Keys, Puerto Rico, etc? This regional impact is mentioned on page 352 line 20 but should also be highlighted in the figure.	Thank you for this suggestion. The 2015/16 bleaching event has been added to the figure based on the global bleaching database cited in Hughes et al. 2018.
adrienne	sutton	141693	Text Region	09. Oceans and Marine Resources		335		10		Should add some reference to low pH in this statement: ‰ÛÏcreating a large ‰Û÷dead zone‰Ûª of water with very low oxygen [and enhancing ocean acidification].‰ÛØ See Cai et al. 2011. Acidification of subsurface coastal waters enhanced by eutrophication. Nature Geosci 4, 766-770.	We added reference to Cai et al 2011 to this sentence
David	Wojick	141694	Text Region	09. Oceans and Marine Resources		336		30		In addition to the modeling-based results of Henson et al. referenced here, it would be good to also reference the observation-based results of Sutton et al. 2016 (which is already referenced elsewhere).	We agree with the reviewer and have added a refernce to Sutton et al 2016.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Frank	Butler	141837	Text Region	09. Oceans and Marine Resources		332	332	29	32	Polar Ice is cyclical and Polar bears are at the highest numbers ever recorded since 1970's There is no mention of Undersea Thermal or Radiation contamination from Fukishima.	This comment is inconsistent with the current state of the science on these topics. The Climate Science Special Report shows a decline in sea ice. In particular, we point the reviewer to this text from the Report, "Since the early 1980s, annual average arctic sea ice has decreased in extent between 3.5% and 4.1% per decade, has become thinner by between 4.3 and 7.5 feet, and is melting at least 15 more days each year. September sea ice extent has decreased between 10.7% and 15.9% per decade. (Very high confidence) (Ch. 11)" The US Fish and Wildlife Five-year Review of polar bears published in 2017 does not give evidence for high bear population size and retained thier listing on the US Endangered Species Act as "Threatened". The IUCN Red List of Threatened Species retained the "vulnerable" listing for polar bears in 2015. While the impact of the March 11, 2011 Tōhoku earthquake and the resulting meltdown of the Fukushima Daiichi nuclear plant caused geological, chemical, and physical consequences for the North Pacific Ocean, their impact is outside the scope of the geographic and topical purview of the 4th NCA for the reasons described below. Furthermore, the reviewer's recommendation is inconsistent with the state of the science. The main impact on the ocean was the large tsunami that was triggered by the earthquake. The tsunami wave traveled across the Pacific and did minor damage on the US West Coast. However, because this is a geological event and not related to climate, these impacts fall outside the purview of the 4th National Climate Assessment. The tsunami also led to the meltdown of the Fukushima Daiichi plant. The meltdown released radiation into both the air and the adjacent ocean in form of various radionuclides. Buessler et al. (2012, https://doi.org/10.1073/pnas.1120794109) found levels of radioactive cesium off of Japan that were 10-1000 times background levels. However, even these levels are not expected to pose a health threat to marine organisms. Furthermore, these concentrations are limited to the immediate waters off of the reactor site, and are thus beyond the scope of the NCA which focuses on impacts on US interests. Finally, while nuclear reactors reach very high temperatures, that heat is concentrated in a small area. For example, one ton of spent nuclear fuel emits ~1kW of heat. This is actually quite small compared to the energy from the sun that arrives at the surface of the ocean every day. Areas of the subtropics and tropics receive, on average, ~200W per square meter. This means that one ton of fuel is emitting the same energy that falls on a patch of ocean roughly the size of two queen-sized beds. The Pacific Ocean is enormous (165 trillion square meters) so there is an incredible amount of heat moving through surface. While water coming out of a nuclear plant is warm, the temperature
Frank	Butler	141838	Text Region	09. Oceans and Marine Resources		333	333	29	32	While there e is no mention of Undersea thermal causes mentioned. Temperatures are taken at 600 foot depths and below, so undersea vents can not be neglected. For the Pacific blob there is no mention of Fukishima Radiation as a cause.	While the impact of the March 11, 2011 Tōhoku earthquake and the resulting meltdown of the Fukushima Daiichi nuclear plant caused geological, chemical, and physical consequences for the North Pacific Ocean, their impact is outside the scope of the geographic and topical purview of the 4th NCA for the reasons described below. Furthermore, the reviewer's recommendation is inconsistent with the state of the science. The main impact on the ocean was the large tsunami that was triggered by the earthquake. The tsunami wave traveled across the Pacific and did minor damage on the US West Coast. However, because this is a geological event and not related to climate, these impacts fall outside the purview of the 4th National Climate Assessment. The tsunami also led to the meltdown of the Fukushima Daiichi plant. The meltdown released radiation into both the air and the adjacent ocean in form of various radionuclides. Buessler et al. (2012, https://doi.org/10.1073/pnas.1120794109) found levels of radioactive cesium off of Japan that were 10-1000 times background levels. However, even these levels are not expected to pose a health threat to marine organisms. Furthermore, these concentrations are limited to the immediate waters off of the reactor site, and are thus beyond the scope of the NCA which focuses on impacts on US interests. Finally, while nuclear reactors reach very high temperatures, that heat is concentrated in a small area. For example, one ton of spent nuclear fuel emits ~1kW of heat. This is actually quite small compared to the energy from the sun that arrives at the surface of the ocean every day. Areas of the subtropics and tropics receive, on average, ~200W per square meter. This means that one ton of fuel is emitting the same energy that falls on a patch of ocean roughly the size of two queen-sized beds. The Pacific Ocean is enormous (165 trillion square meters) so there is an incredible amount of heat moving through surface. While water coming out of a nuclear plant is warm, the temperature signal is quickly diluted as the water cools and mixes with the ocean. Thus, it is not physically possible for a nuclear plant, whether operating normally or abnormally, to emit enough heat to create a significant temperature anomaly. There is strong evidence that both the North Pacific "Blob" and the Northwest Atlantic heatwave were formed by increased heating at the ocean surface (see Chen et al. 2014; Di Lorenzo & Mantua 2016; and other references in the chapter)Heating from geothermal sources is also small--~1% of the surface heating according to Mullarney et al. (2006, http://dx.doi.org/10.1029/2005GL024956). There would have to be a massive increase in geothermal heating in order to explain the rise in global ocean heat content. There would also be a clear spatial pattern, with more heating along mid ocean ridges and less vertical stratification
Frank	Butler	141839	Text Region	09. Oceans and Marine Resources		335	335	15	22	While surface temperatures were collected in 1910, they were just that. Temperatures collected at depths of 600 feet and below were never used before 1989. Adding in warmer ocean floor temps into Man made warming is obviously a false assumption. Computer models only try to gauge the man made with out attributing the Earth made warming.	This comment is inconsistent with the current state of the science on this topic. Oceanographers have been making temperatures at depth since the 1870s. The heat budget of the ocean is dominated by heating from the sun. Heating from geothermal sources is small--~1% of the surface heating according to Mullarney et al. (2006, http://dx.doi.org/10.1029/2005GL024956). There would have to be a massive increase in geothermal heating in order to explain the rise in global ocean heat content. There would also be a clear spatial pattern, with more heating along mid ocean ridges and less vertical stratification (since the heating at depth would destabilize the water column). Neither of these have been observered, so there is no evidence that would refute surface heating as the dominant driver of ocean temperatures and enhanced surface heating due to global warming as the main driver of the long-term trend in ocean temperatures.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
George	Backus	141840	Text Region	09. Oceans and Marine Resources		349	349	29	33	Lacking complete data and ignoring the Radiation of Fukishima and taking into account of decreasing sunspot activity, Natural warming, the man made warming is not assumable . We currently lack field data and data syntheses to make conclusive statements attributing change	While the impact of the March 11, 2011 Tōhoku earthquake and the resulting meltdown of the Fukushima Daiichi nuclear plant caused geological, chemical, and physical consequences for the North Pacific Ocean, their impact is outside the scope of the geographic and topical purview of the 4th NCA for the reasons described below. Furthermore, the reviewer's recommendation is inconsistent with the state of the science. The main impact on the ocean was the large tsunami that was triggered by the earthquake. The tsunami wave traveled across the Pacific and did minor damage on the US West Coast. However, because this is a geological event and not related to climate, these impacts fall outside the purview of the 4th National Climate Assessment. The tsunami also led to the meltdown of the Fukushima Daiichi plant. The meltdown released radiation into both the air and the adjacent ocean in form of various radionuclides. Buessler et al. (2012, https://doi.org/10.1073/pnas.1120794109) found levels of radioactive cesium off of Japan that were 10-1000 times background levels. However, even these levels are not expected to pose a health threat to marine organisms. Furthermore, these concentrations are limited to the immediate waters off of the reactor site, and are thus beyond the scope of the NCA which focuses on impacts on US interests. Finally, while nuclear reactors reach very high temperatures, that heat is concentrated in a small area. For example, one ton of spent nuclear fuel emits ~1kW of heat. This is actually quite small compared to the energy from the sun that arrives at the surface of the ocean every day. Areas of the subtropics and tropics receive, on average, ~200W per square meter. This means that one ton of fuel is emitting the same energy that falls on a patch of ocean roughly the size of two queen-sized beds. The Pacific Ocean is enormous (165 trillion square meters) so there is an incredible amount of heat moving through surface. While water coming out of a nuclear plant is warm, the temperature signal is quickly diluted as the water cools and mixes with the ocean. Thus, it is not physically possible for a nuclear plant, whether operating normally or abnormally, to emit enough heat to create a significant temperature anomaly. There is strong evidence that both the North Pacific "Blob" and the Northwest Atlantic heatwave were formed by increased heating at the ocean surface (see Chen et al. 2014; Di Lorenzo & Mantua 2016; and other references in the chapter)
Frederick	Keady	141892	Whole Chapter	09. Oceans and Marine Resources						1) The chapter gives a thorough review of projected changes in the ocean ecosystems due to changes in atmosphere-ocean circulation by virtue of increase in SST and net carbon intake by oceans. It also provides a detailed account of changes in the socio-economic aspects of the country, especially the people who are living near the coastal regions. Oceanic acidification and deoxygenation are explained in detail and gives clear evidence of imbalances in the marine life in future. 2) The three key messages given in the chapter are very critical not only to the marine organisms, but also can prove fatal to the economical infrastructure of the nation. Since a big amount of population is dependent heavily on the fishing zones, any changes in the oceanic waters will lead to a disruption in these zones and therefore will affect the livelihood of people. It can also lead to inflation in the market prices of seafood, thus leading to increase in the net expense of the people. 3) The only limiting factor which may be improved in the future studies is to use an ensemble of coupled earth system model so as to include feedbacks due to biogeochemical cycles, sea-ice, phytoplankton etc on the climate system. It may not only improve the skill score of the projections, but will also lead to decrease in the uncertainties in the biases.	We greatly appreciate the reviewer's comment about the report and hope that the content is useful. We are eager to see the results of the earth system models and hope they are useful for the next National Climate Assessment.
Christen	Armstrong	141926	Whole Page	09. Oceans and Marine Resources		338				refer to chapter 26, section on Ocean Acidification for good detail on projected impacts of OA on crab fisheries and fish.	We appreciate the suggestion to develop a stronger link with the Alaska chapter. We have referenced this chapter in several places and specifically highlighted the observation that waters in this region may already be understaturated with respect to calcium carbonate.
David	Wojick	141927	Whole Chapter	09. Oceans and Marine Resources						reference the coral reef loss from KM 4 in Chapter 27	Added reference to p 336, line 18 to refer to Chapter 27, KM 4.
Dave	White	141954	Whole Chapter	09. Oceans and Marine Resources						t is said the sea level is rising. This is technically true. (See the blue line satellite data continues on the same slope as previous data.) About 10 inches since 1870. As the oceans rise the surface area expands and the evaporation rate increases due to warming oceans and dilution of glacier water. The increasing evaporation is mitigating all the ocean rise due to glacier melt. This increase is also responsible for increased weather and storm clouds. Previously the clouds blocked 20% of the sun‰Ûªs energy from warming the earth. Now that is increasing with more clouds and soon the temperature increase will stabilize. We are now working with NOAA to make a graph of the satellite ocean measured data by latitude.	This comment is inconsistent with the current state of the science on this topic nor does it apply specifically to this chapter. Sea level rise is covered extensively in the Climate Science Special Report (Chapter 12) and observed and projected impacts are discussed in the Coastal Effects chapter (Chapter 8). Sea levels are rising and the evidence linking sea level rise to higher carbon dioxide levels is very strong. The suggestion that clouds provide a negative feedback is well understood and parameterized in global circulation models (see CSSR Chapter 2). Other feedbacks, such as the decreased albedo due to melting Arctic ice, are more significant. See IPCC "Climate Change 2013: The Physical Science Basis", Chapters 7-8).
Allison	Crimmins	142163	Text Region	09. Oceans and Marine Resources		331	331	3	8	This is a really solid Key Message. Well done.	We greatly appreciate the reviewer's comment
Allison	Crimmins	142164	Text Region	09. Oceans and Marine Resources		331	331	23	24	This first sentence is also the first sentence of chapter 8- almost word for word. Except the fact that they say 123 million people and 39% of the population (you say 124 million, 40%). Neither sentences has a citation provided, but if this comes from the NOAA estimate, then the coastal chapter may have this correct. Even so, it seems like a statistic that makes more sense for the coastal chapter than the oceans chapter, so maybe could be removed here.	Thank you for pointing out inconsistencies between chapters. The first part of this sentence has been removed.
Allison	Crimmins	142165	Text Region	09. Oceans and Marine Resources		334	334	20	20	Could also cite EPA indicators (2016) here- a figure on this is used in Chapter 1	We appreciate the suggestion. We have cited the EPA report in several places in the document and the author team did not feel that a citation at this location is necessary.
Allison	Crimmins	142166	Text Region	09. Oceans and Marine Resources		334	334	27	37	Even though this is really well known stuff, and was in NCA3, there should be citations here.	After consideration of this point, we have determined that the existing text is clear and accurate. The papers by Orr and Feely in the previous sentence (line 27) describe the basic processes in ocean acidification (i.e "three processes"). The sentences highlighted by the reviewer describe these three processes. We think it is clear that the text is summarizing points from the two references and that adding the same references to each sentence would disrupt the flow of the text.
Allison	Crimmins	142167	Text Region	09. Oceans and Marine Resources		335	335	15	28	This paragraph mostly just repeats other parts of the chapter- you could probably drop it and save yourself some room.	Our intention was that this paragraph would explain some of the logic for selecting our three key messages and how they are related. We have edited the paragraph to remove overtly repetitive material (especially in the first sentence), but we think this paragraph provides a valuable transition between the introduction and the key messages.
Allison	Crimmins	142168	Text Region	09. Oceans and Marine Resources		336	336	1	1	This sentence could use some citations. Add the literature the authors reviewed that shows species positively, negatively, and not changing after each part of the sentence.	We appreciate the comment and it made us realize that the "positive, negative, or not at all" phrase may have been viewed as applying over the long term. This was not our intent. The first part of the sentence (species vary) is the critical point, so we removed the other part of the sentence. The next few sentences provide more details and include references.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142169	Figure	09. Oceans and Marine Resources	1	337				This all-red map is sort of confusing. At first I was looking everywhere for a legend that would tell me what the colors meant. Then I found what the pink color meant in the caption, but that only made me wonder why 1.5C was picked as the threshold. Why not just show a range of temperatures? What is so special about 1.5C?	We appreciate the reviewer's comment. Based on this and other feedback, we are replacing this figure with a sequence of images that illustrate the impacted ecosystems and human connections to the ocean.
Allison	Crimmins	142170	Whole Chapter	09. Oceans and Marine Resources						This chapter is 12 pages long, so twice the length it is meant to be. That means a lot needs to be cut out. There are some places of redundancy where whole paragraphs can be cut (noted in other comments). This chapter would also benefit from fewer sub-headings. I would suggest not separating out observed sections from projected sections. Opportunities for reducing risk is good, but I wonder if the mitigation ones can be combined and go under Key Message 1 and the adaptation ones under Key Message 2, so you don't need separate sections under each key message. The climate-ready fishery management section on the top of page 341 would make a nice text box. The emerging issues text can all be punted to the traceable accounts. That could help you consolidate the sections under just the overview and three key messages. You also don't need a conclusion, like a journal article. These can just end when the information is done. Also, all three of your figures are maps, which is a little map heavy. But I wonder if you could save space by having a 3-paneled set of maps in one figure. Or by overlaying the marine heatwaves on top of the projected ocean temperatures in figure 9.1. At the vey least, it would be nice if all three used the same map projections.	We appreciate the reviewer's suggestions on how to reduce the length of the chapter; however, our chapter is consistent with the guidance set out by USGCRP. In particular, the 6 page limit is exclusive of the traceable accounts. We appreciate the suggestion to remove the conclusion. We will work with the other chapter teams to make sure our chapter is consistent with the overall form of the NCA.
Allison	Crimmins	142171	Text Region	09. Oceans and Marine Resources		338	338	38	38	Cite EPA Indicators report 2016 that maps NOAA data (would make a nice interactive figure too)	The suggested reference has been added to the text
Allison	Crimmins	142172	Text Region	09. Oceans and Marine Resources		341	341	28	37	Cut this paragraph down by about half- maybe just two sentences- and put in the Major Uncertainties section of the traceable account for this key message	After consideration of this point, we have determined that the existing text is clear and accurate. Each key message is required to have a subsection on emerging issues and research gaps. The lack of case studies showing clear impacts of acidification on management populations was notable in our review of the literature. We think this is an important area where additional research is needed.
Allison	Crimmins	142173	Text Region	09. Oceans and Marine Resources		341	341	39	39	I really appreciate key message #3. It is something new, not just a repeat of NCA3, and a very interesting topic. The sentence on page 342 lines 12-13 is especially important and well-written. Thank you.	We greatly appreciate the reviewer's compliment on our work.
Allison	Crimmins	142174	Text Region	09. Oceans and Marine Resources		343	343	26	34	This is redundant text and not about projections- suggest deleting and just putting the info on projections from the last 4 sentences of this section up into the main text of Key Message 3 (i.e. no separate projections section)	The text was revised to incorporate this perspective. We streamlined the section material to remove redundancy. The projected change in extreme ocean events is closely tied with our understanding of how natural modes of climate variability willl behave in the future. Thus, the authors feel it is necessary to have some discussion of the climate modes.
Allison	Crimmins	142175	Text Region	09. Oceans and Marine Resources		344	344	7	21	Can this text be shortened and included under Key Message 2?	After consideration of this point, we have determined that the existing text is clear. Specifically, the referenced section refers to an adaptive response to an extreme event (the point of KM3) and not to adaptation in fisheries (i.e. KM2).
Allison	Crimmins	142176	Text Region	09. Oceans and Marine Resources		344	345	23	8	Move most of the emerging issues info (lines 23-32) into traceable accounts (much of this can be cut down) and the last two sentences from this section (lines 32-36) up into the main text of Key Message 3. Delete Conclusion (page 345 lines 1-8)	After consideration, the author team determined that the narrative flows best as written. The uncertainty around the behavior of the jet stream and its relationship to sea ice is an important research gap that we would like to emphasize.
Allison	Crimmins	142177	Traceable Account	09. Oceans and Marine Resources		346	346	3	12	It could be helpful to add here any information you have on the decisions the authors made about scope. What is in this chapter, versus what is in the Coastal chapter and how did you decide that? Is there a topic here you decided not to cover because it is covered in a regional chapter, or because it was beyond what would fit? Why so much focus on fisheries and not, say, changes in phytoplankton communities, or deep sea species, or how climate changes will affect shipping or Arctic transportation or methane clathrates or whatever?	We appreciate the suggestion and have added a paragraph that describes our discussions with the Coasts chapter and our rationale for focusing on ecosystem services like fisheries where the economic benefits can be calculated.
Allison	Crimmins	142178	Traceable Account	09. Oceans and Marine Resources		346	348	22	6	I strongly urge the authors to re-write this Description of Evidence section. The authors do not seem to understand the purpose of this section of the traceable account. The text is almost completely redundant to the text in the chapter. There is very little DESCRIPTION of the evidence. Instead of just regurgitating the facts outlined in the chapter, this section should tell the reader if this information is new, emerging, inconclusive or if it is well-established, with lots of consensus, years of data, etc. Are these findings based in theory but not yet observed in situ? Do 47 studies say one thing but 2 say the other? Are there multiple lines of evidence, or is the science not advanced in certain topics? Also, of course, this entire section could be cut to two paragraphs.	Based on this and other comments, we did a complete rewrite of our traceable accounts for all three key messages. These are now more consistent across the key messages and conform to the guidelines for the NCA. The process of revising our traceable accounts did not lead to changes in our likelihood estimates or confidence levels, but we think that the new text more clearly establishes these levels.
Allison	Crimmins	142179	Traceable Account	09. Oceans and Marine Resources		348	349	8	4	The authors again do not seem to understand the purpose of the traceable accounts. This section is twice as long as it should be and reads like a book report, rather than a brief explanation of where the Major Uncertainties lie. Lines 11-17 are good. Lines 18-28 should be cut to just say there are uncertainties in how species will react to multiple stressors and how they may evolve in response to changing climate. (That takes no more than one or two sentences). Then turn lines 29 through 4 (on page 349) into a sentence or two about how we don't have long-term field data that would allow for attribution studies. Period. This is all good and important text, but just not the place for it (nor is there space for it). Not only that, but you have ranked your key message as "Very High Confidence" and then you have two whole pages of major uncertainties, which doesn't make me feel like there is very high confidence. Saying that we could improve our understanding with long term data observations and studies that examine multiple stressors is great. Saying we have two pages of uncertainties in our very high confidence finding, not so great.	Based on this and other comments, we did a complete rewrite of our traceable accounts for all three key messages. These are now more consistent across the key messages and conform to the guidelines for the NCA. The process of revising our traceable accounts did not lead to changes in our likelihood estimates or confidence levels, but we think that the new text more clearly establishes these levels.
Allison	Crimmins	142180	Traceable Account	09. Oceans and Marine Resources		349	349	13	21	The confidence rankings in this Key Message are a little confusing. First, the KM1 said that warming, acidification, and deoxygenation were very high confidence. Here they are broken out individually and acidification and deoxygenation have only high confidence, not very high. Second, this message seems to be more about fisheries and adaptation, not about the actual impacts of warming/acidification/deox. That is the findings of the first key message. So, I would suggest the authors move these three likelihood and confidence statements into Key Message 1. UNLESS, the confidence rankings in this finding are more about how these impacts will affect catches (in other words, we have very high confidence that acidification is happening but only high confidence that it is affecting catches). If that is the case, then we just need some clarification, and maybe still break out the confidence levels in Key Message 1.	We appreciate the comment and agree that the text was confusing. Based on this and other comments, we did a complete rewrite of our traceable accounts for all three key messages. These are now more consistent across the key messages and conform to the guidelines for the NCA. The process of revising our traceable accounts did not lead to changes in our likelihood estimates or confidence levels, but we think that the new text more clearly establishes these levels. In these edits, we made it clearer that our confidence/likelihood statements were referring to the impacts on fish stocks, rather than the physical trends.
Allison	Crimmins	142181	Traceable Account	09. Oceans and Marine Resources		349	350	23	40	This section is much better written than the section in the traceable account for Key Message 1, as it explains things like "there is strong evidence" and "few studies" and "supported by theory and experimental studies". But overall this section is really really long, and has information that doesn't really belong here. Some info is already in the chapter and those findings don't need to be repeated. Other info, like lines 16-31, seem too detailed, and too specific to describing a methodological approach, and should probably be cut.	We appreciate the advice that this traceable account is closer to the desired form than our others. Based on this and other comments, we did a complete rewrite of our traceable accounts for all three key messages. These are now more consistent across the key messages and conform to the guidelines for the NCA. The process of revising our traceable accounts did not lead to changes in our likelihood estimates or confidence levels, but we think that the new text more clearly establishes these levels.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142182	Traceable Account	09. Oceans and Marine Resources		352	353	15	10	All of this text is redundant to the chapter and can be deleted. Replace with a description of the evidence, not the evidence itself.	Based on this and other comments, we did a complete rewrite of our traceable accounts for all three key messages. These are now more consistent across the key messages and conform to the guidelines for the NCA. The process of revising our traceable accounts did not lead to changes in our likelihood estimates or confidence levels, but we think that the new text more clearly establishes these levels.
Allison	Crimmins	142183	Traceable Account	09. Oceans and Marine Resources		353	353	31	36	The confidence and likelihood statements in this section do not match those in the key message above. Lines 31-33 is an incomplete sentence and doesn't seem to be about this key message.	After consideration of this point, we have determined that the existing presentation fo the confidence and likelihood are consistent. We have changed the incomplete sentence.
Juanita	Constible	142481	Whole Chapter	09. Oceans and Marine Resources						The Oceans and Marine Resource chapter did an excellent job providing an update on the impacts and risks of carbon emissions to marine ecosystems and resources in the U.S. This is a rapidly developing field and the authors captured key events and findings in a very succinct manner, using a broad range of detailed, regional examples.	We greatly appreciate the reviewer's comment.
Juanita	Constible	142482	Whole Chapter	09. Oceans and Marine Resources						The Oceans chapter could be more clear early in the document that ocean acidification is not an impact of climate change (Chapter 9; page 331; Line 26; 'Ocean ecosystems are being transformed due to climate change by three key factors: warming seas, ocean acidification, and deoxygenation, and these transformations are already impacting the U.S. economy and the coastal communities…')	We thank the reviewer for this good point. We did not intend to portray that ocean acidification is caused by climate change. We have altered the sentence in question to state, "Ocean ecosystems are being transformed due to increased atmospheric carbon dioxide levels by three key factors: warming seas, ocean acidification, and deoxygenation…"
Juanita	Constible	142483	Text Region	09. Oceans and Marine Resources		335	335	19	21	Examples of adapting fisheries to a changing climate should be given. ('… there has been progress in adapting fisheries management to a changing climate'.)	After consideration of this point, we have determined that the existing text is clear and accurate. The highlighted sentence is meant to give the reader an idea of where the review is going. Key Message 2 deals exclusively with the impact of climate change on fisheries and specific examples are included in that section.
Juanita	Constible	142484	Text Region	09. Oceans and Marine Resources		338	338	37	38	In discussing the poleward movement of fishes, it would be wise to give specific examples.	After consideration of this point, we have determined that the existing text is clear and accurate. This sentence is meant to describe a general pattern that occurs across many species in many differen regions. Calling out particular species would work against the goal.
Juanita	Constible	142485	Text Region	09. Oceans and Marine Resources		331	331	3	8	Key Message 1 is important to retain in the final document.	Thank you for supporting our work. The authors agree.
Juanita	Constible	142486	Text Region	09. Oceans and Marine Resources		331	331	11	13	The focus on the trifecta of changes occurring in the oceans (warming, acidification, and deoxygenation) is important to retain in the final document.	Thank you for supporting our work. The authors agree.
Juanita	Constible	142487	Text Region	09. Oceans and Marine Resources		341	341	11	13	The research on social vulnerability is important to retain in the final document.	We greatly appreciate the reviewer's comment.
Juanita	Constible	142488	Text Region	09. Oceans and Marine Resources		348	348	13	17	The need for enhanced monitoring of ocean ecosystems and marine resources is important to emphasize in the final document	We greatly appreciate the reviewer's comment. We highlight the value of monitoring several places in the text, notably the "opportunities for reducing risk" section of KM1. We do not think a discussion here is necessary.
Juanita	Constible	142489	Text Region	09. Oceans and Marine Resources		340	340	9	11	The need to better understand the potential impacts to Native Americans is important to retain and emphasize in the final document.	An additional sentence was added to capture that Western Alaska communities receive significant benefits from Alaska groundfish revenues.
Kathy	Mills	143106	Whole Chapter	09. Oceans and Marine Resources						Nice synthesis of complex information at a national scale. Key messages target some of the most important issues facing our oceans as climate change progresses.	We greatly appreciate the reviewer's comment.
Ross	McKitrick	143107	Text Region	09. Oceans and Marine Resources		334	334	23	24	Statement about factors influencing phytoplankton blooms needs a citation. Consider Ji et al. 2010 or Friedland et al. 2016.	The citation Friedland et al. 2016 has been added, as well as Barton et al. 2016. AJP--edited text to match content of citations.
Social Science	Coordinating Committee	143274	Traceable Account	09. Oceans and Marine Resources		346	346	2	12	Process description needs more information on who the stakeholders were. Were the only scientists? Did ocean/marine users participate?	We have added text to provide additional details on our outreach activities and who participated.
Social Science	Coordinating Committee	143275	Traceable Account	09. Oceans and Marine Resources		346	346	2	12	Process description should repeat information on how certainty/likelihood is defined.	After consultation with USGCRP staff, we decided that adding our own description of likelhood/certainty is not necessary. These are defined for the entire NCA and do not need to be defined independently for each chapter.
Social Science	Coordinating Committee	143276	Traceable Account	09. Oceans and Marine Resources		346	346	37	37	Include ecological and economic impacts of specific Caribbean / Hawaii events referenced here.	We appreciate the suggestion and the desire to more fully represent US islands in the Pacific and the Atlantic. We do mention the economic impacts from the loss of coral reefs (we don't break this down by region, though) and the impact through fisheries in these regions. We have also endeavored to link to the key messages from these two chapters.
Social Science	Coordinating Committee	143277	Traceable Account	09. Oceans and Marine Resources		349	349	5	11	Include confidence statement for impact of marine ecological disruption to humans.	After consideration, the author team determined that the narrative flows best as written. This key message is very focused on ecosystems, and this was a deliberate choice by the author team. We do mention the value of ecosystem services from the ocean and connect them to ecosystem disruptions, but this is not the main focus. Our other key messages have stronger human components--again, this was deliberate. We wanted to set some baseline expectation of change in the ocean and then consider how changes impact humans through fisheries and through complex interactions from extreme events.
Social Science	Coordinating Committee	143278	Traceable Account	09. Oceans and Marine Resources		351	351	22	22	Include any available economic projections of future U.S. fisheries demand.	We added text noting the OECD/FAO prediction of very modest price increases over the next decade and the great uncertainties over a longer time frame.
Social Science	Coordinating Committee	143279	Text Region	09. Oceans and Marine Resources		338	338	31	34	As an example of an impact to a specific community, this line is really important. Elaborate further on 'severe socioeconomic stress.' Who was effected? What happened to them? Consider adding more case studies like this.	The word 'servere' was removed from the previous text; new text was added to capture recent heat wave related impacts in the Gulf of Alaska.
Social Science	Coordinating Committee	143280	Whole Chapter	09. Oceans and Marine Resources						Note the critical importance of ocean fisheries to subsistence users with examples.	We appreciate the suggestion. We specifically mention the importance of fisheries to indigenous peoples and do not have space to expand significantly on this issue. However, we did add a sentence on community development quotas, an important source of fishery-derived income for communities in Alaska.
Kathy	Mills	143386	Text Region	09. Oceans and Marine Resources		335	335	8	10	It may be useful to make the connection to coastal acidification (Wallace et al. 2014) following on discussion of algal blooms.	Added reference to end of sentence describing Gulf of Mexico hypoxia.
Kathy	Mills	143389	Text Region	09. Oceans and Marine Resources		335	335	12	14	This sentence does not seem to follow directly from the preceding ones. A tighter connection to the paragraph would be useful.	We added edits to loop phytoplankton back to hypoxia.
Kathy	Mills	143398	Text Region	09. Oceans and Marine Resources		336	336	15	16	Are there citations to support this sentence?	We appreciate the suggestion to add additional references. There are myriad papers that show how the loss of coral alters reef ecosystems. We added a reference to Rogers et al. (2014) that connects structural complexity in reefs to ecosystem services. However, for this statement, we are most interested in how the impacts propagate to human communities. The Hawai'i chapter has an entire key message focused on this connection and refer the reader to that chapter.
Kathy	Mills	143401	Text Region	09. Oceans and Marine Resources		338		4		Marine protected areas are one examples, but a number of studies are showing that good fisheries management can also play an important role in buffering climate impacts to commercial species (Le Bris et al. 2018, Costello's work). It may also be valuable to note that the performance of MPAs under future climate scenarios has not been widely evaluated and is likely a research gap to address in order to use these tools most effectively moving forward.	We appreciate the suggestion and have mentioned fishery management as one opportunity for building resilience. Fisheries management under climate change is our second key message, and we refer the reader to that section.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Kathy	Mills	143407	Text Region	09. Oceans and Marine Resources		339	339	31	34	There are other good single species studies to cite from high-value fisheries if interested: Le Bris et al. 2018 (American lobster), Cooley et al. 2015 (sea scallops)	We thank the reviewer for suggesting the two additional single-species studies. The text has been amended to include them.
Kathy	Mills	143410	Text Region	09. Oceans and Marine Resources		339	339	13	14	I think the interpretation may be a bit off in this sentence. First, it's unclear what "not" is referenced against, the past or the future? The main message of the paper is that as temperatures warm (or warm earlier), more females will make it upriver to spawn before the fishery opens. I think this message is somehow getting turned around in this sentence.	The sentence has been made clearer as suggested by the reviewer.
Kathy	Mills	143411	Text Region	09. Oceans and Marine Resources		340	340	17	19	Are there citations to offer for this sentence? I think it would be valuable to point to examples, even if they are from other countries. Hobday et al. 2016 may be useful.	Citations have been added, as suggested by the reviewer.
Diane	Borggaard	143414	Text Region	09. Oceans and Marine Resources		338	341	18	37	Protected species is noted in this section but there isn't much attention given to this issue. Consider adding to. Also, the title is "Marine Fisheries"; is that the intended focus or should the title reflect a broader "Marine Species."?	We appreciate the suggestion to expand this section to include protected species. While NOAA Fisheries has responsbility for the management of protected species in the ocean and uses some common techniques (e.g. assessments, time-area closures), the author team felt that generalizing the text to "managed species" would make the section less impactful.
Kathy	Mills	143415	Text Region	09. Oceans and Marine Resources		341	341	20	21	Licensing practices provides one example of a policy that impedes diversification (e.g., Stoll et al. 2016); for the latter part of the sentence, Maxwell et al. (2015) may be useful.	We appreciate the suggestion. We added an alternative earlier reference for the first part of the sentence and took the reviewer's citation suggestion for the second part of the sentence.
Kathy	Mills	143580	Text Region	09. Oceans and Marine Resources		341	341	28	37	It would be valuable to mention the work towards species vulnerability assessments that is underway across the US (Morrison et al. 2015; Northeast pilot, Hare et al. 2016). Moving forward, development of pathways to bring this climate information to local communities and to integrate it into fishery management (even as context) would be valuable.	We thank the reviewer for highlighitng the recent fish species climate vulnerability assessment work. We now included reference to this work in the main text and also highlight the need to develop novel pathways to leverage such climate information for decision making in the emerging issues/research gaps section of KM2.
Kathy	Mills	143586	Text Region	09. Oceans and Marine Resources		344	344	1	5	Seems like "frequency" would be a better word than "occurrence." Also, the sentence refers to "these" toxic algal blooms, but the previous paragraph was about ocean acidification. Delete "these"? It feels like this paragraph needs a topic sentence to tie together the two examples covered in it.	The text has been revised to incorporate this suggestion. We added a topic sentence to the paragraph and removed "these."
Aimee	Delach	143598	Whole Chapter	09. Oceans and Marine Resources						Of the various chapters pertaining to natural resources, the ‰ÛÏOceans‰Û chapter does an excellent job of reviewing the various types of climate change impacts on a wide range of species. This chapter could potentially serve as a model for a fuller treatment of biodiversity in the other chapters.	We greatly appreciate the reviewer's comment.
John	Fleming	143643	Whole Chapter	09. Oceans and Marine Resources						Throughout the chapter, emissions scenarios are referenced to characterize potential climate change impacts, primarily RCP8.5 and/or RCP4.5. However, in many instances, only RCP8.5 is mentioned whereas in other cases potential impacts under both RCP8.5 and RCP4.5 are stated. Throughout the chapter, impacts should be assessed under not only under RCP8.5 and RCP4.5, but also under RCP2.6 since this is the only scenario consistent with keeping temperature below 2 degrees Celsius. Relying on all three will better frame the likely risks and the effort that will be necessary to prevent many adverse climate change impacts. Also, this will illustrate the benefits and necessity of reducing emissions to avoid unacceptable climate change damage. Relying solely on RCP8.5 projections discounts the horrible impacts that will occur at lower emissions trajectories such as RCP4.5, and how RCP2.6 and below should truly be the goal.	We appreciate the thoughtful comments. Throughout the NCA process, we have been advised wherever possible, to contrast projected outcomes under RCP 8.5 with RCP 4.5. The difference between these scenarios provides an indication of the benefts to be gained through emission reductions. We appreciate the value in including other scenarios; however, this would be inconsistent with NCA guidance. Furthermore, it is rare to see all three scenarios presented in the ocean climate literature.
Michelle	Tigchelaar	143677	Whole Chapter	09. Oceans and Marine Resources						This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. Shellfish, particularly those harvested through aquaculture, are a key marine resource. Yet the current climate impacts on shellfish do not figure heavily in the Key Messages of this chapter; in fact, the only reference to current impacts on this industry is made in Key Message 3‰Û¤s Opportunities for Reducing Risk section: ‰ÛÏSeveral corrosive events along the Pacific Northwest Coast prompted the Pacific Coast Shellfish Growers Association to work with scientists‰Û_ Similar practices are being employed on the East Coast to adapt shellfish hatcheries‰Û_‰ÛÒ (Page 334, Lines 8-14). Otherwise, climate change impacts on shellfish harvested are referenced only as a Projected Impact in Key Message 2: ‰ÛÏOcean acidification is expected to reduce harvest of US shellfish‰Û_‰ÛÒ (Page 339, Line 34). Climate change has been of particular interest to large players in the shellfish aquaculture industry, particularly in the Pacific Northwest (referenced in the chapter text using the example of the Pacific Coast Shellfish Growers Association, Page 334). The following information should be included to acknowledge current / ongoing effects of climate change on shellfish and aquaculture, rather than just projected or expected impacts (using references already cited in this chapter): Ocean acidification has already cost the US Pacific Northwest oyster industry approximately $110 million, putting in jeopardy nearly 3,200 jobs (Ekstrom et al 2015). Upwelling waters with elevated PCO2 (hypothesized as a recurring feature of a warming climate) were linked to several years of oyster seed production failures in a hatchery in the US Pacific Northwest which used common commercial hatchery conditions and protocols (Barton et al. 2015) While this information does not immediately appear to fit in to any specific areas text areas, it seems as though marine aquaculture generally would be best referenced as a part of the ‰ÛÏmarine fisheries‰Û Key Message, which could be expanded to be more inclusive of other forms of marine resources under existing threat from climate change that does not result solely from extreme events. References:	Thank you for your ample comments. Please note that ocean acidification impacts in the Northwest were covered in NCA3. Given our page limit for this chapter, we relied on the Northwest Chapter to cover the story of the impacts of OA on shellfish more in depth. The Barton reference in your comment does show up on p 343, line 21. Oyster aquaculture is also referenced in this section. The section on p339, lines 34-36 does reference the expected losses to shellfish harvests in the future due to OA.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michelle	Tigchelaar	143794	Text Region	09. Oceans and Marine Resources		335	338	29	17	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. This comment is in support of the first Key Message of Chapter 9, ‰ÛÏOcean Ecosystems.‰ÛÒ Two qualities, which we believe to be critically important to the discussion of this subject, distinguish this Key Message from the remaining two Key Messages in Chapter 9, as well as across other NCA4 chapters. First, the sole focus of this Key Message is on marine ecosystem changes, regardless of related human impacts. This is particularly important information to review, as it generates a fuller understanding of the challenges facing ocean ecosystems as well as the more human-centric climate change impacts addressed in Key Messages 2 & 3. Before we can fully understand the climate impacts on human populations that result from changes in marine resources and extreme events, it must first be made clear the impacts of ocean warming, ocean acidification, and hypoxia on marine ecosystem structure and function. This Key Message also provides a foundation for future National Climate Assessments, as many of the impacts on marine ecosystems that are currently being observed or projected have indirect, or as yet unclear, impacts on human populations. Secondly, this Key Message specifically calls out ‰ÛÏsignificant reductions in carbon emissions‰ÛÒ as the only way to avoid ‰ÛÏtransformative impacts on ocean ecosystems.‰ÛÒ This is a necessary acknowledgement that while adaptation strategies can mitigate the effects of ocean change on human populations, only reducing carbon emissions can address the actual drivers of ocean change. To strengthen this statement in the Key Message itself, as it may get some pushback farther along in the review process, the authors could include the references on page 338; lines 6-7.	We greatly appreciate the reviewer's comment and support of this key message. We are pleased that our thinking is mirrored by that of our reviewers. We have guidance from USGCRP to refrain from including references in the key messages so will not include the suggested references in the key message text.
Michael	MacCracken	144327	Text Region	09. Oceans and Marine Resources		331	331	16	21	In that sea ice retreat will very likely have quite severe impacts on a number of marine mammals that depend on the presence of sea ice, I would suggest that sea ice retreat also needs to be mentioned. Same comment applies to lines 25-28. I do see that Arctic effects are mentioned a bit further along, but in that they are already so far along, I'd urge mention as well up in the key finding itself.	After consideration, the author team decided to keep discussions of ecosystem changes due to reductions in sea ice in key message 1. Years with extremely low or extremely high quantities of ice would definitely qualify as extreme events. However, they are not surprising the way that the two heatwaves highlighted are. Rather, we feel that the trend in the Arctic is the most significant aspect to report.
Michael	MacCracken	144328	Text Region	09. Oceans and Marine Resources		331	331	31	33	You might also mention walrus. And then there are also the species that depend on marine production below the sea ice, so even some species of whales, etc. Basically, I'd suggest the Arctic impacts merit more than one sentence.	Thank you for the comment. We recognize we are missing many animals who are impacted by the loss of sea ice and loss of sea ice phytoplankton. Since we are limited to six pages, refer to the Alaska regional chapter who expands on these issues.
Michael	MacCracken	144329	Text Region	09. Oceans and Marine Resources		337	337	11	11	Saying the United States here seems quite provincial (especially as the US also includes islands in the Pacific and Caribbean). How about saying will impact global ecosystems and then also the benefits of such systems for the US (as well as other nations)?	The reviewer makes a fair point. It was not our intent to be provincial, but we see how the text could come across that way. We have altered the sentence to read simply, "Changes in biodiversity will transform the marine ecosystems."
Michael	MacCracken	144330	Text Region	09. Oceans and Marine Resources		338	338	6	6	I'd urge referring to the global average concentration of CO2. Using plural sort of implies that there is more than one and perhaps it might be influenced more by us than another.	Thank you for this thoughtful comment. We now refer to the global average atmospheric carbon dioxide concentration
Michael	MacCracken	144331	Text Region	09. Oceans and Marine Resources		340	340	3	3	"change" should be plural here	
Michael	MacCracken	144332	Text Region	09. Oceans and Marine Resources		340	340	14	14	It is really best not to use the word "may" as this conveys no useful indication of likelihood. What needs to be done is to use a word from the likelihood lexicon (just a note that I've been offering this comment throughout the assessment). Here, it would be appropriate to perhaps say "is likely to"	We have changed the word "may" to "are likely to", as suggested.
Michael	MacCracken	144333	Text Region	09. Oceans and Marine Resources		340	340	16	16	It would help to say "There will also be"	We have changed the text as suggested
Michael	MacCracken	144334	Text Region	09. Oceans and Marine Resources		340	340	17	17	Would probably be better to say "projections" rather than "predictions"	We have changed the text as suggested
Michael	MacCracken	144335	Text Region	09. Oceans and Marine Resources		344	344	11	11	Likely appropriate to define sigma.	The Greek symbol is omega (not sigma as indicated). It is defined in the introduction to the chapter.
Michael	MacCracken	144336	Text Region	09. Oceans and Marine Resources		344	344	8	11	I thought I read somewhere that the shellfish growers were also flying young shellfish to Hawai'i for initial acclimation to ocean waters outside the hatcheries as the waters of Puget Sound had too low a pH for them at such a young age. If this is indeed the case, I would think it merits mention to indicate the types of adaptation already underway.	Thank you for the suggestion. We were not able to find this described in the peer-reviewed literature that is the basis for the National Climate Assessment. As such, we can not discuss it in our chapter.
Michael	MacCracken	144337	Whole Chapter	09. Oceans and Marine Resources						Particularly well done chapter	We greatly appreciate the reviewer's comment.
Walter	Haugen	140824	Whole Chapter	10. Agriculture and Rural Communities						Beginning sentence: ‰ÛÏU.S. farmers and ranchers are among the most productive in the world.‰ÛÒ This is a false assumption. Productivity is here narrowly defined only in terms of monetary value and yield. In terms of fossil fuel energy used to produce food energy, U.S. farmers and ranchers would be ranked among the lowest in the world. In a report on climate change resulting from burning fossil fuels, starting from the false premise that productivity is ONLY defined by dollar value and yield skews the whole report. Unless the authors of the report are willing to go back and change their core assumptions, the report is worthless.	Thank you for your comment which raise points that are beyond the scope of the chapter.
Sally	Courtright	141630	Whole Chapter	10. Agriculture and Rural Communities						While agriculture is an essential form of revenue to rural communities, in a changing climate, major changes will be required to how the agricultural system works. The large animal agriculture operations (CAFOs) are a major source of greenhouses emissions and result in poor air quality for residents in the surrounding neighborhoods. There are clear gradients of particulate matter in the air surrounding CAFOs, and the resulting air quality results in an increased incidence of respiratory diseases in the nearby residents. The water, carbon, and pollution-intensive nature of these operations means that we must scale them back in the midst of a warmer climate with more variable precipitation. The way that traditional agriculture uses soil also needs to change. Modern agricultural techniques result in the soil being able to store significantly less carbon than it used to; changing farming practices can make our soils become a source, rather than a sink, for carbon. The production of fertilizers is also a source of emissions that cannot be ignored when addressing agriculture, and their overuse threatens many areas of environmental quality. It is inevitable that prices in food will go up as we exchange the extremely efficient but unsustainable techniques of the green revolution for sound practices that preserve soil and water quality. However, with the right government programs in place, it is possible for Americans to adapt to a change in how we produce food, and to produce food in a way that promotes environmental health in all areas of the country.	Thank you for this comment. GHG emissions have been increasingly addressed through nutrient management program incentives. Similarly, conservation tillage management, residue management as well other practices are gaining widespread use and incentive programs have been in place to encourage these changes. Many producers use computer-assisted precision agriculture and fertilizer application both of which reduce particulate air emissions and reduce the amount of fertilizer used. Some of the latest advances are in Climate Smart Agriculture where producers learn to reorient practices to a changing climate.

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Eugene	Takle	141670	Text Region	10. Agriculture and Rural Communities		374		25		add "e.g.," in parenthetical phrase: ‰Û_climate change (e.g., increasing‰Û_)	Done: Revised the text as suggested
Eugene	Takle	141671	Text Region	10. Agriculture and Rural Communities		374		27		add "e.g.," in parenthetical phrase: ‰Û_secondary effects (e.g., increased weed, pest…	Done: Revised the text as suggested
Eugene	Takle	141672	Text Region	10. Agriculture and Rural Communities		374		21		" Observed climatic changes are consistent…" change to "Most observed climatic changes relevant to agriculture are consistent…"	Done: Revised the text as suggested
Eugene	Takle	141673	Text Region	10. Agriculture and Rural Communities		375		2		"To mitigate these impacts‰Û_" Agriculture is adapting to these impacts but it has not mitigated them. Suggest: To reduce these impacts,…	This sentence has been deleted during revisions.
Eugene	Takle	141674	Text Region	10. Agriculture and Rural Communities		375	375	6	10	Move Takle reference. Suggest: The severity of risks also depends on changes in food prices as well as local to global-level trade, as production and consumption patterns will likely be altered due to climate change (Takle et al., 2013). Many countries are already experiencing rapid price increases for basic food commodities mainly due to frequent weather extremes and unpredictable weather events.	Done: Revised the text as suggested
Eugene	Takle	141675	Text Region	10. Agriculture and Rural Communities		376	376	7	8	Add cross reference to Midwest chapter 21 which provides some specifics on heat waves: Suggest: "…across the United States (Ch. 2: Our Changing Climate; USGCRP, 2017; Ch. 21 Midwest), more…"	Done: Added the Midwest chapter reference as suggested.
Eugene	Takle	141676	Text Region	10. Agriculture and Rural Communities		380	380	2	3	"Projected temperature increases of about 1.8â¡F by the year 2030 and 3.6â¡F by 2100 are expected to intensify climate extremes." Is this the projected average increase across the continental US or agricultural areas or some other?	Agreed: Sentence is revised to add "Projected global average temperature…."
Eugene	Takle	141677	Text Region	10. Agriculture and Rural Communities		380		24		Add reference: Takle et al., 2013	The paper is cited in another part of the Chapter where it fits better.
Eugene	Takle	141678	Text Region	10. Agriculture and Rural Communities		387		31		Add reference: Takle et al., 2013	We have cited this paper elsewhere. The paper does not relate to crop response to high temperature stress.
David	Wojick	141679	Text Region	10. Agriculture and Rural Communities		389		37		Suggest adding a sentence: Observed increases in April-May-June precipitation in the Midwest (Zhe Feng et al., 2016) over the last 40 years and projected increases in the future (Cook et al., 2008) present a particular challenge for preventing soil erosion for row-crop agriculture in this region. Cook, K. H., Vizy, E. K., Launer, Z. S. & Patricola, C. M., 2008: Springtime intensification of the great plains low-level jet and midwest precipitation in GCM simulations of the twenty-first century. J. Climate 21, 6321‰ÛÒ6340. Zhe Feng, L. Ruby Leung, Samson Hagos, Robert A. Houze, Casey D. Burleyson, Karthik Balaguru, 2016: More frequent intense and long-lived storms dominate the springtime trend in central US rainfall. Nature Communications, 2016; 7: 13429 DOI: 10.1038/ncomms13429	Observed and projected climate change are better addressed in the specific Regional chapter and Chapter 2 Our Changing Climate. We have not added this sentence.
David	Wojick	141682	Text Region	10. Agriculture and Rural Communities		376	376	11	15	Here is the present text: 11 Key Message 1: Reduced crop yields and quality, intensified wildfire on rangelands, depletion of 12 surface water supplies, and acceleration of aquifer depletion are anticipated with increased 13 frequency and duration of drought and associated high temperatures. By 2050, the number of 14 consecutive dry days may increase as much as 4‰ÛÒ8 days across much of the United States, 15 with potentially frequent but shorter droughts in the Southeast and parts of the Southwest. Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based entirely on the use of questionable computer models, especially the projections to 2050. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	This Key Message is based on information provided in the fully refereed CSSR.
David	Wojick	141683	Text Region	10. Agriculture and Rural Communities		379	379	8	13	Here is the present text: 8 Key Message 2: Challenges to human health, crop productivity, and livestock health are 9 increasing due to increased frequency and intensity of temperature extremes. Higher 10 maximum temperatures can reduce crop yield and forage quality, increase the incidence of 11 pests and disease for crops and livestock, and cause heat stress in livestock. Increases of up 12 to 80 days with temperatures over 100â¡F are possible by 2050, particularly across the 13 southern portions of the United States. Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based entirely on the use of questionable computer models, especially the projections to 2050. That these health claims are highly questionable has already been pointed out to the USGCRP. See for example: "Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment" by Patrick J. Michaels and Paul C. "Chip" Knappenberger, Cato Institute, June 2015. https://www.cato.org/publications/public-comments/draft-impacts-climate-change-human-health-united-states-scientific Apparently the USGCRP has chosen to ignore this information.	This Key Message is based on information provided in the fully referenced CSSR and the published report of Climate Change and Human Health -USGCRP, 2016: The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312 pp. http://dx.doi.org/10.7930/J0R49NQX
David	Wojick	141684	Text Region	10. Agriculture and Rural Communities		382	382	16	20	Here is the present text: 16 The 17 frequency and intensity of extreme precipitation events has already increased and is 18 anticipated to intensify. By 2050, there will be a 20-80% increase in the proportion of annual 19 total precipitation that is produced by the current top 1% of storms, particularly in 20 northeastern and northwestern states. Comment: This text falsely states speculative projections as established physical facts. These projections appear to be based primarily on the use of questionable computer models, especially the projections to 2050. We do not in fact know that these unusual events will become more common or more severe in the future.	This Key Message is based on information provided in the fully refereed volume I CSSR and Chapter 2, Our changing climate in volume II

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142490	Text Region	10. Agriculture and Rural Communities		375	375	22	25	Crop insurance is mentioned as an option for farmers to mitigate risk from climate change. However, this might not be appropriate, as crop insurance can actually be a barrier to crop rotation (another important risk mitigation strategy) because it incentivizes monoculture cropping through yield formulas. The section also names soil erosion technologies and altering crop inputs as strategies for mitigating risk. However, it would be even more appropriate to mention improved soil health. Soil health management practices include soil erosion reduction and lead to reduced crop inputs, but soil health is now viewed more holistically as a biological, chemical, and physical system. A slight modification of language could reflect modern thinking on soil science and avoid promoting crop insurance as a sole risk management strategy. For example, this sentence could be modified to read: "These include altering crop inputs; adoption of a systems approach to soil health management practices; improved management of livestock production systems; integrated pest and disease management; use of climate forecasting; and diversified farming and crop rotation to reduce production risk."	Done: Revised the sentence based this and other comments.
Social Science	Coordinating Committee	143203	Whole Chapter	10. Agriculture and Rural Communities						Key Message 4: Adaptive Capacity of Rural Communities, is not only missing as a key message in the executive summary, but the section itself lacks the specificity of statistics and examples of the other three key messages. It reads less researched and less significant compard to the other sections. Suggestions add missing statistics, examples, and citations or break it up and use the relevant text to enhance the other three messages. Particularly Key Message 1: which in the executive summary doesnt mention the impact on farmer livelihoods. Furthermore, each of the key messages in the executive should include the human component in some way.	We have corrected the executive summary. We agree that detail related to adaptive capacity is less than for other Key Messages but with a short number of pagesallowed to cover a very broad topic we focused largely on agriculutre and covered key rural issuesless thoroughly. We have linked to other chapters to provide examples of adaptation and capacity building for rural and indigenous communities.
Social Science	Coordinating Committee	143204	Text Region	10. Agriculture and Rural Communities		377	377	15	26	Line 18- can include the actual social impacts of increased wildfires incuding economic costs and community displacement. This paragraph also needs citations, particularly for the sentences 'tribal communities are particularly vulnerabe' (line 18) and ending on (line 22) with controls.	Three citations are added, one on social impacts. The subsequent sentences talk about economic costs
Social Science	Coordinating Committee	143205	Whole Page	10. Agriculture and Rural Communities		373				The information on the state of rural communities is good. But it would connect to the key takeaways if it made a stronger point about the impact of climate change (drought, percipitation- and crop yields, infrastucture, and income loss) on the declines in population, the increase in poverty. As it reads, its as if they are completely seperate processes, the aren't.	We agree with these comments, hand have revised the chapter to strengthen the description of climate change impacts on a wde range of agriculture and rural communities.
Social Science	Coordinating Committee	143249	Whole Chapter	10. Agriculture and Rural Communities						This chapter mainly discusses the impacts of climate change affecting the agricultural sector qualitatively. In the 'Traceable Accounts' section, there is reference to the body of literature that evaluates the impacts of climate change on agricultural yields, markets, trades, and rural welfare quantitatively, such as through empirical studies or modeling. The authors can consider providing high-level findings from these studies (such as the AgMIP, from the USDA Economic Research Services, USEPA Climate Impacts and Risks Analysis (2017) and other studies cited in the chapter), to give readers a sense of the magnitude of potential impacts and their regional distributions (with the latter discussed in more details in the regional chapters).	We have inserted linkage to regional chapters to capture quantitative examples of climate change impacts on agriculture.
Social Science	Coordinating Committee	143250	Whole Chapter	10. Agriculture and Rural Communities						In addition to discussion of impacts of climate change on agriculture and rural communities, this chapter can also consider to include some discussion of measures for reducing GHG emissions, and their synergies for enhancing resilience of the sector.	We have added a brief statement to KM2 and refer the reader to the SOCCR2 report for a thorough discussion of mitigation options for agriculture.
Social Science	Coordinating Committee	143251	Text Region	10. Agriculture and Rural Communities		380	380	21	37	In addition to discussion of crop yield impacts, it would also be helpful to add some discussion of the economic impacts (such as on prices, market outcomes), to give readers a sense of the welfare impacts on producers and consumers.	Agreed. A sentence is added on the economic impacts during the 2012 drought in the U.S.. Two citations were provided
Social Science	Coordinating Committee	143252	Text Region	10. Agriculture and Rural Communities		371	371	14	17	In this paragraph it will also be helpful to give readers a sense of the share of agricultural output/population in rural communities. Not all rural population are engaged in agricultural activities, and the declines also reflect the reduced output and jobs in mining and manufacturing.	Provided information on population and land area covered by rural america. We agree with the comment that not all rural population are engaged in agricultural activities. For this reason, it is difficult to provide a share of agricultural output by rural communities.
Social Science	Coordinating Committee	143253	Text Region	10. Agriculture and Rural Communities		374	374	2	6	These two sentences don't flow well. The first sentence discusses the impact of climate change on agriculture; and the second is agricultural sector's contribution to climate change. Suggest to reword by either (1) changing the following sentence to also include agriculture's impacts on climate change: 'Consequently, these resources are affected continually by agricultural management practices and climate change.' or (2), reword the following sentenceand start as a new statement: 'For example, Meanwhile, the agricultural sector is also a contributor to climate change - in 2015 it accounted for 5.5% of GDP but about 9% of the Nation's greenhouse gas (GHG) emissions (U.S. EPA 2017).'	The sentences have been moved and edited.
Social Science	Coordinating Committee	143254	Text Region	10. Agriculture and Rural Communities		374	374	8	16	Suggest to start a new paragraph with 'Current state of the agricultural systems…'	Thank you for the suggestion. We have made the recommended change.
Social Science	Coordinating Committee	143255	Text Region	10. Agriculture and Rural Communities		384	384	1	38	This key message conveys important point and makes linkages with factors that determine social vulnerability in the agricultural sector and rural communities that may be exacerbated by climate change. It's well written.	Thanks
Michelle	Tigchelaar	143670	Text Region	10. Agriculture and Rural Communities		380	380	25	26	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. The potential offsetting effect of CO_2 fertilization on crop yields is only discussed in one sentence on p. 380 (l. 25-26), as well as the evidence base on p. 388 (l. 1-2). This topic has been studied extensively, and is sometimes used in popular media as a reason not to worry about future crop growth, but many uncertainties remain. We therefore suggest that the authors either include more discussion on this in the main text, or include it under Major Uncertainties on p. 388.	The Tracable Account now addresses this as an area of uncertainty and this was added to a new section on research needs.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michelle	Tigchelaar	143672	Text Region	10. Agriculture and Rural Communities		377	377	29	33	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. It is our understanding that the mechanisms for heat tolerance in major grains are extremely complex and poorly understood, and that progress in this area has been modest despite the innovation of techniques to accelerate breeding (Ortiz et al., 2008; Mittler & Blumwald, 2010; Chapman et al., 2012; Jha et al., 2014). This sentiment is expressed under Major Uncertainties on p. 388 (‰ÛÏThere is considerable capacity for genetic improvement in agricultural crops and livestock breeds, but the ultimate ability to breed increased heat and drought tolerance into germplasm while retaining desired agronomic or horticultural attributes remains uncertain (CAST 2017a).‰Û) but conflicts with the statements in the main text following Key Message 1 (p. 377) that ‰ÛÏ[s]eed companies have released numerous crop varieties that are tolerant to heat, drought, or pests and diseases. This trend is expected to continue as new crop varieties are developed that adapt to a changing climate (Kant et al., 2012).‰Û We suggest that the authors more accurately represent the uncertainties associated with the possibility of breeding for heat and drought tolerance in major crops in the main text on p. 377. References: Chapman SC, Chakraborty S, Fernanda Dreccer M, Mark Howden S (2012) Plant adaptation to climate change‰ÛÓopportunities and priorities in breeding. Crop Pasture Sci 63(3):251‰ÛÒ268. Jha UC, Bohra A, Singh NP (2014) Heat stress in crop plants: its nature, impacts and integrated breeding strategies to improve heat tolerance. Plant Breed 133(6):679‰ÛÒ701. Mittler R, Blumwald E (2010) Genetic engineering for modern agriculture: challenges and perspectives. Annu Rev Plant Biol 61:443‰ÛÒ462. Ortiz R, et al. (2008) Climate change: Can wheat beat the heat? Agric Ecosyst Environ 126(1‰ÛÒ2):46‰ÛÒ58.	Agreed. A sentence is added to mention that progress in this area has been modest.
Michelle	Tigchelaar	143675	Whole Chapter	10. Agriculture and Rural Communities						This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. The Executive Summary has three key messages, but the main text has four. The messages in the summary are shorter also than those in the main text. This seems fine on principle, but contrasts with other chapters where this extra level of summarizing was not done.	We have corrected the Executive Summary.
Union of Concerned Scientists	Union of Concerned Scientists	143706	Whole Chapter	10. Agriculture and Rural Communities						I found the combination of rural communities and agriculture confusing, especially as the relationship between the two was not strongly enough made. Agriculture is not only in rural communities, nor are rural communities only engaged in the agriculture sector. One option could be to address specific and unique rural, suburban, and urban community risks and vulnerabilities within the chapter. Another could be to shift both urban and rural community risks into a separate chapter on society/communities.	This decision was made by the USGCRP and was not at the discretion of the authors.
Union of Concerned Scientists	Union of Concerned Scientists	143707	Whole Chapter	10. Agriculture and Rural Communities						The key messages do not clearly capture key information on climate related risks in the agricultural sector, and their structure is confusing. Are they separated by climate change factor (drought, temperature, extreme rainfall)? Or, by theme (ecosystem impacts, health, infrastructure)? Right now they seem to be primarily grouped by the climate change factors, but because these have impacts across multiple themes, this framing feels forced/inaccurate. I would suggest reorganizing, and/or expanding the descriptions within each message. Finally, the key messages are written differently throughout the chapter. It could be easier to read if they were identical throughout.	We have revised the Key Messages and re-organized the paper toimprove the flow and clarity.
Union of Concerned Scientists	Union of Concerned Scientists	143708	Whole Chapter	10. Agriculture and Rural Communities						Some important ideas recieved limited to no attention (e.g., affects of changing seasons, impacts on suitability of agriculture to specific regions & potential shifting of agricultural regions, impacts on pests and beneficial insects, impacts of climate change on soil health and long term sustainability). The discussion was very limited to today's top major crops and systems, with limited discussion on small but important crops (e.g., fruits, vegetables, and other specialty crops) or alternative systems (diversified farms, agroecology, organic, agroforestry, silvopasture). Many pertitant and critical issues raised within the regional chapters were not highlighted within the agriculture chapter.	The chapter is focused on major commodity crops, in part because of their areally extent and monetary contribution to the overall GDP of the US but also due to the greater amount of peer-review literature focused on these crops. Linkages to regional chapters take readers to discussions of regionally-important crops and alternate systems.
Union of Concerned Scientists	Union of Concerned Scientists	143709	Text Region	10. Agriculture and Rural Communities		371	371	6	7	If the focus of this message is on health risks of climate changes, there are more drivers other than extreme temperatures (e.g., drought, floods, change in seasons, food security..). If the focus is instead on temperature extremes, then the impacts seem to go broader than human, crop, and livestock health. All that said, human health doesn't seem to fit here, at least given the current draft. One option could be a separate key message on human health, but it has it's own chapter so I think it could be dropped (unless it is rewritten in a way that is more specific to the content of this chapter).	We agree that there are numerous health risks associated with climate change. We have reworded all Key Messages and have included links to rural health impacts in other chapters.
Union of Concerned Scientists	Union of Concerned Scientists	143710	Text Region	10. Agriculture and Rural Communities		371	371	8	9	Another climate-related driver for infrastructure concerns could be fire. There are also other consequences from large rainfall events besides the ones mentioned here (crop loss, erosion, implications for pests, etc). Finally, these infrastructure damages would seem to affect all communities - not just rural communities.	We have restructured the Key Messages in this chapter to group by impacts (e.g. to crops and forage, soil and water resources, human and livestock health, and rural communities), recognizing a range of climate drivers that may contribute to each impact.
Union of Concerned Scientists	Union of Concerned Scientists	143711	Text Region	10. Agriculture and Rural Communities		371	371	10	13	How does this compare to the totals for the US economy, jobs, and GDP (for context)?. It would also be helpful to briefly explain the scope of the ag-related value added sectors, and be clear how these relate to the scope of this particular chapter.	Agreed: Revised the text add information on the contribution of agricultural and related sectors to the total U.S. economy and GDP, and inserted "in the food supply chain" to indicate the broad scope of other jobs in the ag-related value added sectors.
Union of Concerned Scientists	Union of Concerned Scientists	143712	Text Region	10. Agriculture and Rural Communities		371	371	10	10	It would be good to provide a specific metric here (economically? Based on yields pre acre?)	We have deleted the sentence.
Union of Concerned Scientists	Union of Concerned Scientists	143713	Text Region	10. Agriculture and Rural Communities		371	371	14	17	This is interesting information, but a stronger case needs to be made for why this is in the agriculture chapter. Is it possible to relate these statistics more tightly to farms, farmers, and agriculture?	Agree. However, it was not our decision to combine Agriculture Chapter with Rural Communities Chapter. We have revised the paragraph to link to the overall economy.
Union of Concerned Scientists	Union of Concerned Scientists	143714	Text Region	10. Agriculture and Rural Communities		371	371	21	21	or perhaps more accurately, "that can be viable in different climates" (considering that inputs and infrastructure substantially affect what can be grown in different areas of the country, even areas that may not be optimally suited towards specific crops naturally)	Disagree. The proposed modifcation may not add more clarity to the sentence.

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Union of Concerned Scientists	Union of Concerned Scientists	143715	Text Region	10. Agriculture and Rural Communities		371	371	22	22	even slow shifts, or small changes in the extremes, could pose major challenges	We deleted "relatively rapid"
Union of Concerned Scientists	Union of Concerned Scientists	143716	Text Region	10. Agriculture and Rural Communities		371	371	23	24	The "changing patterns of invasive.." seem more like a driver (and one of many) of the crop failure and loss of livestock. Perhaps restructure the sentence or add more drivers here.	This sentence is no longer in the summary.
Union of Concerned Scientists	Union of Concerned Scientists	143717	Text Region	10. Agriculture and Rural Communities		371	371	24	25	It may be stronger to make the case that rural communities ARE, have been, or will be particularly strongly linked to agriculture, or to leave this out.	We have edited the sentence as suggested.
Union of Concerned Scientists	Union of Concerned Scientists	143718	Text Region	10. Agriculture and Rural Communities		371	371	31	32	Soil erosion and nutrient and chemical transport can occur even without "extreme rainfall", and may also be exacerbated by other climate changes such as droughts and changing precipitation patterns. This current framing may cause confusion.	We agree with the comment and revised the paragraph to add more clarity
Union of Concerned Scientists	Union of Concerned Scientists	143719	Text Region	10. Agriculture and Rural Communities		371	371	34	34	Seems out of place. Connect to agriculture or remove.	We agree with the comment and have revised the paragraph to link to agriculture and added several citations
Union of Concerned Scientists	Union of Concerned Scientists	143720	Text Region	10. Agriculture and Rural Communities		371	371	35	37	Any way to (1) add some statistics to make more specific and/or (2) more tightly link this to agriculture?	We agree and the paragraph is revised to link it to agriculture.
Union of Concerned Scientists	Union of Concerned Scientists	143721	Text Region	10. Agriculture and Rural Communities		373	373	7	9	Consider listing the most important value added sectors here, and breifly explain why they directly depend on the strength/vulnerability of US agriculture/rural communities.	The authors appreciate the comment. However, Figure 10.1 lists the most important value added sectors. Considering the page limit, it is not possible to disscuss more value added sectors.
Union of Concerned Scientists	Union of Concerned Scientists	143722	Text Region	10. Agriculture and Rural Communities		373	373	11	12	It would be great to be more specific about how (or how much) these exports support rural communities	We agree the topic is important. However, we did not find specific information on the contribution of agricultural exports to rural communities in the literature
Union of Concerned Scientists	Union of Concerned Scientists	143723	Text Region	10. Agriculture and Rural Communities		373	373	17	19	Please describe in more detail/numbers what portion of rural communities are heavily dependent on agriculture (as compared to urban communities)	This section was revised to identify 444 counties classified as farming dependent, most of which were rural.
Union of Concerned Scientists	Union of Concerned Scientists	143724	Text Region	10. Agriculture and Rural Communities		373	373	27	27	clarify whether the 915 refers to "all US land" or "40% of US land"	The Executive Summary has been edited to clarify.
Union of Concerned Scientists	Union of Concerned Scientists	143725	Text Region	10. Agriculture and Rural Communities		374	374	2	2	Unclear whether the inclusion of "Consequently" implies that it's just the irrigated land that is affected by management practices and climate change. Consider changing "Consequently, these resources" to "These land resources", or otherwise edit as needed	We have removed the word Consequently.
Union of Concerned Scientists	Union of Concerned Scientists	143726	Text Region	10. Agriculture and Rural Communities		374	374	4	8	This is a good and important point, but it does not follow from the previous sentence. It shows how the sector affects climate change, not how it is affected by it. It's an important point, but perhaps there is a better place for it (within a discussion, perhaps, of what can be done to mitigate climate change risks?)	Agreed. This sentence has been moved to a discussion of negative environmental impacts of current agricultural systems.
Union of Concerned Scientists	Union of Concerned Scientists	143727	Text Region	10. Agriculture and Rural Communities		374	374	7	7	Clarify what "inputs" means in the context of this section.	We have inserted examples of inputs.
Union of Concerned Scientists	Union of Concerned Scientists	143728	Text Region	10. Agriculture and Rural Communities		374	374	11	11	Or perhaps more accurately, "that can be viable in different climates" (considering that inputs and infrastructure substantially affect what can be grown in different areas of the country that may not be optimally suited towards specific crops naturally)	Changed to "that are viaable in different climates".
Union of Concerned Scientists	Union of Concerned Scientists	143729	Text Region	10. Agriculture and Rural Communities		374	374	13	13	The "changing patterns of invasive.." seem more like a driver (and one of many) of the crop failure and loss of livestock. Perhaps restructure the sentence or add more drivers here.	The sentence was reworded.
Union of Concerned Scientists	Union of Concerned Scientists	143730	Figure	10. Agriculture and Rural Communities	2	374				Possible to add another map showing dependence of rural communities on agriculture? (There was a similar figure in NCA3)	A sentence and a citation is added to provide information on dependence of rural communities on agriculture. We have not added the figure due to space limitations
Union of Concerned Scientists	Union of Concerned Scientists	143731	Text Region	10. Agriculture and Rural Communities		374	374	25	25	change "climate change" to " climate change direct effects"	Done: Revised the text as suggested
Union of Concerned Scientists	Union of Concerned Scientists	143732	Text Region	10. Agriculture and Rural Communities		374	374	27	27	not mentioned but also important could be changes in beneficial insects, land use changes and pressures at a larger scale (due to climate change impacts in other regions and sectors), changes to nutrient and water cycling	While we agree with the comment, we have not added these issues to this section but addressed land use and nutrient and water cycling to other parts of the text.
Union of Concerned Scientists	Union of Concerned Scientists	143733	Text Region	10. Agriculture and Rural Communities		375	375	2	2	can you be more specific about how the structure is changing, to-date?	This sentence has been deleted during revisions.
Union of Concerned Scientists	Union of Concerned Scientists	143734	Text Region	10. Agriculture and Rural Communities		375	375	10	15	Agricultural commodities are not all food, so it's important to be clear about the degree of the link between these commodities and food security. Also, the export of these commodities from the US even today does not directly address all four dimensions of global food security. Therefore, this sentence is somewhat misleading. Consider editing, i.e., "The US is a a major exporter of agricultural commodities (ERS 2017a), and disruption in its agricultural production will affect the agricultural sector on a global scale. Food security, which is already a challenge across the globe, is likely to become an even greater challenge as climate change impacts agriculture, particularly in light of projected population growth."	Done: Revised the text as suggested
Union of Concerned Scientists	Union of Concerned Scientists	143735	Text Region	10. Agriculture and Rural Communities		375	375	16	17	But more recently, and as climate change impacts are becoming more evident, these public investments have gone down. Therefore, this sentence as-is could create confusion over current levels of investment in R&D and extension, especially investments directed at climate change adaptation. It seems important to give specific details on current investment in REE, especially how much is focused on climate change adaptation.	Disagree. Here, we are only stating the fact that public investment has led to significant improvement in production practices
Union of Concerned Scientists	Union of Concerned Scientists	143736	Text Region	10. Agriculture and Rural Communities		375	375	18	20	This is an important step worth noting and celebrating. However, the statement needs more context on how well this network is resourced and what their scope of work is, to help readers gauge their position to mitigate risks (and whether there's an opportunity for more). Also, are there any other USDA programs worth mentioning here? What abot the LTARs?	Added Steele and Hatfield, 2018 reference for more background on the Climate Hub network.

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Union of Concerned Scientists	Union of Concerned Scientists	143737	Text Region	10. Agriculture and Rural Communities		375	375	22	25	This sentence is complex and has a lot of overlap with following sentences specific to crop or livestock. Possible to simplify this sentence to provide an overview, and then go into specifics? E.g., "These include altering what is produced, modifying the inputs used for production (e.g., fertilizers, pesticides), adopting new technologies (including climate forecasting), adjusting management strategies (including integrated pest management), and identifying the best crop insurance coverage"	Done: Revised as suggested
Union of Concerned Scientists	Union of Concerned Scientists	143738	Text Region	10. Agriculture and Rural Communities		375	375	22	25	Consider changing "increased rainfall intensity that greatly impact the environment" to "changes to rainfall patterns" (rainfall patterns impact ecosystems in various ways, not just through increased intensity)	Done: Revised the text as suggested
Union of Concerned Scientists	Union of Concerned Scientists	143739	Text Region	10. Agriculture and Rural Communities		375	375	39	40	These are great strategies and citations, but they are provided in the same level detail above so seem redundant as currently written. Since they apply to both crop and livestock systems, they might fit best above (and can be deleted here). However, several strategies have not been mentioned anywhere. What about no-till, cover cropping, crop rotations, perennial crops, integrated crop-livesock systems, diversification, agroforestry, silvopasture.…	The sentence above is revised to cover broad range of adaptation strategies and avoid repetiton
Union of Concerned Scientists	Union of Concerned Scientists	143740	Text Region	10. Agriculture and Rural Communities		376	376	3	3	"singly or in combination" - Adopting these strategies singly would certainly help, but is unlikely to be enough in the face of moderate climate change. Perhaps instead say "Proper implementation of combinations of theses strategies have the potential…"	Done. Revised as per the suggestion
Union of Concerned Scientists	Union of Concerned Scientists	143741	Text Region	10. Agriculture and Rural Communities		376	376	4	5	This sentence implies that the list of strategies listed above have led to continued productivity growth which indicates their effectiveness. However, it is not clear that all of these strategies have been used at large-scale or that they can be attributed to recent productivity growth. Even if they were, current concerns about contributions of agriculture to climate change, water resources, air pollution, etc. may in contrast suggest that the strategies that HAVE led to today's high levels of "productivity" (yield) and "efficiency" (yield/inputs) have not been effective in terms of all of the variables relevant for this chapter (i.e., long term preservation of natural resources that underly a productive agricultural system, the health of crops, animals, humans, and rural communities, etc).	We are only stating that proper adoption these strategies have the potential to reduce climate change impacts and help sustain productivity growth and improve effiency of production.
Union of Concerned Scientists	Union of Concerned Scientists	143742	Text Region	10. Agriculture and Rural Communities		376	376	6	6	"this approach" doesn't seem to fit, since numerous approaches have been listed	Done. Revised as per the suggestion
Union of Concerned Scientists	Union of Concerned Scientists	143743	Text Region	10. Agriculture and Rural Communities		376	376	7	7	or is it just the growing rate of climate changes (including but not limited to extreme events) that justifies the need for more efforts…?	A reference to Climate Change Chapter is provided for more information and the sentence was revised as suggested.
Union of Concerned Scientists	Union of Concerned Scientists	143744	Text Region	10. Agriculture and Rural Communities		376	376	10	15	It was confusing that they key messages changed from what was first written in the exec summary. Could be good to have these the same everywhere.	Agreed: Revised the key messages in both places to have the same everywhere
Union of Concerned Scientists	Union of Concerned Scientists	143745	Text Region	10. Agriculture and Rural Communities		376	376	14	14	May be more helpful to list this as a % of the current average # consecutive dry days (or otherwise communicate the severity/implications of this change)	We have removed the sentence from our key message.
Union of Concerned Scientists	Union of Concerned Scientists	143746	Text Region	10. Agriculture and Rural Communities		376	376	17	19	Clarify whether/how this was linked to climate change. Also, consider defining "drought-disaster area".	We are not aware of specific attribution of this drought to climate change but used this example to indicate the magnitude of losses that could be associated with future climate conditions. "Drought' was deleted from drought-disaster areas.
Union of Concerned Scientists	Union of Concerned Scientists	143747	Text Region	10. Agriculture and Rural Communities		376	376	26	27	Soil carbon is important for many other relevant reasons as well (e.g., soil water holding capacity, for one).	Agreed. Infiltration increases soil water in the rootzone. The sentence is revised to provide additional information
Union of Concerned Scientists	Union of Concerned Scientists	143748	Text Region	10. Agriculture and Rural Communities		376	376	28	30	Clarify whether/how this was linked to climate change	Agreed. A sentence and two citations are provided to show the linkage
Union of Concerned Scientists	Union of Concerned Scientists	143749	Text Region	10. Agriculture and Rural Communities		376	376	31	34	This feels out of place. Perhaps it would be more interesting as a separate box on a case study to demostrate the severity of the possible drought-related risks, and to explain what could be done to mitigate those risks. However, specific management practices (rather than a policy example) may be more instructive.	We disagree with the comments and have therefore not made changes.
Union of Concerned Scientists	Union of Concerned Scientists	143750	Text Region	10. Agriculture and Rural Communities		376	376	35	35	More accurate might be "Irrigation is used for crop production in most of the wester US" or "Irrigation is necessary for current production in most of the western US".	Done. Revised as per the suggestion
Union of Concerned Scientists	Union of Concerned Scientists	143751	Text Region	10. Agriculture and Rural Communities		377	377	19	22	Opportunity to refer to Tribal and Indigenous Peoples chapter?	A reference to Chapter 15 has been added.
Union of Concerned Scientists	Union of Concerned Scientists	143752	Text Region	10. Agriculture and Rural Communities		377	377	22	25	Possible to make this more specific to agriculture/rural communities? Otherwise perhaps simplify and keep the reference to the other chapters.	Reference to other chapters is made in the text . The impacts discussed are relevant to all communities, including rural.
Union of Concerned Scientists	Union of Concerned Scientists	143753	Text Region	10. Agriculture and Rural Communities		377	377	29	30	Are these advancements actually due to the demand for higher crop productivty under climate change, or just in response to current threats and extreme weather?	Done. Revised as per the suggestion
Union of Concerned Scientists	Union of Concerned Scientists	143754	Text Region	10. Agriculture and Rural Communities		377	377	32	37	How many of these recent advances have been developed for a very limited subset of agricultural systems (that might not adapt well to climate change as a whole), and/or for current climate extremes and conditions (versus longterm changes)?	Agree that recent advances have been made for certain crops due to large markets. However, we felt that no revision to the text is necessary.
Union of Concerned Scientists	Union of Concerned Scientists	143755	Text Region	10. Agriculture and Rural Communities		378	378	8		It would be helpful to introduce and define this term (climate smart agriculture) in an earlier (general) section and to define it, as it is relevant to more than just drought. In this section, there is an opportunity to be more specific about what aspects of climate-smart ag matter with respect to drought.	Agree that climate smart agricutlure is relevant to more than just drought. Revised the sentence as "Climate-smart agriculture can reduce the impacts of climate change and consequent environmental conditions on crop yield". Remaning sentences in that paragraph discuss what is involved in climate smart agriculture in response to climate change including drought conditions.
Union of Concerned Scientists	Union of Concerned Scientists	143756	Text Region	10. Agriculture and Rural Communities		378	378	13	13	This is one requirement for irrigation technologies, but what are other limitations? (e.g., cost, wear-and-tear, training, extension)	Agree with reviewers' concern. However, we do not have space to fully address these details.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Union of Concerned Scientists	Union of Concerned Scientists	143757	Text Region	10. Agriculture and Rural Communities		378	378	33	33	this is the only time "Rotations" is mentioned, and it also seems like only one of many different management practices that may be needed. What about saying "different technologies, agricultural production systems, and management practices will be needed" (and be sure to mention crop rotations in earlier sections that describe potential practices).	Done. Revised as per the suggestion
Union of Concerned Scientists	Union of Concerned Scientists	143758	Text Region	10. Agriculture and Rural Communities		379	379	7	7	Based on earlier descriptions of this key message in the present draft, I would have thought that it would be succinctly described instead as "Crop, Livestock and Human Health" OR, perhaps "Temperature changes and extremes".	These short titles are inserted by editing staff for running titles in the web-version of the document. They will not show up in the pdf version of the document.
Union of Concerned Scientists	Union of Concerned Scientists	143759	Text Region	10. Agriculture and Rural Communities		380	380	1	10	This content is important, but feels out of place and not particularly relevant here (especially as the starting point of this section)	In NCA4, Augriculture and Rural communities Chapters were combined. Therefore, it is important to discuss human health in rural communities.
Union of Concerned Scientists	Union of Concerned Scientists	143760	Text Region	10. Agriculture and Rural Communities		380	380	11	20	This is important, but doesn't seem to fit well in this section which seemed to have been focused on temperature extremes. Some reframing here or elsewhere could help.	Agreed: Moved the paragraph to the end of the section and revised
Union of Concerned Scientists	Union of Concerned Scientists	143761	Text Region	10. Agriculture and Rural Communities		380	380	12	12	why would rural communities by more affected (if they don't have pollen allergies)?	Agreed. The phrase "and for those living in rural communities" has been deleted and the sentence as a whole has been substantially re-worked.
Union of Concerned Scientists	Union of Concerned Scientists	143762	Text Region	10. Agriculture and Rural Communities		380	380	24	28	Since the section is framed to be focused on temperatures, these points feel out of place. Consider reframing section(so) or editing this text.	Agreed. Revised the sentence
Union of Concerned Scientists	Union of Concerned Scientists	143763	Text Region	10. Agriculture and Rural Communities		381	381	4	4	How much higher? Is there a value/reference to include?	Although we agree that it is good to add a value or a reference, we could not find one in the literature.
Union of Concerned Scientists	Union of Concerned Scientists	143764	Text Region	10. Agriculture and Rural Communities		381	381	24	24	Clarify why these regions are likely to see larger declines	Revised the sentence to add clarity
Union of Concerned Scientists	Union of Concerned Scientists	143765	Text Region	10. Agriculture and Rural Communities		381	381	30	31	Another obstacle could be related to failure of the technology, and related risks	Done. Agree, revised the sentence accordingly
Union of Concerned Scientists	Union of Concerned Scientists	143766	Text Region	10. Agriculture and Rural Communities		381	381	36	38	How likely is this, and what are the obstacles/implications surrounding this risk mitigation strategy?	No revision is necessary as obstacles and/implications are already discussed in this paragraph
Union of Concerned Scientists	Union of Concerned Scientists	143767	Text Region	10. Agriculture and Rural Communities		382	382	9	11	Seems out of place. This is about drought rather than extreme temperatures. Also, the statement about crops might fit better (or should at least be introduced) in a section focused on crops rather than livestock.	Agreed. Deleted the last two statements
Union of Concerned Scientists	Union of Concerned Scientists	143768	Text Region	10. Agriculture and Rural Communities		382	382	33	36	This overview sentence might make for a better introduction sentence to the section than the current one	We disagree and have not made this suggested change.
Union of Concerned Scientists	Union of Concerned Scientists	143769	Text Region	10. Agriculture and Rural Communities		382	382	38	39	It could help to define/explain the stated "progress". Also, it may be that protecting progress to-date won't be enough (in current or future climates), as erosion is currently already a big problem.	Agreed. Revised the text
Union of Concerned Scientists	Union of Concerned Scientists	143770	Text Region	10. Agriculture and Rural Communities		383	383	1	1	It would be great to list a few examples of the conservations practices that are being implememnted	Agreed. Revised the text to include them
Union of Concerned Scientists	Union of Concerned Scientists	143771	Text Region	10. Agriculture and Rural Communities		383	383	3	3	Is the proposal that the existing strategies themselves may be improved by considering projected extremes? Or would improved estimates show that the current strategies aren't expansive and/or effective enough?	Revised the sentence to add clarity
Union of Concerned Scientists	Union of Concerned Scientists	143772	Text Region	10. Agriculture and Rural Communities		383	383	4	8	How are the "most intense" storms defined? Is this refering to storms that specifically impacted agriculture?	This sentence was removed from text.
Union of Concerned Scientists	Union of Concerned Scientists	143773	Text Region	10. Agriculture and Rural Communities		383	383	9	19	None of this is clearly linked to agriculture (or rural communities)	Revised the text to add clarity
Union of Concerned Scientists	Union of Concerned Scientists	143774	Figure	10. Agriculture and Rural Communities	4	383				How are extreme events calculated/defined? Also, what is the orange line (is it an X-year moving average?)	A part of this paragraph is deleted and combined with the following paragraph to add more clarity and the caption was modified to describe the orange line.
Union of Concerned Scientists	Union of Concerned Scientists	143775	Text Region	10. Agriculture and Rural Communities		384	384	1	1	This message has been missing in all previous text, and is not clearly linked to agriculture currently.	Agreed: Revised the text
Union of Concerned Scientists	Union of Concerned Scientists	143776	Text Region	10. Agriculture and Rural Communities		384	384	23	23	should this ("or to be more loosely") read "and more likely to be loosely"?	Agreed: Revised the text
Union of Concerned Scientists	Union of Concerned Scientists	143777	Text Region	10. Agriculture and Rural Communities		385	385	10	13	The current draft doesn't clearly highlight the different issues that different regions face. Possible to include some bullets, or a table or figure that clearly communicates the major regions and their primary concerns/vulterabilities with respect to this chapter?	We inserted a section at the beginning of the Traceable Accounts to identify issues raised by different regions and how they relate to the key messages.
Union of Concerned Scientists	Union of Concerned Scientists	143778	Text Region	10. Agriculture and Rural Communities		385	385	18	18	Previous versions of this key message were written in short as "Drought" only. Consistency would help ensure clarity.	This was corrected.
Union of Concerned Scientists	Union of Concerned Scientists	143779	Text Region	10. Agriculture and Rural Communities		385	385	29	29	But what about hot days that are not necessarily concurrent with drought? Or other changes to temperature patterns (changes to mins, means, and maxs) that influence seasons and agriculture?	We moved a section from former KM2 (now KM3) to KM1 and discussed high temperature and high minimum temperature stress, as well as seasonality.
Union of Concerned Scientists	Union of Concerned Scientists	143780	Text Region	10. Agriculture and Rural Communities		385	385	35	35	"Inherent resilience" doesn't seem like the right phrase, given the context of major climate changes and recent extreme events that have been very challenging for the livestock sector despite their historical and/or relative resilience.	We removed the word "inherent".

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Union of Concerned Scientists	Union of Concerned Scientists	143781	Text Region	10. Agriculture and Rural Communities		386	386	1	2	Consider rewording to ensure it is clear that the avoided impacts have been within TFP specifically e.g., "While technological improvements have contributed to high TPF values even as climate change has been occurring, projected climate change…"	The change has been made as suggested.
Union of Concerned Scientists	Union of Concerned Scientists	143782	Traceable Account	10. Agriculture and Rural Communities		387	387	23	24	Is there data on what that proportion is? Or other data on how rural populations, particularly ones strongly tied to agriculture, could be more vulnerable than urban or suburban populations to climate change?	We reworded sentence to remove comparison of rural to urban workers. It now states many rural workers are exposed to climate stressors.
Union of Concerned Scientists	Union of Concerned Scientists	143783	Traceable Account	10. Agriculture and Rural Communities		387	387	27	39	There are great references in this section, but it's unclear whether this content fits best within this key message. Regardless, a couple of things appear to be missing: 1) this section is mainly focused on a select few crops. this makes sense because they are dominant in today's agriculture, but given that the climate is changing is there something more that could be said about cropping systems more broadly? 2) some mention of the effect of rising minimum temperatures on crops would seem important (this was covered in the previous NCA but is largely missing here)	This section was moved to KM1, now related to reduced agricultural p productivity. While all plants are impacted by climate change stressors, most of the peer review literature focuses on major commodity crops. Nighttime temperature effects on crop yield and quality are disucssed briefly.
Union of Concerned Scientists	Union of Concerned Scientists	143784	Traceable Account	10. Agriculture and Rural Communities		387	387	32	32	please explain "grain number"	Replaced with "grain number per head".
Union of Concerned Scientists	Union of Concerned Scientists	143785	Traceable Account	10. Agriculture and Rural Communities		388	388	19	21	Relatedly, what about changes to seasons and life cycles of beneficial insects?	This is an important point. Young (2017) refers to insects, diseases, and weeds, which would include benficial insects. However, data are lacking on specific beneficial insect responses to climate change. This was added to emerging issues and reseach needs section.
Union of Concerned Scientists	Union of Concerned Scientists	143786	Traceable Account	10. Agriculture and Rural Communities		389	389	10	11	This is an important point to address, but as currently framed here it does not sound like it fits under "major uncertainty". Perhaps reframe to more clearly communicate that this is an uncertain area of emerging research.	We have added discussion of climate impacts onweeds and beneficial and pest insects and microorganisms and added a section on research needs, including this.
Union of Concerned Scientists	Union of Concerned Scientists	143787	Traceable Account	10. Agriculture and Rural Communities		390	390	7	11	Would be great to list a few so that it is more clear. Also consider changing "Practices" to "Agricultural management practices". Finally, while important to mention these solutions, it may also be important to explain the problem (and the climate change related risks)	We added "agricultural management practices" and inserted sentences about adaptation and mitigation benefits of increased soil carbon. Specific practices to increase soil carbon are given in Paustian et al., 2016; Lal, 2015; Brown and Herrick, 2016; Derner et al., 2016; Blanco-Canqui et al., 2015; Parton et al., 2015.
Union of Concerned Scientists	Union of Concerned Scientists	143788	Traceable Account	10. Agriculture and Rural Communities		390	390	29	29	If this section is retained, consider moving the human health content into this section	The Key Messages were restructured. KM3 addresses rural health and livestock health issues related to climate, and KM4 focuses on vulnerability and adaptive capacity of rural communities.
Union of Concerned Scientists	Union of Concerned Scientists	143789	Traceable Account	10. Agriculture and Rural Communities		391	391	10	16	Although there are numerous programs, are they enough to address the need? Many of these programs are stretched very thin. Possible to provide more specific details about programs and available funding to fill this need?	The authors appreciate the importance of this comment, but adequacy of current or future funding is beyond the scope of this report.
Union of Concerned Scientists	Union of Concerned Scientists	143790	Traceable Account	10. Agriculture and Rural Communities		391	391	20	21	Without additional detail on the level of funding and quality of programming for plans to address these challenges, it is hard to believe that that current efforts will be enough. While it may be the case that adaptive capacity in these communities is "increasing", "increasing" is not likely to be enough.	We changed the likelihood to "low to medium confidence" because of the regional variability of investments and capacity.
Union of Concerned Scientists	Union of Concerned Scientists	143791	Traceable Account	10. Agriculture and Rural Communities		391	391	21	22	Possible to discuss this in greater detail somewhere? More insight into where there are greater needs may be helpful to readers.	This is an important point. However, due to page limitations on this chapter we do not have space to address this.
Union of Concerned Scientists	Union of Concerned Scientists	143792	Whole Chapter	10. Agriculture and Rural Communities						This chapter in general is written like an advertisement for American agricultural productivity, and seems to treat climate as a secondary topic. It would be a much more useful chapter for readers if it referred to other sources for well-trodden background information, and used the space to more clearly explain the projected impacts of climate on agriculture, the contributions of agriculture to emissions, and the needs and opportunities for adaptation and mitigation.	There are many new agricultural technologies and other advances that are briefly described in this chapter, many of which result from a changing climate and the need to maintain productive yields as the influence of climate increase. Climate change specifics are described in the CSSR and in chapter 2 of this volume.
Margaret	Matter	143941	Text Region	10. Agriculture and Rural Communities		371	371	22	24	Since agriculture is fundamentally dependent on ample clean water supplies, rapid changes in climate also poses challenges to agriculture through change in precipitation patterns as well as type, magnitude, intensity and frequency.	We agree with the comment. Additional details about water are in other portions of the text.
Margaret	Matter	143943	Text Region	10. Agriculture and Rural Communities		371	371	24	25	Challenges to agriculture impact not only tightly linked livelihoods in rural communities, but more to the point, it impacts local and regional economies. Agriculture is a business, not merely a livelihood, and it is often the economic base of rural communities.	The sentence has been removed during revision to the summary.
Margaret	Matter	143944	Text Region	10. Agriculture and Rural Communities		371	371	31	37	Increased intensity of rainfall events and landslide events, and increased erosion and risk of landslide events following range and forest fires pose additional challenges to agriculture because of impacts on surface water and reservoir quality used for irrigation and other agricultural purposes, for example, stock watering, produce cleaning, dairy barn washing. In addition, sediments laden runoff may also be rich in nutrients. High nutrient concentrations can promote algal blooms, some of which are toxic. The water quality is then no longer suitable for livestock watering, irrigation or some other agricultural. Sediments and algae create problems for more efficient irrigation methods, such as drip and sprinklers, by clogging the small diameter openings and piping or tubing that carry of the water, spray nozzles and other parts of the irrigation equipment.	We agree with the comments, but, it is not possible to include this level of detail due to space limitation.
Margaret	Matter	143946	Text Region	10. Agriculture and Rural Communities		373	373	17	18	Local and regional economies, not just livelihoods in rural communities are heavily dependent on agriculture. The business of agriculture drives the make up and character of the business community in rural communities, and is often a major employer in the region.	This sentence has been revised to communicate the broader economic impact beyond livelihood.
Michael	MacCracken	144338	Text Region	10. Agriculture and Rural Communities		371	371	6	6	Need to change "increasing" to "increasingly"	Done. Revised the text
Michael	MacCracken	144339	Text Region	10. Agriculture and Rural Communities		371	371	3	9	These Key Messages are much more briefly stated than in other chapters [In reading through the chapter, I noted that the Key Messages in the chapter are longer and more useful--I'm leaving this comment here, but now realize the problem could be fixed by including the full key message here]. What seems to be missing is that the statements don't seem to provide adequate context to stand alone--basically not providing any mention of human-induced climate change being a driving force for these changes. I would suggest a bit of amplification so that each of the findings can stand completely on its own. It would also be helpful if some indication can be given or the relative magnitude and importance of these issues compared to other factors affecting the Agriculture Sector. Also, these lines only have 3 key messages and the chapter has 4 of them.	Done. Full key message text is added
Michael	MacCracken	144340	Text Region	10. Agriculture and Rural Communities		371	371	22	22	Change "poses" to "pose" and can likely drop "any"	The correction was made.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144341	Text Region	10. Agriculture and Rural Communities		371	371	28	28	"In the last century" seems a bit awkward (does it mean no progress in 21st century, etc.). Saying over the last hundred years might be an alternative, but why just starting in 1917. How about saying, since the establishment of land grant colleges and the Agricultural Extension Service in the 19th century (if that is correct).	Done. Revised the sentence by removing "In the last century"
Michael	MacCracken	144342	Text Region	10. Agriculture and Rural Communities		373	373	2	2	Is it worth making the point that "agricultural" here is not, I presume, referring to forestry and so the figures here also do not include forestry, even though USFS is within USDA? Yet on page 374, line 1, "woodland" is apparently counted as "farmland"--so are forest products counted or not (e.g., woodchips from forests that are feedstock for power plants in Europe)?	We appreciate the comment. However, since there is a separate Forestry Chapter, readers are referred there forinformation on climate change impacts on forests.
Michael	MacCracken	144343	Text Region	10. Agriculture and Rural Communities		374	374	5	5	I'm presuming the summation across gases is being done with the 100-year GDP as that is what EPA traditionally does. The problem is that methane's climate effect is much better characterized by using the GWP-20. I'd suggest actually giving the amounts of each of the key gases rather than doing the 100-year summary as that really hides the potential for cutting methane emissions from the agricultural sector.	We agree with the Comments #31 and #32. In response, we moved the sentence that discusses GHG emissions. Space limits detailing each of the individaul gases.
Michael	MacCracken	144344	Text Region	10. Agriculture and Rural Communities		374	374	14	16	I'd suggest a paragraph (somewhere--comment here as not sure where to put it) is also needed summarizing the water usage by agriculture, especially as that is climate sensitive, and agriculture uses a large fraction of water resources in some regions.	We inserted a sentence in the text that accompanies KM1 within the main body of the chapter regarding agricultural water usage and refer the reader to the Water chapter for more detail.
Michael	MacCracken	144345	Text Region	10. Agriculture and Rural Communities		375	375	2	2	Given that the term "mitigation" is used (or misused, depending on viewpoint) to mean emissions reductions, might it better to say here "To moderate" or "To reduce" or something similar?	This sentence has been deleted during revisions.
Michael	MacCracken	144346	Text Region	10. Agriculture and Rural Communities		375	375	9	9	Should this not be saying "more frequent"? Right now it seems to suggest that extremes are occurring frequently, which is true if one considers the baseline climate to be the mid-20th century, but if that is what is meant, then this needs to be said. Otherwise, a statistician might well object.	Done: Revised the text as suggested
Michael	MacCracken	144347	Text Region	10. Agriculture and Rural Communities		375	375	11	11	I would think "will create" needs to be changed to "creates" or say "will create more and more serious challenges"	Done: Revised the text as suggested
Michael	MacCracken	144348	Text Region	10. Agriculture and Rural Communities		375	375	16	16	As noted in another comment, the phrase "In the last century" is a bit confusing.	Removed the phrase.
Michael	MacCracken	144349	Text Region	10. Agriculture and Rural Communities		378	378	1	2	Best to try to avoid the word "may" as this can mean anything. Good practice is to choose a word/phrasing from the likelihood lexicon. For example, here, it might be appropriate to revise this to say "With climate change affecting agriculture at an increasing pace all across the U.S., investments by commercial firms alone are unlikely to be sufficient …" So, give a bit of explanation for the reasoning and choice of likelihood from the lexicon.	Done. Revised to add clarity to that sentence
Michael	MacCracken	144350	Text Region	10. Agriculture and Rural Communities		378	378	27	29	Sentence a bit confusing, starting with "Today" and then ending with "in the late 1950s and late 1980s"--perhaps a parallel set of phrasing for the Dust Bowl, 1950s and 1980s would make it clearer that thee are part of a list rather than the last phrase looking to be dangling there.	Done. Revised to add clarity to that sentence
Michael	MacCracken	144351	Text Region	10. Agriculture and Rural Communities		378	378	30	30	Would be better to use "projected" than "predicted"	Done. Revised as per the suggestion
Michael	MacCracken	144352	Text Region	10. Agriculture and Rural Communities		380	380	8	8	I'm surprised at the ordering here--I would have thought that "undocumented immigrants" would have been the last one listed, although it depends a bit on the reasoning included at the end of the sentence.	Agreed: Revised the sentence by deleting "undocumented workers" from the sentence.-
Michael	MacCracken	144353	Text Region	10. Agriculture and Rural Communities		383	383	9	9	I'd suggest changing "in the last century" to something like "since 1900"	Agreed: revised the sentence as suggested
Michael	MacCracken	144354	Text Region	10. Agriculture and Rural Communities		383	383	12	12	I'd suggest changing "extreme range of global" to "outer range of possible global lä"	Agreed: Revised the sentence
Michael	MacCracken	144355	Text Region	10. Agriculture and Rural Communities		383	383	15	15	You might consider changing "including rural communities" to "including many rural communities located along low-lying rivers in the coastal plains around the US" or something similar to indicate that sea level rise can have effects inland and this will affect many farmers, etc. that located farms up along these rivers to assure a freshwater supply. And, of course, salt water intrusion will become more of a problem along these rivers.	Agreed: Revised as suggested
Julie	Maldonado	144753	Text Region	10. Agriculture and Rural Communities		371	371	1	9	In the chapter as a whole, there are four Key Messages; in the executive summary on page 371, however, there are only three Key Messages listed, which correspond to the first three of the Key Messages expanded on in the chapter. The fourth Key Message is important to the chapter as well and should be included in the executive summary.	Done. 4th key message is addeded
Julie	Maldonado	144759	Text Region	10. Agriculture and Rural Communities		386	386	1	3	This sentence claims that …technological improvements have outweighed the aggregate negative impacts of climate… While the fact itself is not being questioned, it should be supported possibly by an example, because the majority of the rest of the chapter prior to this sentence appear to point toward current large monetary losses due to climate change, for example in on pg 381 lines 1-4, despite technological improvements.	Total factor productivity does not imply that there were no losses associated with climate change. No change was made.
Julie	Maldonado	144762	Text Region	10. Agriculture and Rural Communities		388	389	31	20	These two passages, indicating the uncertainty of the impact of heat on crops and humans in the first passage lines 31-32 on pg 388 and the certainty of its effects in the second passage lines 18-20 on pg 389, appear to contradict each other. While they are referring to slightly different things and therefore could have have legitimately different levels of certainty, maybe some changes in wording could make the initial reading of this portion of the chapter less confusing.	We have moved the crops section to KM1 and reviewed the certaintly levels. Now the certainty levels here relate to human and livestock health impacts.
Angel	Garcia	144764	Text Region	10. Agriculture and Rural Communities		386		5		This line talks about atmospheric vapor pressure, which is important, however it is not mentioned elsewhere in this chapter. The critical role that it plays should either be explained more in relation to climate change, or this line should be taken out.	Vapor pressure is related to increased evaportive demand discussed under KM1. We have modified this sentence to link vapor pressure to crop water demand.
Sandra	Fatoric	140843	Text Region	11. Built Environment, Urban Systems, and Cities		418	418	11	11	Please add additional reference as: (Fatorić and Seekamp 2017; Rockman et al. 2016, CFM 2015). Fatorić, S. & Seekamp, E. (2017). A measurement framework to increase transparency in historic preservation decision-making under changing climate conditions. Journal of Cultural Heritage, DOI: 10.1016/j.culher.2017.08.006.	Thank you for this suggestion. We do not have additional space to include this reference but have provided this citation to the adaptation chapter for inclusion there. That is the chapter is where models and frameworks for adaptation are discussed in more depth.
Sandra	Fatoric	140844	Text Region	11. Built Environment, Urban Systems, and Cities		427	427	7	8	Please add additional reference as: historic and cultural sites (Fatorić and Seekamp 2017, Holtz et al. 2014, Rockman et al. 2016, Markham et al. 2016, 2016, CFM 2015) Fatorić, S. & Seekamp, E. (2017). Are cultural heritage and resources threatened by climate change? A systematic literature review. Climatic Change 142(1), 227-254. This above mentioned study is a first global systematic literature review of the link between cultural heritage/cultural resources and climate change.	Thank you for drawing our attention to this reference. We included it as part of our discussion on climate impacts on historic landmarks and cultural heritage.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Kaveh	Rashidi Ghadi	141283	Text Region	11. Built Environment, Urban Systems, and Cities		425	425	15	23	There is a recent publication on the effectiveness of the role city networks such as C40 and ICLEI,in cities adoption of climate policies. This research covered 127 cities around the globe, including those of the US. Therefore, I would recommend you have a reference to that effectiveness: Original text: Strong leadership and political will are central to addressing these challenges (Butler et al 2016, Shi et al 2015, Vogel et al 2016). Many U.S. cities participate in networks such as the U.S. Conference of Mayors, ICLEI (International Council for Local Environmental Initiatives), C40(C40 Cities Climate Leadership Group), and 100 Resilient Cities. Multi-city networks foster peer-to-peer learning, share best practices, and provide technical assistance for adaptation and mitigation (Clark and Clark 2014, Arup 2015, Rosenzweig et al. 2015, Vogel 2016). Suggested change: Strong leadership and political will are central to addressing these challenges (Butler et al 2016, Shi et al 2015, Vogel et al 2016). Many U.S. cities participate in networks such as the U.S. Conference of Mayors, ICLEI (International Council for Local Environmental Initiatives), C40(C40 Cities Climate Leadership Group), and 100 Resilient Cities. Multi-city networks foster peer-to-peer learning, share best practices, and provide technical assistance for adaptation and mitigation (Clark and Clark 2014, Arup 2015, Rosenzweig et al. 2015, Vogel 2016). These networks have played an important role in shaping climate policy frameworks and are key driving factors for cities climate policy adoptions (K. Rashidi & Patt, 2017). Reference: Rashidi, K., & Patt, A. (2017). Subsistence over symbolism: the role of transnational municipal networks on cities‰Ûª climate policy innovation and adoption. Mitigation and Adaptation Strategies for Global Change. http://doi.org/10.1007/s11027-017-9747-y	Thank you for drawing our attention to this reference. We have included it in the supporting text to Key Message 4.
Perry	Miller	141284	Whole Chapter	11. Built Environment, Urban Systems, and Cities						What is missing here is the emphasis on the importance of the role of co-benefits of climate policies in urban level policy adoptions. There is a growing body of literature highlighting this importance as the key driver in shaping the mindsets of urban policy makers. Consideration of the co-benefits of GHG mitigation projects provides seems to be important for various stakeholders: 1- Urban policy makers: They will understand that it is not all about GHG reduction, but these types of projects result in job creation, air pollution reduction, improved health benefits, productivity gains, etc. These are all local gains of majority of climate policies. 2- City residents: If they see a clear link between their tax payments and impactful investments (i.e. the type of investment that offer benefits beyond GHG mitigation), they will be more willing to participate. Whether in the form of purchasing municipal green bonds, direct investments, or paying additional tax, user fees, etc. 3- Federal support: Consideration of co-benefits of urban climate policies, can possibly increase the likelihood of receiving federal aides. I would like to refer you to our latest publication (Kaveh Rashidi, Stadelmann, & Patt, 2017), which you might find interesting. Reference: Rashidi, K., Stadelmann, M., & Patt, A. (2017). Valuing co-benefits to make low-carbon investments in cities bankable: the case of waste and transportation projects. Sustainable Cities and Society, 34, 69‰ÛÒ78. http://doi.org/10.1016/j.scs.2017.06.003	We appreciate the suggestion. We have refined our discussion on cobenefits and added the suggested reference to the supporting text to Key Message 4.
David	Wojick	141685	Text Region	11. Built Environment, Urban Systems, and Cities		422	422	26	27	Here is the text: 26 Urban adaptation and mitigation actions can affect current and projected impacts of climat 27 change and provide near-term benefits. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	NCA4 Volume 2 is being prepared in compliance with Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (P.L. 106-554) and information quality guidelines issued by the Department of Commerce / National Oceanic and Atmospheric Administration pursuant to Section 515 (http://www.cio.noaa.gov/services_programs/info_quality.html). This specific statement was made based on an assessment of the scientific literature on urban adaptation and is consistent with the findings from this literature (e.g. Georgescu et al 2014, Aerts et al 2014; Brown et al 2015, Stone et al 2014, Pregnolato et al 2016, Milan and Creutzig 2016).
Geoffrey	Marion	141830	Text Region	11. Built Environment, Urban Systems, and Cities		413	413	13	13	What percentage of Americans live in urban areas? The motivation might be improved by mentioning how many Americans to whom this is important.	Thank you for the suggestion. This information is in the chapter.
Geoffrey	Marion	141831	Text Region	11. Built Environment, Urban Systems, and Cities		415	415	13	14	Are urban areas are the primary source of greenhouse gas emissions because of increased population and industrial development? It might help to say that here.	The text has been revised to incorporate this suggestion.
Geoffrey	Marion	141833	Text Region	11. Built Environment, Urban Systems, and Cities		420	422	1	23	Overall, this section does a great job of summarizing effects of climate change on urban utilities. I think it might be improved, however, by a little more writing about the problem outlined in Figure 11.3, namely the effects of floodwater on sewage systems and the associated risks to urban populations, Rather than being somewhat self-contained in the figure itself.	Thank you for the suggestion. Due to space limitations, we are keeping the detail in the caption and are not repeating the information in the text.
Puja	Roy	141960	Whole Chapter	11. Built Environment, Urban Systems, and Cities						In some places in the chapter, it states "buildings and infrastructure" and in other places it is described as "urban infrastructure". It seems like there should be a distinction made between these two terms to improve clarity.	We are interpreting infrastructure to include buildings, so we have edited the document to use the term "infrastructure" rather than "buildings and infrastructure" when we are referring to all types of infrastructure, and "building infrastructure" or "buildings" when we specifically mean buildings only.
Nicholas	Rajkovich	141962	Whole Page	11. Built Environment, Urban Systems, and Cities		413				In the "State of the Sector", there are good data on the importance of the built environment and cities. However, if this chapter is going to include a discussion of the building stock, it would be helpful to include descriptive statistics that talk to the number of buildings, the value of the buildings and their contents, and the overall importance buildings have to climate change mitigation and adaptation. For example, buildings use nearly 40% of the total energy in the U.S.. Exposure to high temperatures often happens indoors; dealing with heat waves may increase energy use and air pollution, etc.	Thank you for your comment. We incorporated your suggestion by adding details regarding metropolitan land values, revising graphics and text to better indicate"where" in the built environment people experience particular impacts.
Casey	Thornbrugh	141963	Whole Page	11. Built Environment, Urban Systems, and Cities		413				It would be helpful to know why Charleston, Dubuque, Fort Collins, Phoenix, and Pittsburgh were chosen as representative cities for this chapter. It doesn't seem to align with the regions of the NCA and no explanation is given. For example, there are two cities from the Southwest, one from the Midwest, one from the Northeast, and one from the Southeast. The Northern and Southern Great Plains, Alaska, Hawai'i/Pacific Islands, and the Northwest are not represented. Cities like Boston, Portland (OR), Honolulu, etc. would help the audience better interpret the results for their own municipalities.	Thank you for your suggestion. We added a sentence on how the five case study cities were selected to the Process Description paragraph of the Traceable Accounts. Because of space limitations, we were not able to include additional cities.
Casey	Thornbrugh	141967	Whole Page	11. Built Environment, Urban Systems, and Cities		412				In line 1, you state "Buildings and infrastructure designed for historical climate trends may not be able to withstand future weather extremes and climate change." It then goes on to describe "forward-looking" design. Please define "forward-looking" design and describe how the use of projections may differ from traditional techniques of averages of past data uses.	Thank you for the comment. Clarifications are provided in traceable accounts.
Casey	Thornbrugh	141971	Text Region	11. Built Environment, Urban Systems, and Cities		427	427	35	36	Please define "tail" events -- this is only used one other place in the NCA: page 1410, line 8. In the appendix, it's described as a "fat tail"; consistency would be helpful for lay readers.	We appreciate this suggestion. To meet plain language guidance and avoid confusion, we removed the word "tail."

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Nicholas	Rajkovich	141973	Text Region	11. Built Environment, Urban Systems, and Cities		415	416	39	1	From this sentence, it's unclear if sea level rise contributed to damage as part of Hurricane Joaquin or if it's projected to cause problems in the future.	Thank you for this observation. We edited the text to make it clearer that the sentence is about the hurricane event in 2015, and the combined effect of it with higher sea levels causing damages in the Charleston area.
Puja	Roy	141974	Text Region	11. Built Environment, Urban Systems, and Cities		417	417	31	36	The report mentions extreme heat several times, but there is no mention of cold temperatures. While the NCA4 states that fewer cold spells will occur in the future, it also states on page 353 (line 18) that declines in arctic sea ice may cause the atmospheric jet stream to get stuck in place for days and weeks. This can lead to cold weather in North America. Extreme cold can also cause morbidity and mortality, and cause failures to heating systems in buildings and damage to urban infrastructure. Should this also be included in this chapter?	Thank you for your comment. We incorporated this suggestion into text and added appropriate references.
Nicholas	Rajkovich	141976	Text Region	11. Built Environment, Urban Systems, and Cities		421	421	8	14	The report discusses interconnections among sectors increasing, however there is little discussion of where these interconnections occur (i.e., in buildings and other critical facilities). A diagram showing how these interconnections can lead to cascading failures (beyond Figure 11.3 which only describes heavy rainfall) would help illustrate this point. While the energy-water nexus is a good example, other sectors like commerce are affected by a loss of electricity, water, sewage, etc. Very few organizations can function if a critical building system is offline, disrupting the economy and hampering recovery.	Because of limited space, we are not able to add the suggested graphic. The sectoral interdepencies chapter has included a graphic that addresses this topic.
Nicholas	Rajkovich	141977	Figure	11. Built Environment, Urban Systems, and Cities	1140.00%	424				The figure shows working at night, cooling patrol, and other policies that are not included in the chapter. It may be helpful to describe some of these policies like changes to building codes at the state level, changes to standards (e.g., ASHRAE Standard 55 for thermal comfort, etc.), and voluntary protocols like the LEED Rating system. Not all policies that affect urban life are determined by cities, and organizations at other levels may impact city performance during extreme events. See for example: Conlon, Kathryn C., Rajkovich, Nicholas B., White-Newsome, Jalonne., Larsen, Larissa, & Marie S. O‰Û²Neill. 2011. Preventing cold-related morbidity and mortality in a changing climate. Maturitas 69 (3): 197-202. (doi: 10.1016/j.maturitas.2011.04.004). Kwok, Alison G., and Nicholas B. Rajkovich. 2010. Addressing climate change in comfort standards. Building and Environment 45(1): 18-22. (doi: 10.1016/j.buildenv.2009.02.005)	We revised Figure 11.4 and its caption to increase its clarity and impact. In the supporting text to Key Message 4, we highlight the variety of governmental and non-governmental policies and strategies for urban adaptationt. Due to space limitations, we are not able to describe each type of policy in depth. Thank you also for the reference.
Nicholas	Rajkovich	141978	Text Region	11. Built Environment, Urban Systems, and Cities		427	427	32	33	Demographics and health factors should be included in the discussion of climate vulnerability -- they are included in indices like the Social Vulnerability Index by Cutter et al. and shown to be a strong predictor of outcomes during an extreme event.	Thank you for this suggestion. We have added text and references to more clearly highlight the role of demographic and health factors in urban vulnerability to climate change as noted in NCA3 and other studies.
Nicholas	Rajkovich	141979	Whole Chapter	11. Built Environment, Urban Systems, and Cities						The chapter describes many extreme events but does not describe other slow moving changes (other than sea level rise) that may have a negative impact on buildings and infrastructure. These include changes in pest ranges like termites that can do damage to wood framed buildings, subsidence due to drawing water out from aquifers and salt water intrusion, and changes to building envelopes and foundations required by shifts in temperature and humidity.	We added discussion about slow moving changes such as salt water intrusion to the Regional Roll Up. We also specified that stressors are acute and chronic.
Ross	McKitrick	141980	Text Region	11. Built Environment, Urban Systems, and Cities		438	438	21	23	Hanak, E. et al should be a separate entry -- it's accidentally combined with Habeeb, D. et al.	Thank you for noticing. We separated the two references.
Sarah	Davidson	141982	Whole Chapter	11. Built Environment, Urban Systems, and Cities						Key Message 4 states that cities are leading efforts to respond to climate change. However, in addition to city government, there are a number of professional organizations, NGOs, and philanthropy that are contributing significantly to this space. The role of professions (e.g., engineers, architects, urban planners, etc.) through their professional societies is critical; they are developing new model codes, standards, and policies for adoption by decision-makers. The document currently reads as though cities are taking the lead, but this work is often supported by or carried out by these other organizations. Recognizing their contribution to adaptation is important to building the response to climate variability and change.	Thank you for your comment. We did not mean to imply that only municipal governments are playing critical roles in urban adaptation and mitigation. We added a more detailed list of relevant stakeholders, including professional societies, in the supporting text to Key Message 4.
Sarah	Davidson	142007	Figure	11. Built Environment, Urban Systems, and Cities	100.00%	414				Please use a consistent coloring scheme for all three maps, and consider using non-arbitrary numbers for the key (e.g. 18,893,109). The red areas in the 2100 SSP5 (bottom) map represent much larger populations than the same color on the 2100 SSP2 (middle) map but this is difficult to notice. For example, the same key with 7 colors could be used for all maps, describing populations equal to or less than 10k, 100k, 1mil, 10mil, 20mil, 30mil and 60mil. Use colors to make clear that the difference between 30mil and 60mil is much larger.	Thank you for the detailed suggestion. We have revised Figure 11.1 to have a consistent and logical coloring and numbering scheme.
Sarah	Davidson	142008	Text Region	11. Built Environment, Urban Systems, and Cities		431	431	35	38	Key Message 4 and the accomanying text do not address the degree to which cities are reliant on state and national laws, policies and regulations in order to implement climate adaptation and especially mitigation. This is a critical message for municipalities that have pledged to achieve the level of emissions reductions needed to meet lower emissions targets. The statement that "cities can address [challenges to implementing adaptation and mitigation actions] by building on local knowledge and joining multi-city networks (high confidence)" as I read it is false. See e.g. the draft clean energy plan for Philadelphia at https://beta.phila.gov/documents/powering-our-future-a-clean-energy-visi…. This report explains throughout that despite many existing and proposed programs and actions, Philadelphia's goals to reduce carbon emissions are significantly dependent on state and federal efforts to incentivize clean low-carbon energy development and efficiency improvements. For example, Philadelphia is prohibited by law from enacting buiding energy codes to reduce energy use; thus it requires the state to act to modernize the building code statewide or allow the city to adopt their own. See the "Key Players" boxes in the report for other examples.	Thank you for your observation. We did not mean to imply that cities can achieve adaptation and mitigation goals on their own. We have added more details to our discussion of the factors that constrain urban adaptation and mitigation. We specifically highlight the role of policy decisions at other scales.
Sarah	Davidson	142009	Whole Chapter	11. Built Environment, Urban Systems, and Cities						Consider adding more science-based information about urban emissions and mitigation. This information seems critical given urban contributions to US emissions and the number of US cities that have made pledges to achieve emissions reductions needed to meet lower emissions targets. It could be incorporated by editing Key Message 4 or possibly with an additional message that meeting these city-level pledges likely requires or is significantly challenged without action at state and federal levels (actions do not need to be specified or evaluated, i.e. the information can stay within the scope of report requirements described in the Front Matter). For example the draft clean energy plan for Philadelphia (https://beta.phila.gov/documents/powering-our-future-a-clean-energy-visi…) describes throughout ways that Philadelphia's goals to reduce carbon emissions are dependent on state and federal efforts to incentivize clean low-carbon energy development and efficiency improvements (e.g. Philadelphia cannot enact building energy codes to reduce energy use; it requires the state to update the state building code or allow the city to adopt their own). See the "Key Players" boxes in the report for other examples. Also see e.g. Rockstrâ_m et al. (2017, doi:10.1126/science.aah3443) and Figueres et al. (2017, doi:10.1038/546593a) for science-based descriptions of the level of action needed to meet lower emissions targets.	This is largely outside the scope of our chapter. We provided additional references to SOCCR-2, which analyzes the science on urban emissions and mitigation at the national level, and to the mitigation chapter. We added a sentence in the supporting text to Key Message 4 that urban actions alone will not achieve targets. While the comment highlights a good example, space restrictions do not allow us to discuss it in detail in the chapter.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Erica	Brown	142038	Whole Chapter	11. Built Environment, Urban Systems, and Cities						Key messages should be consistent in that the confidence level for the statement should be noted in each key message, or not, across all key messages. It would be best to keep it in the traceable account section for each chapter.	We appreciate the reviewer's comment. Per USGCRP guidance, we provide a confidence level for each component of each key message in the traceable account section, not the main text.
Hannah	Fogle	142402	Text Region	11. Built Environment, Urban Systems, and Cities		415		9		This statement is too general ‰ÛÒ the word ‰ÛÏsome‰Û would be appropriate. Some urban forests are increasing, and restoration of some urban waterways is improving functionality.	The text has been revised to incorporate this suggestion. We added the modifier "many" added to text.
Juanita	Constible	142491	Whole Chapter	11. Built Environment, Urban Systems, and Cities						This chapter provides an excellent overview and update to the 2014 Review, "Urban Systems, Infrastructure, and Vulnerability" chapter on the risk of climate change to urban environments and systems. Cities have taken a central position in our response to climate change particularly in the current political context. One suggestion for the overall framing of the chapter is that it should also acknowledge how the urban built environment itself creates vulnerabilities in our choices for how we have constructed the urban form. The chapter acknowledges the interconnectedness of urban and regional systems, but makes no mention of how the urban form creates unique vulnerabilities for cities that can extent and multiply in other regions.	Thank you for this insight. We expanded our discussion of urban vulnerability to highlight how historic development patterns increase differential risks to urban populations and properties.
Juanita	Constible	142492	Text Region	11. Built Environment, Urban Systems, and Cities		411	411	23	37	There was a very good study that was published in the Proceedings of the National Academy of Sciences that gave some eye-opening estimates of cities in the U.S. that will be affected by sea level rise and the year that emissions will reach a level where a certain level of inundation is "locked in." It would help drive home the linkage between emissions and sea level rise to include some of those figures. See "Carbon choices determine US cities committed to futures below sea level", (Strauss, Kulp, and Levermann, PNAS, Nov. 2015, Vol 112, No. 44.	We do not think this citation is relevant for our chapter, so therefore have not added information from this reference. The information is more appropriate for the coastal chapter.
Juanita	Constible	142493	Whole Page	11. Built Environment, Urban Systems, and Cities		413	413			Introduction - The first paragraph identifies key components of urban infrastructure and the built environment. However, it seems to limit its focus to what might be termed "productive" assets (transportation, communications, energy, and water systems) as well as residential and commercial buildings, streets, and landscaping. Missing from this description are public buildings and assets including hospitals, schools, parks and green space and others that are all critical components to the urban built environment that impact quality of life and livelihood. Understanding the differing qualities of key components to the urban built environment and infrastructure is critical to understanding how and why certain areas might be left vulnerable while others are offered investment and protected.	Thank you for this observation. We addressed this comment by highlighting the importance of different parts of the built environment to urban quality of life in both the introduction and supporting text to Key Message 1.
Juanita	Constible	142494	Figure	11. Built Environment, Urban Systems, and Cities	100.00%	414				The chart of projected populations from USEPA is very instructive, but not the only source of information on how population may shift in the future. We highly recommend including information from "Migration induced by sea-level rise could reshape the US population landscape" (Hauer, Nature Climate Change, 17 April 2017). This paper made more refined projections of how the populations of various coastal cities may be affected and what areas of the country may receive an influx of population as a result.	Thank you for the reference. We added information Hauer's main findings to the text and have the reference in the reference list. The reason we use the US EPA population projects is because they are the official NCA4 population scenarios to maintain consistency across chapters.
Juanita	Constible	142495	Whole Page	11. Built Environment, Urban Systems, and Cities		415				State of the Sector - The chapter does well to acknowledge the challenge of rising inequality and that; "Current infrastructure design can lock in fossil fuel dependency, so urban development patterns will continue to affect carbon sources and sinks in the future". The section should highlight how current urban development patterns that exacerbate the climate crisis also contribute to rising inequality and increased vulnerability to certain populations and underdeveloped regions of cities. The section should also question whether current attempts by cities to reduce GHG emissions will exacerbate inequalities, and how inequality might limit the capacity of some cities to respond to the climate challenge.	Thank you for this insightful comment. We expanded our discussion of urban inequality to include literature that addresses how social inequity is related to vulnerability to climate change, as well as how it intersects with adaptation and mitigation efforts. We cross-reference the coastal chapter and other relevant chapters on this point.
Juanita	Constible	142496	Whole Page	11. Built Environment, Urban Systems, and Cities		415				The section "Regional Roll-up" is an excellent summary of many of the unique dangers faced by cities in specific locations and the common themes most will need to contend with. The report's "Key Messages" offer an organized distillation of complex interactions between climate and cities. However, the sections could be improved by highlighting what we've learned since the publication of the last NCA.	Thank you for this suggestion. We added a sentence in the introduction to orient readers to what is new in this field since NCA3.
Juanita	Constible	142497	Whole Page	11. Built Environment, Urban Systems, and Cities		417				Key Message 1 on "Impacts on Urban Quality of Life" identifies existing challenges to qualify of life in cities and how climate change can exacerbate those. The report should make clear that addressing these challenges must be a central component of Key Message 4: "Urban Response to Climate Change". Otherwise, many cities will view issues of livelihood and inequality as secondary, at best, to responding to climate change. Too many cities and city leaders see urban greening as a market and growth opportunity, not an imperative that would change the course of current development patterns. As such, the build out of green infrastructure remains marginal to the overall functioning of even leadership cities.	Thank you for this insight. We revised the supporting text to Key Message 4 to include literature that provides evidence for the importance of addressing social inequality and quality of life as part of urban adaptation and mitigation efforts.
Juanita	Constible	142498	Text Region	11. Built Environment, Urban Systems, and Cities		418	419	25	27	In setting design standards in coastal areas, there is a great deal of uncertainty about what future sea levels will be. It's impossible to know how high sea levels will rise without knowing how high governments are going to allow emissions to rise. This creates a highly uncertain situation for establishing design standards. In similar situations, it is usually the case that a realistic "worst case" scenario be determined that can serve as the basis for a design standard. However, this is not the approach taken for flood risk, even when determining flood risks based on past data. FEMA, in assembling flood maps and mapping the so-called 100-year flood or the flood with a 1% chance of occurring in any given year, uses the 50th percentile of flood probability when defining that flood. This results in people having an artificially low perception of flood risks. In reality, there is a 50/50 chance we have correctly estimated the 100-year floodplain. But would we design a bridge with a 50/50 chance of standing up to rush hour traffic? Absolutely not. We urge the authors of this chapter to make some recommendations on ways this uncertainty in future sea levels should be addressed.	Thank you for the comment. Clarification and references on risk management strategies regarding these uncertainties are provided in traceable accounts.
Juanita	Constible	142499	Text Region	11. Built Environment, Urban Systems, and Cities		418	419	25	27	There are some good examples of different design and engineering standards that could be highlighted here as ideas for fostering urban resilience and preparedness. The Federal Flood Risk Management Standards (Executive Order 13690) are one such policy that, while it was rescinded in August 2017, local communities and states could adopt something similar for themselves. In fact, according to the Association of State Floodplain Managers, hundreds of communities around the nation have voluntarily adopted improved flood protection standards, requiring new construction to be elevated above the level of the 100-year flood, as mapped by FEMA (see http://www.floods.org/ace-files/documentlibrary/floodriskmngmtstandard/c… and http://www.floods.org/ace-files/documentlibrary/floodriskmngmtstandard/s…). Another proposed policy is the Disaster Relief Reform Act of 2017 (H.R. 4460), a provision of which would empower FEMA to rebuild public facilities and infrastructure to higher design specifications, beyond the codes or standards that the local jurisdiction has adopted. This is a very smart proposal, which would allow FEMA to pay for the reconstruction of much more resilient public facilities that are better prepared for the future, and is another good example of how urban areas can adapt and better prepare for the effects of climate change.	Thank you for the comment. Clarification and references are provided in traceable accounts. This chapter is focused on current directives and forwarding looking design.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Tomi	Vest	142778	Text Region	11. Built Environment, Urban Systems, and Cities		418	418	17		NYC's tree planting program is called the MillionTreesNYC Initiative not the Trees for Public Health program. (https://www.nycgovparks.org/trees/milliontreesnyc)	Thank you for the comment. Trees for Public Health is part of the MillionTreesNYC program, so our text is correct. We fixed the link in our references: http://www.milliontreesnyc.org/html/about/getting_parks.shtml
Mikko	McFeely	142862	Text Region	11. Built Environment, Urban Systems, and Cities		432	432	5	7	This text section does not account for the water sector which is a leading adaptation sector within many large urban areas. Please consider editing the sentence to read: Municipal departments from water systems to public works to transportation and other.... etc.	We agree that additional urban stakeholders other than municipalities, including the water sector, play important roles in urban adaptation efforts. We revised this sentence accordingly. The particular role the water sector plays and strategies it uses are provided in more detail in the water chapter.
Mikko	McFeely	143063	Whole Chapter	11. Built Environment, Urban Systems, and Cities						Given the chapter topic, it is surprising that none of the authors work for a municipality or are civil engineers or city planners with urban experience. Lacking that experience, the authors do an admirable job developing the content of this chapter. That said, we recommend having someone with that background complete a thorough review or perhaps if it's not to late have the person join the author team.	Thank you for your suggestion. We believe we have a high degree of expertise on the author team needed to write this chapter. We recognize that the author team does not represent all expertise engaged in the urban environment. We rely on the review process, including both the public and National Academy reviews, to provide any missing expertise and commentary to ensure this chapter addresses all important aspects of climate change and the urban environment.
Mikko	McFeely	143064	Text Region	11. Built Environment, Urban Systems, and Cities		411	411	3	3	We recommend changing Opportunities and resources of urban areas are critically important to the health and well being of urban residents to Opportunities and resources in urban areas are critically important to the health and well being of residents . It's not necessary to say urban residents, which is already implied.	Thank you for the suggestion. The text has been revised to read "residents" not "urban residents"
Mikko	McFeely	143065	Text Region	11. Built Environment, Urban Systems, and Cities		411	411	4	6	We recommend changing the 2nd sentence of KM1 to be Climate change can exacerbate existing urban challenges affecting the populaces quality of life, . . .	After consideration, the author team determined that the existing word choice is appropriate, and no change was made.
Mikko	McFeely	143066	Text Region	11. Built Environment, Urban Systems, and Cities		411	411	28	28	We recommend changing Urban areas in the United States are already… to Urban centers are already… . In its current form, the starting phrase sounds repetitive because it is used to open the previous paragraph (line 23).	After consideration, the author team determined that the existing word choice is appropriate, and no change was made.
Mikko	McFeely	143067	Text Region	11. Built Environment, Urban Systems, and Cities		413	413	6	6	We suggest avoiding using pronoun's such as we in the text to be consistent with other chapters.	Thank you for noticing this. We have been advised to avoid the passive voice in the chapter, so we changed "we" to "this chapter" in the text.
Mikko	McFeely	143068	Text Region	11. Built Environment, Urban Systems, and Cities		413	413	14	14	What are smaller micro areas? Can you use a footnote to define?	Per USGCRP guidance, the chapter does not use footnotes. We were unable to fit a plain language definition in the space available, so we have suggested to USGCRP that these terms be added to the glossary.
Mikko	McFeely	143069	Text Region	11. Built Environment, Urban Systems, and Cities		413	413	16	16	We recommend you list the five largest cities the text is refering to, perhaps as a footnote. By specifically mentioning the five largest cities it makes the reader wonder which one's those are.	Space contraints preclude us from listing these cities.
Mikko	McFeely	143070	Text Region	11. Built Environment, Urban Systems, and Cities		415	415	18	18	Change Regional Roll Up to Regional Summary .	Thank you for this idea. We are following USGCRP guidance to make the title of this section consistent with the other chapters. We will let USGCRP decide about whether to make this change for the entire report.
Mikko	McFeely	143071	Text Region	11. Built Environment, Urban Systems, and Cities		415	417	18	18	To be consistent with other chapters, it would be helpful if the Regional Summary referenced the NCA regions. Recognizing that this Chapter is focused on cities, perhaps you could say Cities in the Southwest, such as Los Angeles, CA and Phoenix, AZ, are more vulnerable to … than cities in the Northeast for example?	We appreciate this suggestion, but space is limited. References to NCA regions were added where appropriate.
Mikko	McFeely	143072	Text Region	11. Built Environment, Urban Systems, and Cities		416	416	18	19	Add reference (see Ch. 4: Energy) to the end of the sentence.	Thank you for noticing. We added the reference to the energy chapter.
Mikko	McFeely	143073	Text Region	11. Built Environment, Urban Systems, and Cities		417	417	4	5	Hanak et al. 2015 is not in the reference list and based on a quick search, doesn't seem like the right reference for this statement.	Thank you for your suggestion. We reviewed the text and determined that this is an appropriate reference to use.
Mikko	McFeely	143074	Text Region	11. Built Environment, Urban Systems, and Cities		419	419	21	21	The text should probably define the term forward looking. Does this mean resilient or adaptive?	Thank you for the comment. Clarifications are provided in traceable accounts. Forward -looking means planning for or anticipating possible future events, conditions. Resilience is defined in the USGCRP glossary.
Mikko	McFeely	143075	Text Region	11. Built Environment, Urban Systems, and Cities		421	421	12	13	Please edit text to include drinking water impacts. Suggested change: Hotter water temperatures affect cooling for electricity production and drinking water treatment and distribution processes.	Thank you for the suggestion about drinking water impacts. We added this point to an earlier sentence: "Both extreme weather that causes power outages and hotter water temperatures can affect drinking water treatment and distribution in urban areas."
Mikko	McFeely	143076	Text Region	11. Built Environment, Urban Systems, and Cities		422	422	30	37	This text on cities does not mention the leading edge work of municipal water providers within cities to plan for and adapt to climate change. Suggest adding the following statement at the end of this paragraph of text: Large municipal water providers within cities are also pioneering ways to assess and adapt to climate impacts that are fundamental to city resilience (Water Utility Climate Alliance, 2017).	We agree that additional urban stakeholders other than municipalities, including the water sector, play important roles in urban adaptation efforts. We revised this sentence accordingly and added details about water utility actions in the supporting text for Key Message 4 on urban adaptation.
Mikko	McFeely	143077	Text Region	11. Built Environment, Urban Systems, and Cities		428	428	19	21	The water resources text section should also include an additional reference from the Water Utility Climate Alliance on considering a range of future climate conditions. Suggest the following reference after listing Brown and Ray, 2015, Kaatz, L., Raucher, K., Raucher, R. 2015. Embracing Uncertainty: a Case Study Examination of How Climate Change is Shifting Water Utility Planning. Water Utility Climate Alliance, American Water Works Association, Water Research Foundation, and the Associaton of Metropolitan Water Agencies.	Thank you for the comment. We added the reference you suggested.
Social Science	Coordinating Committee	143207	Text Region	11. Built Environment, Urban Systems, and Cities		411	411	13	14	Two of the four key messages relate to social systems. The linkages are a bit vague, unlinear and leave important components undefined e.g. 'many areas of urban life'---what does this mean?	Thank you for your suggestion. The goal of this chapter is to provide a high level summary of the available information for cities across the US, which means that it is not possible for us to provide more detailed information. While the KMs are not linear, they are logical, and the 4 most imporant messages to communicate about the urban environment and climate change. The flow of information builds from general vulnerability of cities (KM1), to specific infrastructure impacts (KM2) to networked infrastructure and cascading impacts (KM3), to adaptation responses (KM4). In all of these KMs, we address social systems. We clarified language within the chapter.
Social Science	Coordinating Committee	143208	Text Region	11. Built Environment, Urban Systems, and Cities		411	411	34	34	Gaps center around making linkages between climate events and impacts on residents of urban cities e.g. 'Heavy rainfalls are expected to increase in frequency and intensity.' This statement should be followed by potential scenarios of impacts and examples. We already see impacts from these events---how are social systems reacting?	In the caption of Figure 11.3, we provide more information on social system impacts of flooding.
Social Science	Coordinating Committee	143209	Whole Page	11. Built Environment, Urban Systems, and Cities		416				Examples of multiple stressors provided stop short of using social science to interpret impacts. The examples of Charleston and Fort Collins explore broad economic impacts and do not discuss response across social or cultural systems.	We do mention what Charleston and Ft. Collins did in response to impacts elsewhere in the chapter. However, the literature assessing broader systemic social and cultural responses is not mature enough such that we can draw conclusions for this chapter, particularly for long term climate change.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Social Science	Coordinating Committee	143286	Text Region	11. Built Environment, Urban Systems, and Cities		411	411	3	7	Key Message 1 doesn't deliver a clear, strong take-away, particularly the first sentence which refers only to urban residents although the evidence notes that urban areas are the major economic engine of the nation. It may be better phrased, "Urban areas create opportunities and provide resources that are critically important to the health and well-being of urban residents and the nation."	Thank you for the suggestion. After careful consideration, the authors decided to retain the existing Key Message phrasing.
Social Science	Coordinating Committee	143287	Text Region	11. Built Environment, Urban Systems, and Cities		415	415	13	14	Is this definition of urban areas the same as on page 413 line 13? If so that would indicate that cities are more efficient emitters of GHS's as they have a greater share of population than share of GHG emissions. In general, discussion of the efficiency of urban areas and the relationship with density and wealth is lacking http://siteresources.worldbank.org/INTUWM/Resources/340232-1205330656272…	Thank you for raising this issue. The available literature does not support our ability to make statements that are national in scope about the relationship among urban emissions efficiency, density, and wealth. We welcome further research in this area. We do cross-reference the mitigation chapter on mitigation actions cities are taking to reduce emissions.
Social Science	Coordinating Committee	143288	Text Region	11. Built Environment, Urban Systems, and Cities		415	415	8	12	The brief discussion of urban impacts on the environment does not mention the impacts of increasing suburbanization/greenfield development on climate resilience, such as on water supplies http://www.sciencedirect.com/science/article/pii/S174778910700035X	We highlight the intersection of climate change with urbanization, including the impact of sprawl (suburbanization), on urban resilience.
Adam	Carpenter	143397	Text Region	11. Built Environment, Urban Systems, and Cities		416	416	1	1	Chapter 11. Page 416. Line 1:This section discusses ‰ÛÏsewage spills‰Û but does not elaborate on what a sewage spill consists of. In the water sector, a wastewater spill (for example, leakage of a raw wastewater in a treatment facility) is a different phenomenon than a sewage overflow, which could be anything from undiluted wastewater backing up through manhole covers and customer systems to highly diluted wastewater released through pre-determine points. If this section is describing combined or sanitary sewer overflows (CSOs or SSOs) we recommend changing ‰ÛÏsewage spills‰Û to ‰ÛÏsewage overflows.‰Û Regardless, we recommend clarifying to reduce confusion.	Thank you for this observation. It was sanitary sewer overflows. The text is corrected.
Andrew	Schumacher	143928	Text Region	11. Built Environment, Urban Systems, and Cities		413	413	7	9	The cities studied are relatively representative of the USA as a whole. I‰Ûªm curious why these exact cities were selected and why not different ones? It seems like the western USA might have been sold short in this sample.	Thank you for your suggestion. We added a sentence on how the five case study cities were selected to the Process Description paragraph of the Traceable Accounts. Because of space limitations, we were not able to include additional cities.
Andrew	Schumacher	143930	Text Region	11. Built Environment, Urban Systems, and Cities		419	419	22	27	Are there any major constructions within the past decade that have incorporated climate projections? If so, how might this or these construction projects set an example for the future of climate change ready construction?	Thank you for the comment. Clarification and references are provided in traceable accounts.
Andrew	Schumacher	143932	Text Region	11. Built Environment, Urban Systems, and Cities		415	415	13	17	Since 80% of human-caused greenhouse gases comes from urban areas, does that mean that even a slight change in an urban area to decrease emissions will have a large impact on the total?	We agree that additional urban stakeholders other than municipalities, including the water sector, play important roles in urban adaptation efforts. We revised this sentence accordingly and specified measures that water utilities are taking to protect assets essential to the functioning of urban systems.
Michael	MacCracken	144356	Text Region	11. Built Environment, Urban Systems, and Cities		411	411	37	37	The word "may" needs to be replaced by a word from the lexicon to provide a useful indication of likelihood ("may" can mean anything). Here, I would suggest saying "trends are not likely to be able" is justified.	Thank you for the comment. We changed "may" and used more appropriate terminology.
Michael	MacCracken	144357	Figure	11. Built Environment, Urban Systems, and Cities	100.00%	414				Regarding the color key for the population, the breakdowns at the higher population levels that go to 8 figure precision make no sense at all. I'd urge doing some rounding.	Thank you for the suggestion. We have revised Figure 11.1 to have a consistent and logical coloring and numbering scheme.
Michael	MacCracken	144358	Text Region	11. Built Environment, Urban Systems, and Cities		415	415	24	26	Some updating of the fire information might now be necessary.	This is still the largest fire California has experienced (Thomas fire), so no updates are necessary.
Michael	MacCracken	144359	Text Region	11. Built Environment, Urban Systems, and Cities		417	417	34	35	Best to avoid use of word "may" rather than using a word from the likelihood lexicon (or similar). Use on line 34 might be changed to "often" and on line 35 to "are also likely to be at risk"	Thank you for the comment. We changed "may" and used more appropriate terminology.
Michael	MacCracken	144360	Text Region	11. Built Environment, Urban Systems, and Cities		418	418	6	6	You might change "may experience" to "are vulnerable to" or something similar--use the likelihood lexicon as possible.	Thank you for the comment. We changed "may" and used more appropriate terminology.
Michael	MacCracken	144361	Text Region	11. Built Environment, Urban Systems, and Cities		418	418	27	27	Change "may not be able" to "are unlikely to be able" to accord with the lexicon	Thank you for the comment. We changed "may not" and used more appropriate terminology.
Michael	MacCracken	144362	Text Region	11. Built Environment, Urban Systems, and Cities		419	419	1	2	On line 419, change "may fail" to "become more likely to fail" or something similar--best to avoid "may" and use the lexicon. On line 2, change "may be" to "are likely to be"	Thank you for the comment. We changed "may" and used more appropriate terminology.
Michael	MacCracken	144363	Text Region	11. Built Environment, Urban Systems, and Cities		419	419	11	13	On line 11, change "may" to "is likely to" and on line 12 change to "Sea level rise will over time permanently submerge more and more coastal properties and public infrastructure."	Thank you for the comment. We changed "may" and used more appropriate terminology.
Michael	MacCracken	144364	Text Region	11. Built Environment, Urban Systems, and Cities		422	422	9	9	Need to change "may lead to"--perhaps to "generally lead directly to increased"	Thank you for the comment. We changed "may" and used more appropriate terminology.
Michael	MacCracken	144365	Text Region	11. Built Environment, Urban Systems, and Cities		422	422	10	11	"Urban populations who already experience food insecurity" is a pretty long euphemism for "the poor"--though may also apply to those in middle class as well.	We agree with the commentor that food insecurity is not only limited to the poor. Because of that, and the focus of the paragraph on food systems specifically, we are leaving the sentence as is.
Michael	MacCracken	144366	Text Region	11. Built Environment, Urban Systems, and Cities		425	425	5	5	How about changing "are constrained" to "are often constrained"	We revised the text to incorporate this suggestion by adding word "often" to modify the sentence.
Michael	MacCracken	144367	Text Region	11. Built Environment, Urban Systems, and Cities		425	425	8	8	Need to replace "may"--perhaps say "is often considered a lower priority than addressing current problem areas." And then perhaps make the point that what is needed is to be considering all public investments as an opportunity to also be building resilience and reducing vulnerabilities--so one addresses climate change in the course of addressing other priorities. It is not either/or, but often just a bit more money allows doing both, if planning is taken seriously.	We thank the reviewer for the helpful suggestion. We revised the text to change "may be constrained" to "is often constrained" as this modification is supported by the scientific literature. The first sentence of this section makes the observation that cities are mainstreaming adaptation and mitigation into other aspects of planning. We also touch on this issue in key message 1 and 2.
Michael	MacCracken	144368	Text Region	11. Built Environment, Urban Systems, and Cities		427	427	27	27	There are not degrees of "certainty"--one is certain or not. The can be degrees of confidence and of uncertainty. Here, change "certainty" to "confidence" to remain consistent with the lexicons that were developed.	After consideration of this point, we have determined that the existing text is clear and accurate.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
David	Wojick	141686	Text Region	12. Transportation		453	453	18	22	Here is the present text: 18 Key Message 1: A reliable, safe, and efficient U.S. transportation system is at risk from 19 increases in heavy precipitation, coastal flooding, heat, and other extreme events as well as 20 changes to average precipitation and temperature. Over the coming decades and the rest of 21 the century, climate change will continue to pose a risk to U.S. transportation performance 22 with differences among regions. Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	The Key Messages are supported by the content and references in each section.
David	Wojick	141687	Text Region	12. Transportation		456	456	14	19	Here is the present text: 14 Extreme 15 events that increasingly impact the transportation network are inducing societal and 16 economic consequences, some of which disproportionately affect vulnerable populations. In 17 the absence of intervention, projected changes in climate may lead to increasing 18 transportation challenges, particularly for urban areas because of system complexity, aging 19 infrastructure, and dependency across sectors. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models.	The Key Messages are supported by the content and references in each section. Not all projections are based on computer models and those that are have been vetted by the author team.
Andrew	Pershing	141915	Figure	12. Transportation	12.1	450				In figure 12.1, what's the definition of Intermediate Low, Intermediate, and Extreme sea level rise scenarios? Also, what's the definition of the annual vehicle-hours of delay for most major roads caused by sea level rise scenarios? How is the annual vehicle-hours of delay calculated from the simulation? How is the simulation set up? Does the annual vehicle-hours of delay mean the length of time of the annual vehicle-hours in the period of high tide flooding minus the average time in other time? Why not also use decadal average values for 2100? Maybe this type of questions need to be addressed for figure 12.1.	The definitions of the scenarios were added to the body of the text. The definiation of vehicle -hours of delay was added to the figure caption. The remaining requested details appear in the paper's methods from which the figure was taken and are beyond the scope of this chapter.
Juanita	Constible	142500	Whole Chapter	12. Transportation						In general, there seems to be a lack of emphasis on the role transportation plays in causing climate change. Transportation is the leading source of US GHG emissions, and while that fact is mentioned, it's not one of the key messages. It could be worked into Key Message 3	The suggestion is outside the scope of this chapter; detailed discussions of mitigation/contributions to climate change belong in the Mitigation chapter.
Juanita	Constible	142501	Whole Chapter	12. Transportation						The chapter mentions the fact that urban areas are perhaps more resilient than rural areas because of the many transportation options which create some redundancy in the system. It would strengthen the chapter to mention that providing more transportation choices not only makes a community more resilient to climate change, but also helps to mitigate greenhouse gas emissions if transit, carpooling, safe biking and walking are possible. Additionally, the chapter plainly points out that communities such as New York where people can simply walk, are inherently more resilient to climate change. Dense, walkable communities also significantly reduce the need to drive, and therefore the carbon footprint of their residents. For policy makers struggling to adapt to climate change, creating walkable communities does double duty, and failing to point this out weakens the chapter.	Urban and rural areas have different challenges and coping mechanisms. The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text. This report does not include policy discussions or recommendations for climate mitigation or adaptation.
Juanita	Constible	142502	Whole Chapter	12. Transportation						In a world of increasingly limited resources, public dollars have to hit multiple social objectives. The chapter would do well to point out that in a world of limited resources, our investments can and must advance adaptation to -- and mitigation of -- climate change.	Consistent with its Congressional mandate, this assessment is a technical report and does not include policy discussions of climate mitigation or adaptation.
Juanita	Constible	142503	Text Region	12. Transportation		448	448	15	19	Key Message 3 suggests that transportation planners are increasingly interested in addressing climate risks, as evidenced by more vulnerability assessments. It's also worth pointing out that transportation planners - both state and federal - are increasingly interested in measuring and reducing their greenhouse gases from transportation, as evidenced by the adoption by USDOT/FHWA of the MAP-21 carbon performance standard in January, 2017.	The commenter is correct that there has been increased interest from subnational governments and the private sector in climate mitigation. However, due to the size of the topic, the page limit for the chapter, and the overall focus of the NCA4, we focused on adaptation rather than mitigation. There is discussion of mitigation efforts in the dedicated mitigation chapter.
Juanita	Constible	142504	Text Region	12. Transportation		451	451	35	38	The text suggests that the impact of ridesourcing is uncertain. However, many recent studies have documented increased VMT and reduced transit ridership from TNCs and these should be referenced.	The commenter's position is not supported by the literature. We reviewed peer-reviewed and grey literature on this topic. We found that while increased VMT is common in cities with ridesourcing, there is not enough evidence to claim this is a definitive trend. Impacts of ridesourcing on transit and the overall impacts of ridesourcing on the environment (when considering parking impacts, reduced vehicle ownership etc) are uncertain at this time.
Juanita	Constible	142505	Text Region	12. Transportation		452	452	1	6	The text implies that TOD and increasing multimodal options is "likely: to reduce emissions and help build resilience". In fact, TOD and multi modal solutions have been repeatedly documented to reduce emissions. Likely is not strong enough.	The text has been revised to incorporate this suggestion.
Mikko	McFeely	142863	Text Region	12. Transportation		452	452	7	7	Change Regional Roll Up to Regional Summary.	This is the terminology dictated by USGCRP.
Ken	Moraff	143158	Text Region	12. Transportation		449	449	1	8	To mitigate emissions consequences, provide incentive funding, usable for planning and for infrastructure, under FHWA's Alternative Fuel Corridors program https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/, which helps states and MPOs consider which fuels to offer and where. Also fund DOE's Clean Cities Coalitions https://cleancities.energy.gov/, which assists with the same efforts on the grassroots level by harnessing support from fuel providers, vehicle manufacturers, fleets, and local officials.	The suggestion is outside the scope of this chapter; detailed discussions of mitigation/contributions to climate change belong in the Mitigation chapter.
Ken	Moraff	143159	Text Region	12. Transportation		455	455	5	5	Attempts to move rail and highway routes away from coastal threats are stymied by local populations through whose communities the new routes would travel. Low-emission, low-noise technology could help gain acceptance (e.g., electrified passenger and freight rail routes; bypass highway routes for electric cars, buses and trucks only).	The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text. This report does not include policy discussions or recommendations for climate mitigation or adaptation.
Ken	Moraff	143160	Text Region	12. Transportation		455	455	8	10	Another impact to add is that trucks and locomotives may need to idle more due to an increased number of high-heat days to protect electronics, occupants/drivers, and cargo---unless equipped with idle reduction equipment, which also uses fuel or electricity, albeit less than main-engine idling.	This is in interesting point that is potentially an impact, but we did not finding any references supporting this statement.
Ken	Moraff	143161	Text Region	12. Transportation		455	455	25	25	Another impact to add is that rail track damage due to extreme heat might lead to locomotive idling if trains cannot proceed or be positioned where intended.	This is in interesting point that is potentially an impact, but we did not finding any references supporting this statement.
Social Science	Coordinating Committee	143358	Text Region	12. Transportation		451	451	28	29	I don't understand what it means that VMT has "doubled on transit"	To improve clarity, we changed the statistic to: "Passenger miles traveled on highways has grown approximately 250% since 1960 and 175% on commuter rail in the same time."

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Natalie	Little	143926	Whole Chapter	12. Transportation						Consider adding "wildfire" behind the word "heat" in the following locations. Chapter 12, Page 448, Line 4 Chapter 12, Page 453, Line 19 Chapter 12, Page 467, Line 31 Wildfire is expected to significantly increase with climate change. Wildfire can impact transportation and transportation systems during the event, but also afterwards with effects including changes in runoff, tree mortality and tree fall, and road and bridge damage.	Agreed. The changes were made. We also added a case study that deals with enhanced debris flows, flooding challenges as a result of wildfires, and discussion of debris flows to KM1.
Michael	MacCracken	144369	Text Region	12. Transportation		448	448	3	3	Need to choose singular or plural--e.g., make "systems" singular	The text has been adjusted to reflect this comment
Michael	MacCracken	144370	Text Region	12. Transportation		448	448	3	5	Normally, one says "temperature and precipitation"	The text has been adjusted to reflect this comment
Michael	MacCracken	144371	Text Region	12. Transportation		448	448	6	6	Climate change is going to be more than a threat--it is going to force changes to the transportation system.	Climate change will likely force changes to the transportation system, but these changes have yet to be realized in most cases. In this Key Message, we focus on the climate impact to the existing transportation system. Hopefully the material in KM3 addresses this comment -- transportation practitioners are trying to understand the systems they manage so that they can start to change the transportation system in response to climate change.
Michael	MacCracken	144372	Text Region	12. Transportation		448	448	12	12	"may" is a word that conveys no information. Authors need to choose a word from the lexicon. I'd say "are going to lead" as I don't think there is any doubt about it when said this generally.	The text was revised to incorporate this suggestion. The word "may" was replaced with "will." (Repeat of 144385
Michael	MacCracken	144373	Text Region	12. Transportation		448	448	25	26	Of particular concern in some regions like New England are the freeze/thaw cycles that are occurring and that cause road heaving, which tends to cause pavements to break apart. I'd suggest mentioning that as that problem seems to be causing significant expense in the community I visit up in New England.	Freeze-thaw cycles are added to the text.
Michael	MacCracken	144374	Text Region	12. Transportation		451	451	10	10	Change "safety" to "safely"	The text has been adjusted to reflect this comment
Michael	MacCracken	144375	Text Region	12. Transportation		452	452	8	8	Change "predicted" to "projected"	The text has been adjusted to reflect this comment
Michael	MacCracken	144376	Text Region	12. Transportation		452	452	10	10	Need to restate replacing "may" using lexicon. So, perhaps "which are likely to"	The text has been revised to incorporate this suggestion.
Michael	MacCracken	144377	Text Region	12. Transportation		452	452	11	12	I'd suggest changing "due to" to "resulting from" and I would add "heaving due to freeze/thaw cycles", which particularly affects roads in rural areas where road foundations don't of can't properly drain. Another problem from freeze/thaw cycles are increased likelihood of ice dams that can damage bridges, etc.	We have determined that the existing text is clear and accurate with respect to the commenter's first suggestion. We revised the text to incorporate the second suggestion.
Michael	MacCracken	144378	Text Region	12. Transportation		452	452	17	17	I don't understand "unique to this region"--hurricane wind speeds and precipitation are also increasing for the Caribbean region, the Southeast, Gulf Coast, etc.	The text has been revised to incorporate this suggestion.
Michael	MacCracken	144379	Text Region	12. Transportation		453	453	11	15	Sentence needs a bit of smoothing	The text has been revised to incorporate this suggestion.
Michael	MacCracken	144383	Text Region	12. Transportation		455	455	28	30	The underlying problem is, as I understand it, the expansion and weakening of the tracks, sometimes even bending the rails. I'd urge mentioning the cause of the problem and not just saying "guidelines"	Good point. The discussion of the problem with rails was added.
Michael	MacCracken	144384	Text Region	12. Transportation		455	455	31	31	This does not apply just to smaller airplanes.	The text has been revised to incorporate this suggestion.
Michael	MacCracken	144385	Text Region	12. Transportation		456	456	17	17	Need to replace "may" with word from likelihood lexicon, so say "are very likely to" or something.	The text was revised to incorporate this suggestion. The word "may" was replaced with "will." (Repeat of 144385
Michael	MacCracken	144386	Text Region	12. Transportation		456	456	26	26	Need to replace "may"--this time perhaps to "tends to"	The text has been revised to incorporate this suggestion.
Michael	MacCracken	144387	Text Region	12. Transportation		457	457	2	2	Another need to replace "may" with word from lexicon.	After consideration of this point, we have determined that the existing text is clear and accurate. The ability to redirect cargo is location-specific.
Michael	MacCracken	144388	Text Region	12. Transportation		457	457	19	19	I would suggest saying "often lacks"	Text revised to include "often" as suggested.
Michael	MacCracken	144390	Text Region	12. Transportation		471	471	8	8	remove space, so have "concerns"	The text has been adjusted to reflect this comment
David	Wojick	141688	Text Region	13. Air Quality		494	494	4	12	Here is the present text: 4 Key Message 1: Climate change is increasing the risk of adverse respiratory and cardiovascular 5 effects, including premature death, due to higher concentrations of air pollutants in many 6 parts of the United States. Increased air pollution will also have other environmental 7 consequences, including degraded visibility and damage to agricultural crops and forests. 8 Climate change is promoting weather conditions that more frequently lead to the buildup of 9 ozone and particulate matter and enhance emissions that form these pollutants. These 10 adverse impacts of climate change will compromise ongoing efforts to improve air quality by 11 controlling air pollutant emissions from human activities. Mitigating climate change will 12 also lessen its negative impact on air quality and health. Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature, as presented in NCA4 Vol. I. NCA4 Vol. I states (Ch. 4): "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." Confidence in the impact of climate change on air quality is likewise grounded in understanding of the physical and chemical processes governing pollutant formation. Volume I of the Fourth U.S. National Climate Assessment was prepared and Volume II is being prepared in compliance with Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (P.L. 106-554) and information quality guidelines issued by the Department of Commerce / National Oceanic and Atmospheric Administration pursuant to Section 515 (http://www.cio.noaa.gov/services_programs/info_quality.html). For purposes of compliance with Section 515, these documents are deemed a "highly influential scientific assessment" (HISA) and contain expert assessments of the relevant scientific literature that are peer-reviewed by the National Academy of Sciences. The report graphics follow the ISO 19115 standard which includes the necessary information to achieve reproducibility.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
David	Wojick	141689	Text Region	13. Air Quality		496	496	5	9	Here is the text: 5 Key Message 2: More frequent and severe wildfires due to climate change pose an increasing 6 risk to human health through impacts on air quality. Smoke from wildfires will impair 7 visibility in wilderness areas as well as populated regions. More prevalent wildfires are 8 likely to increase the rate at which outdoor recreational activities are canceled because of 9 the health hazard of wildfire smoke. Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models.	Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature, as presented in NCA4 Vol. I. NCA4 Vol. I states (Ch. 4): "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." Confidence in the impact of climate change on air quality is likewise grounded in understanding of the physical and chemical processes governing pollutant formation.
adrienne	sutton	141690	Text Region	13. Air Quality		496	496	33	36	Here is the present text: 33 Key Message 3: The frequency and severity of allergic illnesses, including asthma and hay fever, 34 are likely to increase as a result of a changing climate. Earlier spring arrival, warmer 35 temperatures, changes in precipitation, and higher carbon dioxide concentrations can 36 increase exposure to airborne pollen allergens. Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. That these health claims are highly questionable has already been pointed out to the USGCRP. See for example: "Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment" by Patrick J. Michaels and Paul C. "Chip" Knappenberger, Cato Institute, June 2015. https://www.cato.org/publications/public-comments/draft-impacts-climate-change-human-health-united-states-scientific Apparently the USGCRP has chosen to ignore this information.	Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature, as presented in NCA4 Vol. I. NCA4 Vol. I states (Ch. 4): "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." Confidence in the impact of climate change on allergic illnesses is likewise grounded in understanding of the physical and biological processes governing pollen production and transport in the atmosphere.
Dominique	David-Chavez	141913	Figure	13. Air Quality	13.2	489				There are two figure 13.2 in this chapter (on page 489 and 495). What are the difference of these two figures? Also, Which model does the results in figure 13.2 come from? How does the simulations be set up? Are the results from coupled runs? What are the input taken into the model? What does the initial conditions and boundary conditions look like? Is this the ozone concentration averaged over June, July and August to get the summer season ozone? Maybe this type of questions need to be addressed for figure 13.2.	The figure appears both in the chapter's Executive Summary and the chapter body; this is intentional. The details that were in the caption have been moved to the Traceable Accounts, and have been clarified to answer some of the questions raised by the commenter. For other detailed questions raised by the commenter, we are unable to provide such a level of specificity. The chapter references the original source where these questions are answered.
Nicholas	Rajkovich	141975	Text Region	13. Air Quality		492		6		It is interesting to note that actually "People who live outside of urban areas are potentially more susceptible to these health risks than those in urban areas due to differences in factors such as population density,percentage of families living in poverty, and percentage of elderly residents" - contrary to one's usual lines of thought.	After a thorough literature review, we find that the relative health risk for rural versus urban populations is largely uncertain. We have therefore deleted this sentence.
Juanita	Constible	142506	Text Region	13. Air Quality		488	488	2	3	Consider changing "respiratory and cardiovascular effects" to "respiratory and cardiovascular health effects" to improve clarity.	Per suggestion, we have revised the wording to improve clarity.
Juanita	Constible	142507	Text Region	13. Air Quality		488	488	8	8	Consider changing "enhance emissions" to "enhance natural air pollution emissions" to improve clarity.	This sentence has been deleted from the Key Message.
Juanita	Constible	142508	Text Region	13. Air Quality		488	488	10	10	Consider changing "controlling air pollutant emissions" to "controlling air pollutant and pollutant precursor emissions" so that statement also reflects the secondary process of tropospheric ozone formation from primary anthropogenic NOx and VOC emissions.	This sentence has been deleted from the Key Message.
Juanita	Constible	142509	Text Region	13. Air Quality		488	488	12	16	The direct health risks of wildfire-triggered pollution (largely from exposure to particulate matter) are not described in this key message. After "air quality" in line 13, consider adding "…, including adverse effects on respiratory and cardiovascular health due to particles in wildfire smoke"	We have revised the Key Message to emphasize the health risks of wildfire smoke. We chose not to refer more specifically to respiratory and cardiovascular health risks due to particles in wildfire smoke, because that detail is included in Key Message 1.
Juanita	Constible	142510	Text Region	13. Air Quality		488	488	16	16	Consider changing "hazard" to "hazards," because the health effects of wildfire smoke are numerous.	This sentence has been deleted from the Key Message.
Juanita	Constible	142511	Text Region	13. Air Quality		488	488	22	22	Consider changing "precursors that affect human health" to "precursors that threaten human health" to improve clarity.	The text has been modified as suggested.
Juanita	Constible	142512	Text Region	13. Air Quality		488	488	29	29	Consider adding "…, including biogenic compounds like isoprene that are emitted from certain plants and trees" to the sentence concluding with "influenced by temperature" to improve clarity.	After consideration of this point, we have determined that the existing text is clear and accurate. There are potential interactions between climate change and other sources of emissions besides biogenics, including increased evaporative emissions and changes in power plant emissions from increased electricity demands for air conditioning.
Juanita	Constible	142513	Text Region	13. Air Quality		489	489	3	3	Consider changing "produced" to "produced by plants" to improve clarity.	The text has been modified as suggested by the commenter.
Juanita	Constible	142514	Text Region	13. Air Quality		489	489	7	9	The words "contributor" and "precursor" are used inconsistently with respect to particle formation. Consider using the phrase "precursor (contributor)" consistently throughout the chapter to improve consistency and clarity.	We have improved the consistency of our usage, now referring to "precursors" throughout the chapter. The term "contributor" has been removed, and we now refer to important "components" of particulate matter (e.g., sulfate aerosols).
Juanita	Constible	142515	Text Region	13. Air Quality		489	489	15	16	The "higher scenario" and "lower scenario" are not explained---consider changing to "higher GHG scenario" and "lower GHG scenario." Consider changing "compared with" to "compared to" to improve clarity.	As discussed in the "Scenario Products" subsection of the Front Matter, the terms "higher scenario" and "lower scenario" are used consistently throughout the entire NCA4 Volume 2 to refer to RCP8.5 and RCP4.5, respectively. After careful consideration, we believe "compared with" is clear and grammatically correct.
Juanita	Constible	142516	Text Region	13. Air Quality		489	489	16	16	Consider beginning this sentence with "Under RCP8.5, by 2090,…" rather than mentioning the year at the end of this sentence to improve clarity.	Per suggestion we have revised the wording to improve clarity.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142517	Text Region	13. Air Quality		489	489	20	20	Add references here since "studies" (plural) are cited. We suggest: Chen, J., J. Avise, B. Lamb, E. Salathl©, C. Mass, A. Guenther, C. Wiedinmyer, J.-F. Lamarque, S. O'Neill, and D. McKenzie. 2009. "The Effects of Global Changes upon Regional Ozone Pollution in the United States." Atmospheric Chemistry and Physics 9 (4): 1125âĐ41, Hogrefe, C., B. Lynn, K. Civerolo, J. Y. Ku, J. Rosenthal, C. Rosenzweig, R. Goldberg, S. Gaffin, K. Knowlton, and P. L. Kinney. 2004. "Simulating Changes in Regional Air Pollution over the Eastern United States due to Changes in Global and Regional Climate and Emissions." Journal of Geophysical Research 109 (D22): D22301. Racherla, P. N., and P. J. Adams. 2006. "Sensitivity of Global Tropospheric Ozone and Fine Particulate Matter Concentrations to Climate Change." J. Geophys. Res 111: D24103. West, J. Jason, Sophie Szopa, and Didier A. Hauglustaine. 2007. "Human Mortality Effects of Future Concentrations of Tropospheric Ozone." Comptes Rendus Geoscience 339 (11-12): 775âĐ83. doi:10.1016/j.crte.2007.08.005.	We appreciate the suggested additional references. The underlying statement regarding variation in results across models and the associated references has been moved from the caption of the figure to the Traceable Accounts.
Juanita	Constible	142518	Text Region	13. Air Quality		490	490	16	16	"These parts of the nation" is not clear. Consider changing this sentence to "Areas that experience excessive periods of drought and higher temperatures will experience an increasing frequency of wildfires and more windblown dust from soils."	Per suggestion, we have revised the sentence to improve clarity.
Juanita	Constible	142519	Text Region	13. Air Quality		490	490	20	21	Consider clarifying "alter the demand for heating and cooling of indoor spaces" to "alter the demand for heating and cooling of indoor spaces due to changes in ambient temperatures."	Per suggestion, we have revised the sentence to improve clarity.
Juanita	Constible	142520	Text Region	13. Air Quality		490	490	24	24	Consider revising "worsen the impact of pollen" to "worsen the health burden due to pollen exposure" to clarify this statement.	Per suggestion, we have revised the sentence to improve clarity.
Juanita	Constible	142521	Text Region	13. Air Quality		490	490	24	25	The phrase "Despite the potential regional variability over multiple climate impacts..." is not clear. Consider revising this to "Despite potential variability in the regional impacts of climate change..."	Per suggestion, we have revised the sentence to improve clarity.
Juanita	Constible	142522	Text Region	13. Air Quality		490	490	32	32	Consider adding "human (anthropogenic) and natural (biogenic)" before "emissions" to demonstrate the complexity of air pollutant emissions.	After consideration of this point, we have determined that the existing text is clear and accurate. The suggested modification would detract from the readability of the text.
Juanita	Constible	142523	Text Region	13. Air Quality		490	490	32	32	Change "benefits" to "co-benefits" for consistency with Chapter 13, page 489, line 8.	The text has been modified as suggested.
Juanita	Constible	142524	Text Region	13. Air Quality		491	491	3	3	Use of the phrase "Earth System" followed by processes that "create, remove, and transport air pollution" makes this sentence hard to follow. Consider changing "Earth System" to "coupled human-environment systems."	We agree that the caption to Figure 13.1 was complex and difficult to follow, and have simplified it for clarity.
Juanita	Constible	142525	Text Region	13. Air Quality		491	491	7	7	The "emission(s) from trees" labeled in the figure (specifically, biogenic VOCs) are also associated with O3 formation in the troposphere---this association is not made in the figure. Consider adding a grey arrow that connects these biogenic emissions to O3.	To clarify, we have broadened the grey arrow showing emissions of ozone precusors so that it encompasses plants/trees. The "emission from trees" refers to the process affected by climate change that will then influence air quality.
Juanita	Constible	142526	Text Region	13. Air Quality		492	492	6	8	While this statement may be true, other studies have shown that urban populations experience worse health effects than those in rural areas for the same dose of PM2.5 pollution. For example, a 2013 study showed that "... the effect of PM2.5 on life expectancy is greatest in the most urban counties." [Correia, A. W. et al. Effect of Air Pollution Control on Life Expectancy in the United States. Epidemiology 24, 23--31 (2013).] We suggest revising this statement to, "PM2.5 health impacts vary between urban and rural areas for a number of reasons, including differences in particle composition. While some evidence indicates that particles present in ambient urban air are more damaging (Correia et al. 2013), people who live outside urban areas are potentially more susceptible to these health risks than those in urban areas due to differences in factors such as population density, percentage of families living in poverty, and percentage of elderly residents (Madrigano et al. 2015)."	After a thorough literature review, we find that the relative health risk for rural versus urban populations is largely uncertain. We have therefore deleted this sentence.
Juanita	Constible	142527	Text Region	13. Air Quality		492	492	31	32	This sentence cites the 2015 Design Value data from U.S. EPA, which indicates areas that exceed the applicable National Ambient Air Quality Standard (NAAQS) for ozone. The NAAQS level is not necessarily equal to the "healthy level" listed here. In fact, some studies have shown health risks associated with ozone exposures below the current NAAQS for zone. For example, the study below found "significant evidence of adverse effects related to exposure to PM2.5 and ozone at concentrations below current national standards." Di, Qian, et al. "Air pollution and mortality in the Medicare population." New England Journal of Medicine 376.26 (2017): 2513-2522. We suggest that you replace the phrase "values that exceeded healthy levels" to "values that exceeded the National Ambient Air Quality Standard (NAAQS) for ozone that is set to protect human health and the environment."	The text has been modified to incorporate this suggestion.
Juanita	Constible	142528	Text Region	13. Air Quality		493	493	30	32	We suggest including several additional references. For other studies projecting an increasing frequency of stagnant air masses due to climate change: Jacob, D. J., and D. A. Winner. 2009. "Effect of Climate Change on Air Quality." Atmospheric Environment 43 (1): 51--63. Mickley, L. J., D. J. Jacob, B. D. Field, and D. Rind. 2004. "Effects of Future Climate Change on Regional Air Pollution Episodes in the United States." Geophysical Research Letters 31 (24): L24103. Leung, L. Ruby. 2005. "Potential Regional Climate Change and Implications to U.S. Air Quality." Geophysical Research Letters 32 (16). doi:10.1029/2005GL022911. http://www.agu.org/pubs/crossref/2005/2005GL022911.shtml. For studies on secondary PM formed from biogenics precursor emissions: Kinney, Patrick L. 2008. "Climate Change, Air Quality, and Human Health." American Journal of Preventive Medicine 35 (5): 459--67. doi:10.1016/j.amepre.2008.08.025. Lam, Y. F., J. S. Fu, S. Wu, and L. J. Mickley. 2011. "Impacts of Future Climate Change and Effects of Biogenic Emissions on Surface Ozone and Particulate Matter Concentrations in the United States." Atmospheric Chemistry and Physics 11 (10): 4789--4806. doi:10.5194/acp-11-4789-2011.	The suggested references have been added to the paragraph as appropriate.
Juanita	Constible	142529	Text Region	13. Air Quality		494	494	1	1	An appropriate reference to add here is: Ebi, Kristie L., and Glenn McGregor. 2008. "Climate Change, Tropospheric Ozone and Particulate Matter, and Health Impacts." Environmental Health Perspectives 116 (11): 1449--55. doi:10.1289/ehp.11463.	After careful consideration, the authors have determined that the indicated sentence does not require further references. However, the suggested reference has been added to the text in the Ozone subsection of the State of the Sector section.
Juanita	Constible	142530	Text Region	13. Air Quality		494	494	29	30	This statement is inconsistent with the uncertainty mentioned on page 493, line 38 (as well as other statements in the paragraph from line 31-38). It should be revised to say, "Without considering the effects of climate change, concentrations of PM2.5 in the United States..."	The text has been modified to incorporate this suggestion.
Juanita	Constible	142531	Text Region	13. Air Quality		495	495	1	9	This paragraph should mention that the modeled climate impacts on ozone are quantifying the effects of biogenic precursors and temperature (but not changes in human emissions). Also, to improve clarity, the figure titles should read "Lower Emissions Scenario" rather than just "Lower Scenario."	The text has been modified as suggested to clarify that human emissions of ozone precursors are held constant in this study. As discussed in the "Scenario Products" subsection of the Front Matter, the terms "higher scenario" and "lower scenario" are used consistently throughout the entire NCA4 Volume 2 to refer to RCP8.5 and RCP4.5, respectively. Anthropogenic emissions of air pollutants are the same in all panels of Figure 13.2.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142532	Text Region	13. Air Quality		496	496	2	2	Add reference here since "studies" (plural) are cited. We suggest: Chen, J., J. Avise, B. Lamb, E. Salathl©, C. Mass, A. Guenther, C. Wiedinmyer, J.-F. Lamarque, S. O'Neill, and D. McKenzie. 2009. "The Effects of Global Changes upon Regional Ozone Pollution in the United States." Atmospheric Chemistry and Physics 9 (4): 1125âÐ41. Hogrefe, C., B. Lynn, K. Civerolo, J. Y. Ku, J. Rosenthal, C. Rosenzweig, R. Goldberg, S. Gaffin, K. Knowlton, and P. L. Kinney. 2004. "Simulating Changes in Regional Air Pollution over the Eastern United States due to Changes in Global and Regional Climate and Emissions." Journal of Geophysical Research 109 (D22): D22301. Racherla, P. N., and P. J. Adams. 2006. "Sensitivity of Global Tropospheric Ozone and Fine Particulate Matter Concentrations to Climate Change." J. Geophys. Res 111: D24103. West, J. Jason, Sophie Szopa, and Didier A. Hauglustaine. 2007. "Human Mortality Effects of Future Concentrations of Tropospheric Ozone." Comptes Rendus Geoscience 339 (11-12): 775âÐ83. doi:10.1016/j.crte.2007.08.005.	We have added the suggested references to the chapter.
Juanita	Constible	142533	Text Region	13. Air Quality		498	498	5	5	Need to distinguish here between GHG mitigation efforts that unintentionally result in higher ambient ozone concentrations (see Grabow et. al, below) and those that affect ozone and PM precursors. Grabow, Maggie L., et al. "Air quality and exercise-related health benefits from reduced car travel in the midwestern United States." Environmental health perspectives 120.1 (2012): 68.	After consideration of this point, we have determined that the existing text is clear and accurate. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter.
Juanita	Constible	142534	Text Region	13. Air Quality		498	498	17	21	This statement is unclear and needs revision. We suggest, "Additionally, PM influences climate on local to global scales by affecting the radiation balance of the Earth via albedo effects (USGCRP 2017, Fiore et al. 2015), so controlling emissions of PM and its precursors will not only yield direct human health benefits via reduced exposure but also by avoiding or minimizing local meteorological conditions that lead to a buildup of pollutants (Xing et al. 2016)."	After consideration of this point, we have determined that the existing text is clear and accurate, and that the suggested phrase "via albedo effects" is unnecessarily technical. The text has not been modified.
Juanita	Constible	142535	Text Region	13. Air Quality		499	499	33	34	This point is key and should be made more clear in the main text (specifically, page 494, line 18).	Thank you for this suggestion. We have incorporated the suggested change.
Ken	Moraff	143162	Text Region	13. Air Quality		500	500	32	37	Key Message 2: Increased Impacts of Wildfires should include a discussion of wildfire enhanced ozone production. The increased wildfires will lead to increased downwind ozone concentrations. This is a concern for the Northeastern Region. [Jaffe, D., Chand, D., Hafner, W., Westerling, A., Spracklen, D., 2008. Influence of fires on O3 concentrations in the western US. Environmental Science and Technology, 42, 5885-5891. Jaffe, D.A., Wigder, N.L., 2012. Ozone production from wildfires: A critical review. Atmospheric Environment, 51, 1-10. Jaffe, D.A., Wigder, N., Downey, N., Pfister, G., Boynard, A., Reid, S.B., 2013. Impact of wildfires on ozone exceptional events in the western US. Environmental Science & Technology, 47, 11065-11072. Jiang, X., Wiedinmyer, C., Carlton, A.G., 2012. Aerosols from fires: An examination of the effects on ozone photochemistry in the Western United States. Environmental Science & Technology, 46, 11878-11886.] - Possible case study: http://www.ct.gov/deep/cwp/view.asp?a=2684&Q=591378 https://www.epa.gov/air-quality-analysis/exceptional-events-documents-oz… https://www.epa.gov/air-quality-analysis/exceptional-events-documents-oz…	The text has been modified to include wildfire impacts on ozone formation and to include the suggested references.
Ken	Moraff	143163	Whole Page	13. Air Quality		498				Add another key message that extreme weather impacts include increased risk of flooding induced mold, and contaminants as well as increased PM2.5 from wood stove and emergency generator use when there is a electric power interruption.	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter.
Ken	Moraff	143164	Text Region	13. Air Quality		493	493	31	31	Add in that extreme weather events can lead to power outages and the increase use of wood stoves and emergency generators resulting in increased particulate emissions.	The text has been modified to state that human-caused emissions can also change in response to weather events.
Ken	Moraff	143165	Text Region	13. Air Quality		488	488	24	24	Inequitable distribution of impacts will cause more harm to people already vulnerable to air quality impacts.	We agree, and state in the Air Pollution Health Effects subsection that certain population subgroups are more vulnerable to air pollution health impacts.
Ken	Moraff	143166	Text Region	13. Air Quality		492	492	18	18	A sentence could be added also to state that air conditioning use has a positive feedback relationship with greenhouse gas emissions. That is, demand for A/C may increase energy use consequently increase GHG emissions, and so on. For each degree C increase, there is a corresponding 2-4% increase in residential electricity consumption from A/C. [Sailor and Pavlova, 2003, Energy 9(28), "Air conditioning market saturation and long-term response of residential cooling energy demand to climate change", pp.941-951, https://doi.org/10.1016/S0360-5442(03)00033-1.]	After consideration of this point, we have determined that the existing text is clear and accurate. The additional GHG emissions associated with increased air conditioning use is outside the scope of this chapter, which is focused on Air Quality.
Ken	Moraff	143167	Text Region	13. Air Quality		492	492	31	32	There are no "healthy" levels of ozone. That is, breathing ozone at any level contributes negatively to an individual's health. Rather, EPA sets levels for ozone that are protective of health. For greater accuracy, change the language from "healthy levels" to the phrase "levels determined by EPA to be protective of public health".	The text has been modified to incorporate this suggestion.
Ken	Moraff	143168	Text Region	13. Air Quality		492	492	33	33	EPA regulations are primary drivers for emission reductions, however market and state/regional forces are also primary drivers for the declining emissions of ozone precursors. Therefore, add the words "in part" after "Due".	The text has been modified to incorporate this suggestion.
Ken	Moraff	143169	Whole Chapter	13. Air Quality						In general, short of a stand alone section for Indoor Air, we should recognize the connection between climate change, human health and the indoor environment. There are certainly broad categories where this nexus can be examined including this chapter on Air Quality. It should be added that individuals spend the majority of their time indoors which presents opportunities for chronic exposures to indoor air pollutants. The quality of indoor air is impacted by air pollutants that migrate in from the outdoors. Additionally, indoor air quality is further compromised by additional contaminants from the occupants' behaviors as well as other indoor emission sources.	The text has been modified to incorporate this suggestion. We have added a paragraph on indoor air to the State of the Sector section.
Ken	Moraff	143170	Whole Chapter	13. Air Quality						Could a schematic be added that includes the migration of outdoor air to the indoor environment? It will make the case for the showing the important connections between air pollution, the built environment and human health. See schematic on page 491, Figure 13.1, entitled "Climate Change Impacts on Air Quality."	We appreciate the suggestion, but Figure 13.1 is already complex. While it is certainly true that people spend the majority of their time indoors and there are important linkages between air pollution, the built environment, and human health, the evidence for a specific and quantifiable impact of climate change on indoor air quality is lacking. Accordingly, the author team has decided not to include a depiction of outdoor air migrating to the indoor environment.
David	Wojick	143193	Whole Chapter	13. Air Quality						Key Message 1 applies to human health impacts of climate change Key Message 4 also applies to human health impacts, pointing to emission source mitigation - it's not obvious from the wording of these two KM points that these are clearly different key messages	Both Key Message 1 and Key Message 4 have been substantially revised. Key Message 4 now reads "Many emission sources of greenhouse gases also emit air pollutants that harm human health. Addressing these common emission sources will both mitigate climate change and immediately improve air quality, thus benefiting human health."
Mark	Muyskens	143195	Text Region	13. Air Quality		489	489	11	12	Current text says ‰Û÷Mitigation strategies‰Û_can do more‰Û_‰ÛÒ ; my question is, more than what? I assume it is more than focus only onâÊGHG mitigation. I think this sentence attempts to make an important point, and it can be made clearer.	This sentence has been deleted.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Elizabeth	Carlton	143196	Text Region	13. Air Quality		492	492	28	30	I think it is extraordinarily important to highlight instances where regulatory controls have positive impact, therefore, I suggest this particular passage will be significantly strengthened by including at least one specific example of improvement, beside the references to supporting sources.	Per the suggestion, we have added a sentence to highlight that ozone in the United States has decreased by 22% over the 1990-2016 time period due to reductions in precursor emissions (US EPA2017).
Social Science	Coordinating Committee	143225	Text Region	13. Air Quality		488	488	21	24	change 'emit particles and ozone precursors' to 'emit particles and ozone and particulate matter precursors'. Power plants, autos, and other GHG sources directly emit particles, but also emit SO2, NOx, and VOCs which react in the atmosphere to create secondarily formed particles. Also, SO2 and NOx emissions contribute to ambient SO2 and NO2 that have direct health effects, in addition to contributing to ozone and PM formation.	These details have been deleted from the Key Message.
Social Science	Coordinating Committee	143226	Text Region	13. Air Quality		492	492	6	9	This is an odd and counterintuitive statement that needs further referencing or explanation. EPA has not identified people outside of urban areas as a specific at-risk population for ozone or PM. The statement seems to be based on one study in the Eastern U.S. (and only 91 counties) that looked only at ozone, and that used interpolation to county centroids to estimate exposure. In non-urban counties, there are fewer ozone monitors, so the exposure measures are more likely to have additional error relative to urban counties, making comparisons between urban and non-urban counties suspect, and in fact the CIs for the urban and non-urban risk estimates overlap. Given the lack of strong evidence, I would take out this statement. Even if you choose to leave this statement in as it relates to ozone (and I don't recommend this), you need to make it clear that the evidence is just for ozone, and not for PM.	After a thorough literature review, we find that the relative health risk for rural versus urban populations is largely uncertain. We have therefore deleted this sentence.
Social Science	Coordinating Committee	143227	Text Region	13. Air Quality		496	496	7	9	The statement is made that more prevalent wildfires are likely to increase the rate at which outdoor recreational activities are canceled. Is there any evidence to back this up? None is provided in the following text or in the traceable accounts. Behaviroal responses to changes in the environment are complex -- activities might be rescheduled rather than cancelled, and more accurate information on smoke events might allow for some mitigation of negative impacts through changes in timing of activities. Not that these changes are without cost, but the statement should be reflective of the alternative possibilities.	The Key Message has been modified to be more focused on the health effects of wildfire smoke. For the point about outdoor recreational activities, we now refer to the Northwest chapter.
Social Science	Coordinating Committee	143228	Text Region	13. Air Quality		497	497	29	30	change 'emit particles and ozone precursors' to 'emit particles and ozone and particulate matter precursors'. Power plants, autos, and other GHG sources directly emit particles, but also emit SO2, NOx, and VOCs which react in the atmosphere to create secondarily formed particles. Also, SO2 and NOx emissions contribute to ambient SO2 and NO2 that have direct health effects, in addition to contributing to ozone and PM formation.	To keep the message accessible to a broad audience, the text of the Key Message has been modified to refer more generally to "air pollutants".
Social Science	Coordinating Committee	143229	Whole Chapter	13. Air Quality						The human health chapter talks about the role of adaptation in mitigating the health impacts of climate change. This chapter talks about how emissions reduction policies can reduce air quality impacts from climate change, but does not mention how other adaptation policies, e.g. air quality response plans, greater availability of air quality information to inform planning of outdoor activities, etc. could help to mitigate air pollution related health risks. For consistency, the potential for adaptation to reduce air quality related risks should be discussed, along with the potential costs and impacts of such adaptation measures. I would recommend provding some language in the chapter that links to chapter 14.	We have added two sentences to the text following Key Message 1 discussing reduction of air quality health impacts via adaptation measures and referencing Ch. 14.
Jun	Zhang	143604	Whole Chapter	13. Air Quality						This chapter is generally well-structured. It has discussed 4 different aspects of climate change impact on air quality in United States which includes: Increasing Health Risks from Air Pollution; Increased Impacts of Wildfires; Increases in Airborne Allergen Exposure; Air Quality Benefits of Reduced Emissions. However, those four aspects are based on local emissions and changes. The long-range transport from other countries and continents is not taken into account. Climate change is projected to alter the general circulation in the future, which could promote air mass exchange with other counties. This could further influence the air quality in the United States. It would be better if one more section is added to focus on the long-range transport from other regions.	For ozone, the authors agree that long-range transport of ozone and its precursors influences US ozone air quality. We address this point by stating: "Besides being affected by climate change, future ozone levels in the United States will also be affected greatly by domestic emissions of ozone precursors, as well as by international emissions of ozone precursors and global methane levels." We have also added the following sentence to highlight the influence of long-range transport on ozone: "Additionally, ozone concentrations in one region may be influenced by the transport of either precursors or ozone itself from another region (Fiore et al., 2009; TFHTAP, 2010)". Global multi-model studies suggest that the impact of climate change on long-range transport of ozone is predominantly via changes in emissions and chemistry (e.g, temperature, H2O) rather than climate-related changes in transport (Doherty et al., 2013). Given that there are uncertainties in the effect of climate change on large-scale atmospheric circulation and the resulting changes in ozone, the author team has agreed not to add another section on the long-range transport of ozone to the United States.
Jun	Zhang	143622	Text Region	13. Air Quality		493	494	5	1	This section focuses on the the impact of climate change on the particulate matter. Since there is a future projection plot in the ozone air quality section, adding a figure of projected change for PM would be more obvious and persuasive to see its future change, if any projections are currently available.	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
John	Fleming	143637	Whole Chapter	13. Air Quality						In the "Air Quality" chapter, the co-benefits of reducing greenhouse gas emissions are discussed. These co-benefits include slowing of the progression of global warming and reducing the risks to human health from air pollution. These benefits occur together because, as discussed in the chapter, many constituents emitted with greenhouse gases contribute to ozone and particulate matter formation, so reducing greenhouse gas emissions reduces these as well. However, there is a manner in which co-benefits could manifest that has not been discussed. Volatile organic compounds (VOCs) are primarily discussed in the chapter only in terms of their contribution to the formation of ozone, where ozone is a significant air pollutant. However, this discounts the role of VOCs as air pollutants themselves. For instance, benzene is a known human carcinogen, while the other BTEX compounds (toluene, ethylbenzene, xylene) have varying effects, including damage to the brain and nervous system, kidneys, and liver. Symptoms of exposure include fatigue, drowsiness, headaches, dizziness, confusion, eye and respiratory tract irritation, and loss of muscle coordination (Leusch, F., & Bartkow, M., A short primer on benzene, toluene, ethylbenzene and xylenes in the environment and in hydraulic fracturing fluids, 189 Smart Water Res Centre 1 (2010)). Other hazardous air pollutants such as naphthalene, formaldehyde, and 1,3-butadiene are all classified as carcinogens or potential carcinogens, likewise affecting the respiratory, reproductive, and cardiovascular systems (Agency for Toxic Substances and Disease Registry, November 4, ATSDR A-Z Index (2015)). Such VOCs are directly associated with emissions from refineries and often present in oil field operations, and in addition to contributing to ozone, pose direct health risks in surrounding areas. The co-benefits from shutting down fossil fuel infrastructure such as refineries would be halting greenhouse gas emissions, limiting the formation of ozone and PM, and preventing the spread of harmful VOCs into surrounding communities. Several studies have linked poor health outcomes to proximity to refineries. A 2013 study in Georgia found that non-Hodgkin lymphoma incidence was significantly higher the closer people lived to benzene release sites such as refineries (Bulka, C. et al., Residence proximity to benzene release sites is associated with increased incidence of non‰Û¤Hodgkin lymphoma, 119 Cancer 3309 (2013)). A 2014 study of a 2010 flaring incident at a BP refinery in Texas City, Texas found that individuals exposed to resulting emissions were at higher risk of developing liver and blood-related disorders (D‰Û¤Andrea, M. A., & Reddy, G. K, Hematological and hepatic alterations in nonsmoking residents exposed to benzene following a flaring incident at the British	The text has been modified to incorporate this suggestion. We now state: Specifically, mitigating GHGs can lower emissions of PM, ozone and PM precursors, and other hazardous pollutants, reducing the risks to human health from air pollution (Shindell et al. 2012; West et al. 2013; Rao et al. 2016; Zhang et al. 2016; Thompson et al. 2014; Gao et al. 2018).
Michael	MacCracken	144391	Text Region	13. Air Quality		494	494	4	4	Is it just the risk that is increasing, or also the incidence? If the latter, this needs to be made clear.	The text of the Key Message has been modified to state that worsened air pollution would increase the incidence of those health impacts.
Michael	MacCracken	144392	Text Region	13. Air Quality		494	494	13	14	Does this sentence not need to say something about its assumption of future vehicle emissions? If the US goes electric, emissions should go down enough that this statement would not be true. So, should there not be a phrase something like: "If US vehicle emissions continue on their current path, there is high confidence …"	The text has been modified to incorporate this suggestion. Specifically, we begin the text of this section with "Unless offset by additional reductions of ozone precursor emissions …"
Michael	MacCracken	144393	Text Region	13. Air Quality		496	496	14	14	I'd suggest saying "from 1984 to 2015"	The text has been modified to incorporate this suggestion.
Michael	MacCracken	144394	Text Region	13. Air Quality		498	498	14	14	Likely better to say "ozone concentrations"	The text has been modified as suggested.
Michael	MacCracken	144395	Whole Chapter	13. Air Quality						Overall, a very well done chapter	We greatly appreciate the reviewer's comment about the report and hope that the chapter is useful.
Valory	Wangler	140874	Figure	14. Human Health	2	518				This is not a very compelling figure to have in the executive summary. First, it talks about hospitals, but nowhere in the text of the summary is there mention of hospitals. So why is the figure on hospitals here? Second, it is from an old source, well before NCA3 came out and of course before the USGCRP health report. This isn't necessarily bad on it's own but it certainly doesn't convey that there is any new information or literature that has come out in the last five years. But of course there has been more recent literature that has come out- there was a presentation at this year's APHA meeting looking at hospitals across the country in the flood plain. This figure also does not incorporate FEMA's 2016 proposal to rewrite the 100 year floodplain standard. There is also, of course, all the post-Sandy literature, some of it specific to New York (http://www.ingentaconnect.com/content/wef/wefproc/2014/00002014/00000011… or https://www.cambridge.org/core/journals/prehospital-and-disaster-medicin…). There is a 2016 report on hospitals in the floodplain in Miami-Dade (with a figure) that would be more recent than this figure (https://static1.squarespace.com/static/561328cee4b0f47fe04a43d3/t/57193c…) and a 2017 assessment of climate impacts on hospitals in LA (https://www.cambridge.org/core/journals/prehospital-and-disaster-medicin…). With so much more recent literature on this topic, showing such an old figure implies that the authors did not review current literature, but just 'wrote what they knew'. Hopefully this is not the case, but it doesn't present well. Thirdly, this figure does not convey any sense of urgency. The figure shows that there are many many more hospitals in New York that are not in the floodplain and are totally fine. Is it the author's intent to tell us not to worry about hospitals in the floodplain? Furthermore, the few hospitals that have tiny little red dots are primarily in wealthy parts of the city, which seems to go against your Key Message #1. Overall, it is difficult to understand why the authors chose this, of all figures, to represent their chapter. It seems like a missed opportunity.	Figure replaced with another example; reference to Adelaine et al. 2017 was added to text.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Valory	Wangler	140875	Figure	14. Human Health	1	518				Delete this drawing. This is badly drawn, does not present any information, is not appropriate for the intended audience, and has no valid citation. The figure is not about climate change, but is trying to say something about response to weather. There are no values on the x or y axis. There is no explanation of what disease is being shown. The caption itself says this is a "stylized" epidemic curve. It is inappropriate to take up so much space in this chapter with a diagram filled with jargon about public health/outbreak concerns in a climate assessment. The boxes on the left have meaningless text in them and point (randomly?) to other boxes with meaningless text in them. How do those strange boxes "show the opportunity for disease prevention when moving from an approach of surveillance and response to prediction and prevention"? The authors do not explain the meaning of or difference between surveillance, response, prediction, or prevention. What is the meaning of -120 days (the only number in this drawing) and the poorly drawn black marks under the poorly drawn gray arrows? This entire figure could be summed up in a sentence that says "Early warnings can improve response times" rather than an entire text box and made-up (stylized) image about prediction in a climate assessment. Furthermore, that simple sentence is all that needs to be conveyed in a chapter on climate impacts to health. Any more details on predictive response would be more appropriate in other publications; here it only opens up the vulnerability of confusing weather and predictions with climate and projections. The authors were tasked with assessing the literature, but instead this "figure" is cited to personal communication. This figure is in stark contrast to the well-written section on adaptation on page 525 and the first half of 526, and weakens the Key Message #2. This seems to be a figure that the authors created for themselves, rather than for the consumers of this assessment. Delete entirely. There are much better figures available that represent climate impacts on health or economics. Even deleting this figure and instead using the table or pathway figure from the 2016 climate and health assessment in key message #1 section would be an improvement. Also, there are several quantitative evaluations of health related impacts in the mitigation key message (#3) that represent new information since the 2016 report, so a figure or maps of those impacts would be more useful to this chapter's audience.	Figure was removed and the concepts explained in the text.
Holly	Mallinson	141634	Figure	14. Human Health	14.1	518				On page 527, Figure 14.1 shows the impact that an early response can have on limiting the severity of an epidemic. However, in Figure 14.1, neither the x-axis (Time) nor the y-axis (Number of Cases) is quantified. The decreased time and number of cases is merely a proportionality when compared to those seen in a typical response. If it is possible to show how many days and how many cases are spared with an early response, I think that would be valuable information to present.	Figure was removed and the concepts explained in the text.
Holly	Mallinson	141635	Text Region	14. Human Health		518		16		"Every American Is Vulnerable to the Health Risks of Climate Change" does not accurately summarize Key Message 1, which, from my reading, is that climate change disproportionately affects vulnerable communities.	This is a statement of the current impacts of climate change on the health of Americans. The fact that some are more vulnerable is stated later in the paragraph.
Holly	Mallinson	141636	Text Region	14. Human Health		518	520	2	8	In 14.1 State of the Sector, the first half (page 520 lines 2-8) are nearly identical to the Summary Overview (page 518, lines 19-38 and page 519 1-8). More detailed information that builds off what‰Ûªs given in the Summary Overview could be put in the State of the Sector section instead.	Paragraph deleted.
Rose	Miller	141637	Text Region	14. Human Health		518	524	5	21	The inclusion of a Mental Health section (page 524 lines 5-21) was great as this isn‰Ûªt widely addressed or thought of when thinking of climate change despite being an essential part of everyday life.	No response necessary.
David	Wojick	141695	Text Region	14. Human Health		518	526	11	13	In the Adapting to the Health Risks of Climate Change section (page 525 lines 11-38 and page 526 lines 1-13) some additional examples of what has been recently done by cities and the results from this could be beneficial to see, even if just preliminary evidence.	This is an excellent suggestion for the adaptation chapter.
David	Wojick	141696	Text Region	14. Human Health		518	528	6	17	The economic benefits part of the Health and Economic Benefits of Reducing Greenhouse Gas Emissions section (page 528 lines 6-17) is scant and doesn‰Ûªt provide any estimates of how much money could be saved in the future. Although it is cited that there are a lot of costs that are difficult to quantify, citing how much money could be saved in just one aspect such as medical expenses could help provide more context and sense of magnitude and severity.	This is an introductory paragraph. Detailed numbers follow.
Allison	Crimmins	142184	Text Region	14. Human Health		518	520	17	23	The present text is this: 17 Key Message 1: Although every American is vulnerable to the health impacts associated with 18 climate change, risks are not experienced equally, with older adults, children, low-income 19 communities, and communities of color among the population groups that are particularly 20 vulnerable. Health risks arise from exposure to heatwaves, floods, droughts, and other 21 extreme events; from vector-, food- and water-borne infectious diseases; from changes in the 22 quality and safety of food and water; and from stresses to mental health and well-being. The 23 risks are projected to increase with additional climate change. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	The authors disagree with the premise and conclusions of this comment. The text and traceable accounts describe specifically the level of certainty with the key messages, and conclusions based on future models are not stated as physical facts but instead qualified appropriately with levels of uncertainty. The peer-reviewed studies and methods supporting this finding can be found in the chapter text and the associated traceable account for this key message. For responses to public comments made by Paul Knappenberger on the Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessmen, see https://www.globalchange.gov/health-assessment. The transparent process leading to this report is documented on the USGCRP website and includeds numerous avenues for the public to engage. All sources were assessed to meet the guidance to authors on Information Quality. This guidance assures that sources comply with Information Quality Act requirements for (1) utility, (2) transparency and traceability, (3) objectivity, and (4) integrity and security. In addition, the entire report has been peer reviewed by the National Academies of Sciences.
Allison	Crimmins	142185	Text Region	14. Human Health		518	528	7	10	The present text says this: 7 Key Message 3: By the end of this century, reducing the severity of climate change by reducing 8 greenhouse gas emissions could save thousands of lives each year and produce hundreds of 9 billions of dollars in health-related economic benefits each year, compared with following a 10 pathway of higher greenhouse gas emissions. Comment: This entire message is merely a series of speculative conjectures falsely stated as established physical facts. These conjectures appear to be based primarily on the use of questionable computer models. That these health claims are highly questionable has already been pointed out to the USGCRP. See for example: "Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment" by Patrick J. Michaels and Paul C. "Chip" Knappenberger, Cato Institute, June 2015. https://www.cato.org/publications/public-comments/draft-impacts-climate-change-human-health-united-states-scientific Apparently the USGCRP has chosen to ignore this information.	The authors disagree with the premise and conclusions of this comment. The text and traceable accounts describe specifically the level of certainty with the key messages, and conclusions based on future models are not stated as physical facts but instead qualified appropriately with levels of uncertainty. The peer-reviewed studies and methods supporting this finding can be found in the chapter text and the associated traceable account for this key message. For responses to public comments made by Paul Knappenberger on the Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessmen, see https://www.globalchange.gov/health-assessment. The transparent process leading to this report is documented on the USGCRP website and includeds numerous avenues for the public to engage. All sources were assessed to meet the guidance to authors on Information Quality. This guidance assures that sources comply with Information Quality Act requirements for (1) utility, (2) transparency and traceability, (3) objectivity, and (4) integrity and security. In addition, the entire report has been peer reviewed by the National Academies of Sciences.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142186	Text Region	14. Human Health		518	518	3	6	This first sentence is long and awkward. It would be better either split into two sentences (cut after the word "equally") or at least use a semi-colon. It is also curious that there are only 4 vulnerable groups listed here, when the USGCRP climate and health assessment lists several more. Why are these four called out in this key message? It may be better to not try to list all the groups in the key message and just delete everything after the word "equally". It also seemed strange that this was the first sentence of the first key message (so must be important!), but the underlying chapter barely talked about vulnerable population groups beyond two paragraphs at the bottom of page 524. Half of the first paragraph just listed all the vulnerable groups and said they are vulnerable. The rest of this section (pg 524-525) is vague and overly general statements with no clear point and no specifics. To warrant this is a key message, more specific treatment and references are needed in the chapter. It is not enough to just note that 'these groups are at risk' and 'more research would promote understanding'. Suggested citations have been provided in other comments. This seemed like a missed opportunity to discuss social inequities in a way that other chapters do not have space to do. Suggest reviewing the Coastal chapter, which had more information on social inequity than this chapter.	The sentence was split as suggested. The four groups listed are particularly vulnerable, as noted throughout the chapter. Because this chapter builds on the information in the 2016 Climate and Health Assessment, the conclusions from that assessment were very briefly summarized. Readers are encouraged to read that assessment for further details.
Allison	Crimmins	142187	Text Region	14. Human Health		518	518	10	14	The two sentences in this key message are redundant. The second sentence in particular provides no information and is so vague it could be dropped into a number of other chapters in this report. It provides even less information than the first sentence and basically says 'thinking about climate change would be good'. This is an insufficient conclusion for the authors to come to after assessing the literature, which begs the question: how is that a key message? What are the beneficial health consequences? What do you mean by incorporating climate risks into planning?	The first sentence states that adaptation can effectively reduce the health impacts experienced, and the second that there opportunities to increase the effectiveness of adaptation for human health in infrastructure planning and urban design. The sentences were edited for clarity.
Allison	Crimmins	142188	Text Region	14. Human Health		518	518	10	18	Suggest reversing the order of the adaptation message and the mitigation messages. It would be more intuitive to talk about mitigation first, as the things people/communities need to adapt to would be determined by how much mitigation did/did not take place. The third key message has many more specifics, so I'm guessing there is a lot more literature that the authors assessed to come to this statement. This would further argue that the message more based in the literature come before the message where the literature is less advanced or quantitative.	Adaptation and mitigation are equally important. From the perspective of health systems, it is more logical to discuss how to prepare for and manage the risks identifed in Key Message 1 than to discuss mitigation, which will not affect the magnitude and pattern of risks until at least mid-century.
Allison	Crimmins	142189	Text Region	14. Human Health		519	518	16	16	Are the thousands of lives just in the United States? Maybe that is ok not to specify in the key message since this is a document about the United States. Upon reading this though, it occurred to me that if there are thousands of lives saved in the United States alone, think how many there would be globally?	The commenter is correct in noting the NCA is focused on literature and impacts relevant to the United States. Global assessment is out of the scope of the Assessment and this chapter.
Allison	Crimmins	142190	Text Region	14. Human Health		519	518	10	14	Instead of a key message that merely says adaptation is a good thing (which all chapters dutifully have), I would recommend that this be replaced with information from the literature on either global health concerns and how they relate to the US ones, or where the research has started to look at multiple stressors at the same time, like heat and air quality or cascading impacts. A text box would cover the adaptation information in this chapter (e.g. the hospital one) and the rest could be left for the Adaptation chapter to cover. These other topics seem valuable and under-represented in this chapter and this report. They were also absent from the climate and health assessment, so this would be an opportunity to advance the science in these important topics. As is, Box 14.3 takes a good amount of space and is irrelevant to climate change, as it is explicitly discussing Early Warning and Response Systems, not climate change impacts, which is the topic of this report. Such information on response systems or predictive modeling seems better suited for a public health report or a report on Adaptation or on Monitoring/Response, not climate impacts in the United States.	The key message was edited to be more explicit. The NCA4 focuses on the United States and the authors were not mandated to assess the globa literature on adaptation. The adaptation chapter does not cover health adaptation, so removing information on health adaptation from this chapter would remove it from the report. Early warning and response systems are an important tool for reducing the translation of the health risks of climate change into impacts.
Allison	Crimmins	142191	Text Region	14. Human Health		519	518	29	30	This paragraph is really good. Just one note in the last sentence, the text says that the pattern of health risks is expected to increase, which doesn't make sense. Do you mean to say the existing pattern is intensified? I think this entire sentence could be re-worded with the intended audience more in mind. Something like 'more people will be at greater risk' or something more straightforward.	This section has been extensively edited and the language in question has been changed in a way that should address the commenter's concerns about clarity.
Allison	Crimmins	142192	Text Region	14. Human Health		519	518	33	36	These seem like good examples, but they are unorganized. The first three all seem to be related to the verb "developing", so maybe there should be a semi-colon after response plans. "Hardening" infrastructure does not make sense, or it is jargon that the audience does not understand. Finally, it is unclear why surveillance is an adaptation option, or why the authors chose just Lyme disease and not other climate related diseases. Since the text discusses infrastructure in the next two sentences and the surveillance example is not well explained, this reviewer would recommend dropping those last two examples to make this sentence a little easier to read, and to keep the sentence about planning materials that can be developed.	This section has been removed from the summary. The authors have made every attempt to clarify and use appropriate language in the main text where these topics now appear.
Allison	Crimmins	142193	Text Region	14. Human Health		519	519	6	8	Suggest including the word "avoided" in this sentence where it talks about mental health impacts. As is, this sentence makes mental health impacts sound like a benefit of reducing GHGs.	Avoided' added.
Allison	Crimmins	142194	Text Region	14. Human Health		519	520	2	4	Suggest rewording: "…from associated changes in the air, water, food, and environments crucial to human health and well-being."	This section has been extensively edited and the language in question has been changed in a way that should address the commenter's concerns about clarity.
Allison	Crimmins	142195	Text Region	14. Human Health		520	520	4	6	Suggest rewording to something less academic and more for the intended audience, such as: "Exposure to increasing temperatures, altered precipitation patterns, and rising sea level threaten human health."	Sentence edited for clarity.
Allison	Crimmins	142196	Text Region	14. Human Health		520	520	6	7	Suggest rewording "multiple timescales" to something less academic and more for the intended audience, such as: "Near-term and long-term exposure to degraded air and water…". The phrase "These exposures" is awkward, as it is not clear what the phrase is referencing, since this sentence itself lists types of exposures.	Sentence edited for clarity.
Allison	Crimmins	142197	Text Region	14. Human Health		520	520	9	10	Again, the phrase "these exposures" is difficult to follow as the noun of the sentence. I believe the authors are trying to say that PEOPLE are not just exposed to these threats in isolation, but that there are other factors that compound threats from exposure to climate impacts. Maybe start with the noun as the person, something like: "A person's vulnerability, as determined by their exposure, sensitivity, and ability to adapt to the health risks of climate change, is further complicated by non-climate factors that influence community health, such as changes in demographic, socioeconomic and underlying health trends."	Sentence edited for clarity.
Allison	Crimmins	142198	Text Region	14. Human Health		520	520	13	14	The text says that the pattern of health risks is expected to increase, which doesn't make sense. Do you mean to say the existing pattern is intensified? This entire sentence could be re-worded with the intended audience more in mind. Something like 'more people will be at greater risk' or something more straightforward.	Sentence edited for clarity.
Allison	Crimmins	142199	Text Region	14. Human Health		520	520	26	26	Delete "weather and". This is inaccurate. The 2016 report was on climate change, not weather. Including weather in this sentence will only confuse the intended audience, who may not understand that the authors mean long-term (30+ years) trends in weather, or long-term trends in extreme weather phenomena. The use of "weather" in the following sentence is more accurate.	This sentence has been edited and now reflects the usage in the following sentence identified by the commenter.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142200	Text Region	14. Human Health		520	520	29	30	Since the 2016 report was only on the science of climate and health, the last part of this sentence starting with "…, unless additional interventions…" is not actually a conclusion of the 2016 report. It is a harmless enough statement, just not one that was in the 2016 report. For instance, it is not stated in the 2016 report's executive summary.	Sentence edited for accuracy.
Allison	Crimmins	142201	Text Region	14. Human Health		520	521	5	8	This paragraph doesn't follow the NCA style guidelines- it tells the reader there is information out there, but doesn't tell the reader what that information is. Suggest dropping the "recent research" language and explain what the new findings are. For instance, the paragraph cites a paper that identifies new vulnerable populations. What are those populations? Another paper identifies new strategies. So what are those strategies?	The authors believe summarizing the findings of the 2016 Climate Health Assessment in the NCA4 is a critical priority, while also conveying new insights from more recent literature. Because of space constraints, not all new literature results can be explained fully within the text, and in some cases, the reader may have to read the original study to get a complete understanding. Where possible, the authors have revised the text, including in the section provided as an example, to provide as much detail or specific examples within space constraints.
Allison	Crimmins	142202	Text Region	14. Human Health		520	521	5	8	While the information on vulnerable populations would be helpful here (if the authors tell us what the findings of those citations are, not just that they exist!), the only other "new" research that is cited in this Extreme Events section is on adaptation. Why is this under key message 1 when Adaptation is covered under key message 2? There has been more research that has come out since 2016 on extreme events and health impacts that are not listed or discussed here. Where is that literature? Strongly suggest putting this adaptation information (Vernberg) in the section on adaptation, or dropping it, since it is so vague. Instead, assess the literature on extreme events impacts on health here. For example, here is a short list of papers on the health impacts of climate-related changes in extreme events, that have all come out in the last couple years: https://ehp.niehs.nih.gov/ehp216/ http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0144202 https://www.ncbi.nlm.nih.gov/pubmed/27840238 https://www.sciencedirect.com/science/article/pii/S0013935116301931 https://ehjournal.biomedcentral.com/articles/10.1186/s12940-016-0142-z https://www.ncbi.nlm.nih.gov/pubmed/27090489 https://ehp.niehs.nih.gov/1408971/ https://www.ncbi.nlm.nih.gov/pubmed/28176761	It was very difficult to find all suggested references because many of the urls were incomplete. The identified literature was reviewed and relevant papers included in the chapter.
Allison	Crimmins	142203	Text Region	14. Human Health		520	521	19	19	Strongly suggest citing the literature the authors assessed that has come out since 2016. For example, here are two studies on climate and coccidioidomycosis published in 2017: http://onlinelibrary.wiley.com/doi/10.1002/2017GH000095/full http://onlinelibrary.wiley.com/doi/10.1002/2017GL073524/full These citations would also help you extend the findings of this text box to the entire Southwest region, not just California and Arizona.	It was very difficult to find all suggested references because many of the urls were incomplete. The identified literature was reviewed and relevant papers included in the chapter.
Allison	Crimmins	142204	Text Region	14. Human Health		520	521	9	9	Suggest dropping "and periods of unusually dry months" from the title. First, it is redundant. Second, you don't explain what is meant by "unusually dry" nor how many months/how long a period is in the box text. Keep it simple for the intended audience.	It would be very helpful if there were consistent definitions of drought, including when a drought starts and ends. There are periods of dry weather that do not constitute a meteorological drought that can have adverse health consequences, as noted in the text box.
Allison	Crimmins	142205	Text Region	14. Human Health		520	521	9	29	This is a good text box and well written. I especially appreciate how it discusses a climate impact that is not always considered "an extreme weather event", as drought tends to be long-lasting or more gradual in nature. It is helpful to explain to readers how climate affects health beyond just hurricanes and fires, and this box does that clearly and succinctly.	No response necessary
Allison	Crimmins	142206	Text Region	14. Human Health		520	521	32	32	For all these sections, it would be helpful to drop the "2016 Climate and Health Assessment conclusions:" and the "Additional research shows" language. It makes the sections unnecessarily long and hard to read.	The health chapter builds off the 2016 Climate and Health Assessment, and then assesses new research. The sentence and sections were reworded to increase clarity.
Allison	Crimmins	142207	Text Region	14. Human Health		521	521	35	37	This sentence may need an edit, as it sounds like the only reason people in the city have higher ambient temperatures is because of air conditioning. I think the authors were trying to say there are higher ambient temperatures from the urban heat island effects PLUS there is also waste heat from air conditioning.	Sentence edited for clarity.
Allison	Crimmins	142208	Text Region	14. Human Health		521	522	8	8	The paper cited here (Lane et al 2014) is not "additional research since the climate and health assessment" since it was published well before 2016. But more importantly, it is not an appropriate citation to demonstrate that risks vary across regions due to early warning systems. This paper only focuses on New York City. It does not compare heat warnings across regions, or other states, or even within different locations within New York City. Replace this citation with an appropriate source for this statement or drop that part of the sentence, if there is no literature to support it.	Lane et al. 2014 was not cited in the CHA. This publication is used to support the statement that heatwave early warning systems are a protective measure. Most of this sentence was moved to adaptation.
Allison	Crimmins	142209	Text Region	14. Human Health		521	522	9	9	The paper cited here (Berisha et al 2017) is not an appropriate citation to demonstrate that risks vary across regions due to access to cooling centers. This paper focuses only on Maricopa county. It does not compare cooling stations across regions, or other states. Replace this citation with an appropriate source for this statement or drop that part of the sentence, if there is no literature to support it.	Berisha et al. 2017 is used to support cooling shelters for managing heat-related risks. Most of this sentence was moved to adaptation.
Allison	Crimmins	142210	Text Region	14. Human Health		521	522	10	10	The paper cited here (Gronlund et al 2015) is not an appropriate citation to demonstrate that risks vary across regions due to access to green space. This paper focuses only on 8 cities in Michigan. It does not compare green space across regions, or other states. Replace this citation with an appropriate source for this statement or drop that part of the sentence, if there is no literature to support it. The second citation here (Klein Rosenthal et al 2014) at least compares vulnerability across locations within New York City, but it does not compare vulnerability across regions. Edit or drop if there is not sufficient literature to support.	Gronlund et al. 2015 is used to support green spaces for managing heat-related risks. Most of this sentence was moved to adaptation.
Allison	Crimmins	142211	Text Region	14. Human Health		521	522	6	11	This sentence was full of citations that were inappropriate and did not support the claims the authors made. Most did not represent updates since the 2016 Climate and Health Assessment. Furthermore, the authors use "risk" and "vulnerability" and at times even "exposure" interchangeably in this chapter, though the 2016 Climate and Health Assessment had very specific definitions of these terms. This further confuses this paragraph. The citations provided (Lane, Berisha, Gronlund, Klein Rosenthal) do not demonstrate regional variation in risk, but they do provide some interesting case studies of evaluation of response/adaptation actions. These citations therefore seem more appropriate for the section on adaptation, rather than the section updating impacts of extreme heat. Suggest moving or deleting.	Risk is the interaction of hazards, exposure, and vulnerability, as defined in the IPCC lastest assessment report. Most of the referenced sentence was moved to adaptation.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142212	Text Region	14. Human Health		521	522	6	11	Many new papers have been released on impacts of extreme heat on health. Here are a few examples that the authors should assess- some of these specifically address vulnerable populations, which is relevant to the key message of this section: https://www.sciencedirect.com/science/article/pii/S0013935117317565 http://www.annualreviews.org/doi/abs/10.1146/annurev-publhealth-032315-0… https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4749077/ https://link.springer.com/article/10.1007/s10584-016-1638-9 http://iopscience.iop.org/article/10.1088/1748-9326/11/7/074006/meta http://www.sciencedirect.com/science/article/pii/S0013935115301444	It was very difficult to find all suggested references because many of the urls were incomplete. The identified literature was reviewed and relevant papers included in the chapter.
Allison	Crimmins	142213	Text Region	14. Human Health		521	522	22	23	Overall, this section on vector bourne disease is good. But I suggest editing the academic language to better accommodate the intended audience. For example: "favor the establishment and maintenance of vector-bourne diseases"? Do you mean that more people will get sick? If so, please state simply.	Sentence edited for clarity.
Allison	Crimmins	142214	Text Region	14. Human Health		521	522	25	25	The Monaghan citation is listed here as 2016, but in the references as 2015	The correction was made.
Allison	Crimmins	142215	Text Region	14. Human Health		521	522	24	25	While the two citations here (Belova et al 2017 and Monaghan et al 2016) are very good citations, they do not discuss "increasing survival of vectors" nor "shortening the developmental time of the pathogens themselves". These two citations are projecting future exposure, and they are good citations to confirm that we expect more people to be exposed to mosquito-bourne disease in the future under climate change (as in lines 26-30). They just aren't good citations for this sentence. Move Belova to the end of the sentence on lines 26-30 and replace with recent literature supporting this statement, or delete.	This sentence has been edited for accuracy in a manner that reflects input from this commenter.
Allison	Crimmins	142216	Text Region	14. Human Health		521	523	34	1	The first and third sentence of this paragraph are redundant. Pick one or combine into just one sentence. Aside from that, this is a very good text box.	These sentences made different points; they are now combined.
Allison	Crimmins	142217	Text Region	14. Human Health		522	522	33	33	The authors may want to consider a different title for this box. "Climate variability" is jargon and in the text box itself the authors call El Nino events "anomalous". This could confuse readers about whether this is a natural swing within the range of variability, or whether it is actually outside the range of variation (therefore, anomalous). Plus, it is just overly academic for this kind of report. If you are only talking about El Nino, then just say El Nino (since El Nino's happen on a general scale of once every 7 years, I wouldn't call this anomalous). If you are talking about extreme weather, then say extreme weather. It may also be helpful to include a sentence about how this relates to climate change: you say it is an analog- do you mean that we will expect more El Nino events to occur in the future? Maybe cite the CSSR here?	Box deleted and text integrated into body of chapter.
Allison	Crimmins	142218	Text Region	14. Human Health		522	523	21	21	Farmer is spelled wrong. It should be Farmar	The reference was deleted.
Allison	Crimmins	142219	Text Region	14. Human Health		522	523	21	21	Farmar-Bowers 2014 is an inappropriate citation to use here. First, it is a study that takes place in Australia. Second, it is not "additional research" to the 2016 report, as it was published in 2014. Third, while it does mention water availability and quality, that is not the main focus of this paper and it does not evaluate climate change impacts on water quality and subsequent impacts of reduced water quality on food security. Strongly suggest deleting and replacing with a citation that supports this finding.	Sentence deleted.
Allison	Crimmins	142220	Text Region	14. Human Health		522	523	21	21	The citation Barosh 2014 is inappropriate here. First, it is a study that takes place in Australia. Second, it is not "additional research" to the 2016 report, as it was published in 2014. Third, the paper does not discuss water availability or quality. In fact, the word "water" does not even appear in this paper. Finally this paper is about cost and access to food, and inequity in food choice, in Australia and in no way supports the sentence for which it is cited. Delete and replace with a citation that supports this finding.	Sentence deleted.
Allison	Crimmins	142221	Text Region	14. Human Health		522	523	21	21	Lissner 2014 is an odd citation to use here. It is not "additional research" to the 2016 report, as it was published in 2014, and therefore would have been assessed by that report's authors. Also, this paper does not discuss food security, so does not support this sentence's finding. While this does talk about water availability and quality, it is really more of a methodological paper, so an odd choice for a citation here. Suggest replacing with literature that supports this finding.	Sentence deleted.
Allison	Crimmins	142222	Text Region	14. Human Health		522	523	21	21	Wutich 2014 is also a very odd citation to use here. It is not "additional research" to the 2016 report, as it was published in 2014, and therefore would have been assessed by that report's authors. Also, this paper does not discuss climate change- it only mentions climate change once and it is cursory. While this does talk about food and water security, it is really more of a methodological paper comparing "coping" and behavioral responses, so an odd choice for a citation here. It is also an anthropological essay, not a research article. Suggest replacing with literature that supports this finding.	Sentence deleted.
Allison	Crimmins	142223	Text Region	14. Human Health		522	523	21	21	While at least the citation Haddeland 2014 talks about water availability/quality and food security in the context of climate change, it is not "additional research" to the 2016 report, as it was published in 2014 and therefore would have been assessed by that report's authors. Consider citing in the previous paragraph or replacing with more appropriate citation.	Sentence deleted.
Allison	Crimmins	142224	Text Region	14. Human Health		522	523	21	21	The citation Guo et al 2015 does talk about food security in the United States, but does not discuss water quantity or quality and only mentions climate change once. This may be a better citation for the Tribal chapter, as it does not support the sentence here. Suggest replacing with more appropriate citation.	Sentence deleted.
Allison	Crimmins	142225	Text Region	14. Human Health		522	523	22	22	Again, this is a very, very strange citation (Rocklinsberg 2015). While it is possible that this came out after the cut off period for literature for the 2016 report, it is not a very convincing citation. It is focused on fishing policy in the European Union, whether fish are "sentient", and whether we have a moral obligation to show "loving kindness" to fish. It does have the words "food security" and "climate change" in it, but that is not what this paper is about, and it certainly does not provide much support to the sentence where it is cited. Delete and replace with an appropriate citation for this finding.	Sentence deleted.
Allison	Crimmins	142226	Text Region	14. Human Health		522	523	21	22	I strongly suggest that the review editor check the citations in this chapter carefully. Upon reviewing the seven citations cited for this sentence, not one was an appropriate source to support this sentence. None of them are more recent than the 2016 climate health assessment. Some are focused on other countries, some do not discuss food security or climate change or water quality at all, and one is about the morality of treating fish like sentient animals (!). This represents a disturbing failure of the authors to conduct a robust literature assessment and accurately report findings. I do not doubt the veracity of the sentence, only the lack of demonstrated literature review from the authors to support it.	The section on waterborne disease, which apparently this comment refers to (although the page number start isn't consistent) was revised, references checked, and references from outside the US and other OECD countries removed. The statement referencing fisheries states "Extreme weather and climate events can negatively impact the safety of produce from agriculture and fisheries".
Allison	Crimmins	142227	Text Region	14. Human Health		522	523	20	21	Delete sentence as it adds no new information, is extremely vague, and does not have appropriate citations.	Sentence deleted.
Allison	Crimmins	142228	Text Region	14. Human Health		522	523	25	25	The Bathi 2016 reference is a very good paper, but it is not about viral or bacterial contamination from combined sewage overflows. Move this reference to a more appropriate place or delete.	Reference deleted.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142229	Text Region	14. Human Health		522	523	26	26	Though the Eze et al 2014 reference is relevant, it does take place in Scotland and it was published in 2014, so not "additional research" since the 2016 report. With all the other citations for this sentence, this may not be needed.	Reference deleted.
Allison	Crimmins	142230	Text Region	14. Human Health		523	523	26	26	The Manciocco 2015 reference is a good example of a study that looks at climate impacts on marine aquatic species, and potential subsequent impacts on human health. But it does not discuss extreme precipitation or flooding, impacts on sewers or water infrastructure, or human pathogens, viral or bacteria contamination. Thus, it is not an appropriate reference for this sentence. Move this reference to an appropriate place or delete.	Reference deleted.
Allison	Crimmins	142231	Text Region	14. Human Health		523	523	26	26	The Bush et al 2014, Galway et al 2014, and Uejio et al 2014 papers are all relevant to this sentence, but were published in 2014, so would have been assessed by the authors of the 2016 report. In fact, the Uejio paper is already cited in the 2016 report, so not new research. The Galway paper also takes place in Canada. "Tournevi" is spelled wrong- it is spelled right in the references. This too is a relevant paper, but takes place in Sweden. Is there such a lack of recent research on extreme events and water quality focused in the United States that these are the best resources the authors could assess? Here are six recent references focused on this topic in the United States, though two are from 2015, so potentially were captured in the 2016 report: http://www.sciencedirect.com/science/article/pii/S004313541530381X?_rdoc… http://onlinelibrary.wiley.com/doi/10.1002/etc.3220/abstract https://www.nature.com/news/study-role-of-climate-change-in-extreme-thre… https://www.ncbi.nlm.nih.gov/pubmed/25885050 https://www.ncbi.nlm.nih.gov/pubmed/25719461 http://www.sciencedirect.com/science/article/pii/S0048969715312419?_rdoc…	Galway et al. 2014 was not cited in the CHA. References to Bush et al. 2014 and Uejio et al. 2014 were cited in the CHA, and were removed. The reviewer is correct on the very limited research on waterborne disease in the U.S. Galway et al. and Tournevi et al. (spelling corrected) results are relevant to the U.S. It was very difficult to find all suggested references because many of the urls were incomplete. The identified literature was reviewed and relevant papers included in the chapter.
Allison	Crimmins	142232	Text Region	14. Human Health		523	523	27	28	The Farmar-Bowers reference takes place in Australia, was published in 2014 so would have been assessed in the 2016 report, and does not discuss drought or water scarcity, but agricultural food security in Australia. Therefore it does not appear to be an appropriate reference for this statement. Delete.	Sentence deleted.
Allison	Crimmins	142233	Text Region	14. Human Health		523	523	27	28	The Wutich 2014 is not "additional research" to the 2016 report, as it was published in 2014, and therefore would have been assessed by that report's authors. Also, this paper does not discuss climate change- it only mentions climate change once and it is cursory. There is no mention of drought in this paper. While this does talk about food and water security, it is really more of a methodological paper comparing "coping" and behavioral responses, so an odd choice for a citation here. It is also an anthropological essay, not a research article. Delete.	Sentence deleted.
Allison	Crimmins	142234	Text Region	14. Human Health		523	523	28	28	greater than what?	Greater' changed to 'increased'
Allison	Crimmins	142235	Text Region	14. Human Health		523	523	29	29	The Khan et al 2014 reference is a study that takes place in Bangledesh, is published in 2014 and so would have been assessed by the 2016 report, is focused on salinity - not pathogens, and does not discuss children or elderly populations, but pre-eclampsia in pregnant women. Therefore it is not an appropriate citation for this sentence. Delete.	Reference deleted.
Allison	Crimmins	142236	Text Region	14. Human Health		523	523	29	29	The Cornwell 2015 paper may also be an inappropriate citation, though it is not open access, so hard to tell. But it does take place in Indonesia, doesn't mention climate change, and may have been published in time to be reviewed by the authors of the 2016 report.	Reference deleted.
Allison	Crimmins	142237	Text Region	14. Human Health		523	523	29	29	While the Grace et al 2015 paper does address children's risk to climate related impacts on waterbourne disease, it is focused in Africa and may have been published in time to be reviewed by the authors of the 2016 report, so not additional research.	Reference deleted.
Allison	Crimmins	142238	Text Region	14. Human Health		523	523	27	29	Of the seven citations listed in these two sentences, one is in Australia, one in Bangledesh, one in Indonesia, and one in Africa. None are more recent than 2015 and four are from 2014, so should not be classified as research since the 2016 climate and health assessment report. Several are completely irrelevant to the sentence where it is cited. Furthermore, nothing in this paragraph presents new information from the 2016 report- these sentences are very general and repeat the findings of the waterbourne chapter in the 2016 report. This is rather alarming, as it demonstrates either a) there is no recent research focused on water bourne disease in the United States or b) the authors have not done their due diligence in finding such resources. We know "a" to be untrue, as there have been publications on this topic since 2016. In addition to the suggested research articles in earlier comments, here are several additional examples of recent research on climate change and waterbourne disease that take place in the United States: https://www.nature.com/articles/s41598-017-13392-2 https://link.springer.com/article/10.1007/s10040-016-1521-9 https://www.pseau.org/outils/ouvrages/annual_reviews_climate_change_and_… If the authors still feel the need to cite dates sources from other countries, it would be helpful to select studies that may be applicable to the United States (e.g. EU or Australia over Bangladesh and Indonesia) and explain how those may be similar or different to impacts expected in the United States.	Section edited to focus on publications from the U.S., and other OECD countries where relevant. It was very difficult to find all suggested references because many of the urls were incomplete. The identified literature was reviewed and relevant papers included in the chapter.
Allison	Crimmins	142239	Text Region	14. Human Health		523	523	20	29	I strongly recommend the review editor pay close attention to this paragraph and it's citations. At least 16 of these citations are inappropriate and several others are questionable. The paragraph does not add any value or new information to the findings of the 2016 report, and since so many citations are irrelevant, they can not even be said to confirm the findings of the 2016 report. Furthermore, every reference in this paragraph is from 2014 or 2015. While there is nothing wrong with citing papers from those years, they should not be characterized as additional research since the publication of the USGCRP climate and health assessment. However, recent papers on climate impacts on waterbourne disease in the United States certainly exist and several examples have been provided in previous comments. If the authors still feel they need to cite references that occur outside the United States, it would be helpful to the reader to understand how these impacts are relevant to the health of Americans.	The section on waterborne disease, which apparently this comment refers to was revised, references checked, and references from outside the US and other OECD countries removed.
Allison	Crimmins	142240	Text Region	14. Human Health		523	524	31	4	The sentence on line 35 mentions food security but does not provide any details- how does temperature affect food security? What did these studies show? I am assuming some of these references that were published before 2016 were not covered in the 2016 climate and health report, but were they covered in the Brown et al report? I realise there is an agriculture chapter, but there could be more mention here of climate impacts on yields, prices, access, etc. and at least a reference to the agriculture or international chapters as appropriate.	This section has been revised and as much detail as possible provided, given space constraints and the fact that the literature focused on food qualtiy impacts in the United States is very limited.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142241	Text Region	14. Human Health		523	523	37	37	Brown et al should be 2015, not 2016.	The text was revised.
Allison	Crimmins	142242	Text Region	14. Human Health		523	524	4	4	Marvin et al 2013 would have been assessed by the authors of the 2016 climate and health report or the Brown et al food security report, so should not be classified as research that took place since publication of those reports.	Marvin et al. removed.
Allison	Crimmins	142243	Text Region	14. Human Health		523	523	38	38	A potential additional resource for decreases in dietary zinc: https://link.springer.com/content/pdf/10.1007/s11104-016-3166-9.pdf	The suggested reference was reviewed, but because it does not focus on climate impacts on nutrition, it was not included in the chapter.
Allison	Crimmins	142244	Text Region	14. Human Health		523	524	37	1	There are good examples of recent work on rising CO2 concentrations on different nutrients, but is there any recent work on those decrease's effects on human health? If not, that may be worth mentioning.	A sentence was added to that effect.
Allison	Crimmins	142245	Text Region	14. Human Health		523	523	35	35	Suggest the authors refrain from saying that recent research "shows that…", as it implies that the earlier reports (Ziska and Brown) did not reach these same conclusions. Similarly on line 37, avoid the word "shows". In both cases, and in the last sentence on the top of page 524, these words could be replaced by "confirmed" or "strengthened the understanding of" or something similar to let the reader better understand the state of the scientific field.	Sentences edited to remove 'shows'. The introduction to this section of the chapter stated that new research confirms and strengthens the conclusions of the 2017 Climate and Health Assessment.
Allison	Crimmins	142246	Text Region	14. Human Health		523	524	6	11	This is an excellent summary paragraph. Should the reference be at the end, as these all were points made in Dodgen et al. 2016, yes?	Earlier comments requested the reference to be after the first sentence, otherwise it appeared those sentences were unsupported. The text was revised to include the citation at the end of both sentences.
Allison	Crimmins	142247	Text Region	14. Human Health		523	524	14	18	While these statements are all true, they were all made in Dodgen et al. 2016, and do not represent "recent research" since the publication of the 2016 report. The citations are all older than 2016, so would have been assessed by the literature review those authors conducted. In fact, Beaudoin 2011 is cited in Dodgen 2016. These statements and citations, while true and valid, should not be represented or characterized as "new knowledge" or "additional recent research" (page 520 lines 30-32).	The text was revised to not allude to the fact that the literature is new, but rather representative of the state of the science.
Allison	Crimmins	142248	Text Region	14. Human Health		523	525	1	1	Reference the Tribal chapter here	Reference added.
Allison	Crimmins	142249	Text Region	14. Human Health		523	524	33	38	It is unclear which of these references were published or available after the 2016 report, but none of these statements are new findings. They were all already stated in Gamble et al 2016. Suggest not saying that "Recent research shows…" or stating these facts as if they are new, when in fact they have been known. These additional citations may "confirm" or "improve our understanding" or "advance the science", but they are not the first to show these impacts.	Leading sentence edited to remove "recent research shows that". Two more recent publications have been added to replace Gamble 2016: Sheffield et. al 2016 and Ziegler et. al 2017.
Allison	Crimmins	142250	Text Region	14. Human Health		523	524	33	38	The first sentence of this paragraph (lines 33-36) is redundant to, or could be combined with, the last sentence of the previous paragraph. The second sentence of this paragraph is mentioned in the previous paragraph (Indigenous people) and is also stated in the Tribal chapter. Such general statements do not need to be repeated, but the reader would benefit from more specific information. This is such an important topic, and a key element to the Key Message #1, it would be nice to see specific findings on it rather than just general "these populations are vulnerable" statements, which were made in the 2016 report. It may help to add vulnerable population considerations into the numerous text boxes in this chapter. In future NCAs, a separate chapter on social inequities would be beneficial. But in the meantime, it would help readers if the authors of this chapter told us the findings of the citations in lines 33 through line 4 on page 525. What are the new findings? Are some populations more vulnerable or less vulnerable than we previously thought? Are any other populations identified? Were new characteristics of certain populations recently identified as the source of the vulnerability? Explain how the science on this subject has advanced rather than just repeating the fact that these groups are vulnerable.	The chapter is differentiating between conclusions in the 2016 Climate and Health Assessment, and the results of recent research.
Allison	Crimmins	142251	Text Region	14. Human Health		523	525	1	4	I realise there is a lot of information to cover in this section, but it is five pages long in a chapter meant to be six pages total. The adaptation section is 3.5 pages and the economic section is 2 pages long. It seems that each of these three findings need to be closer to 2 pages apiece to hit 6 pages total (assuming there will be no regional roundup), and so require some difficult cutting. The text under this Key Message #1 is very redundant-- both to the 2016 report and to itself. Much of the information that was presented as "new" since the 2016 report was not, in fact, new but just another reiteration of the points found in the 2016 report. Many of the "recent research shows that…" statements were using citations that were published before the 2016 report, and did not in fact show that some new piece of scientific knowledge had been achieved. Yet, there are many new papers that have been published since 2016 that the authors unfortunately did not find or assess. See suggested examples of sources in previous comments. There are a few options for shortening this section, though I realise each would be painful. First, the authors could remove all the information that was in the 2016 report and only report actual new findings since that publication- only updates, or where the science has advanced. In this option, rather than making general statements about climate change impacting, say water or vectorbourne disease, there would be room to present specific findings from the author's literature review. Another option would be to create a large figure with the 2016 information. One example may be the table at the beginning of the 2016 report with findings from each chapter. An additional column could be added to note recent research or updates. This could get cumbersome, but it would at least serve as a quick reference guide to the findings of the 2016 report. Or, a table could be created with the link to the appropriate chapter in the 2016 report and only information about new science displayed. Another overall option for shortening, one that may have to be taken even if one of the earlier options is employed, is to delete one of the text boxes. Both boxes are well-written and helpful, but there just doesn't seem to be room. Another option would be to drastically shorten or cut the adaptation section. There is already an adaptation chapter, so much of that information could be placed there, if it is not there already. Regardless, the Key Message #2 section would need to be shortened by nearly half anyway. That section could be cut to only a comprehensive 1-page text box that discusses impacts, adaptation, and social inequities, leaving more room for the text boxes under Key Message #1. The portions of Key Message #2 section that don't have to do with climate change (e.g. early warning system/ response/ predictions) should be cut from a climate	The chapter was extensively edited to shorten and clarify the content.
Allison	Crimmins	142252	Text Region	14. Human Health		523	525	12	23	This is a good paragraph- good examples that are specifically explaining how they would improve health.	No response necessary.
Allison	Crimmins	142253	Text Region	14. Human Health		523	525	24	28	This first sentence, while true and supported by a good reference, is fairly general and could easily be found in any chapter's discussion of adaptation- not just health adaptation. With limited space, I would suggest deleting this sentence. Then taking the second sentence in this paragraph and inserting it after the sentence that ends on line 16. It is a nice segue between the adaptation examples that are health department related and those that are not.	Sentence removed and previous paragraph edited for conciseness.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142254	Text Region	14. Human Health		523	525	29	29	"range of timescales" is academic jargon. Suggest rewording, or dropping this sentence as it is so general as to not provide any information.	Sentence removed.
Allison	Crimmins	142255	Text Region	14. Human Health		523	525	35	35	The word "forecast" should be "projections". Also, how can infrastructure adaptations make use of climate projections? Are the authors trying to say that considering climate projections can improve infrastructure planning by making it more resilient to future impacts? Suggest just saying that.	Sentence edited for accuracy and clarity.
Allison	Crimmins	142256	Text Region	14. Human Health		523	525	34	34	Citation needed	Sentence removed.
Allison	Crimmins	142257	Text Region	14. Human Health		523	525	35	35	citation needed	Sentence removed.
Allison	Crimmins	142258	Text Region	14. Human Health		524	525	37	38	How can they benefit from incorporating climate projections? Overall, this is a very good paragraph. A bit more specificity would strengthen it.	This section has been extensively edited and the language in question has been changed in a way that should address the commenter's concerns about detail, within space constraints.
Allison	Crimmins	142259	Text Region	14. Human Health		524	526	7	13	The paragraph preceding this one was so well-written (lines 1-6), but this paragraph should be deleted. The first sentence is policy prescriptive and doesn't belong in this assessment. Plus the idea of decreasing social inequities is already covered in the previous paragraph. The second sentence has nothing to do with social inequities and has no citations even though the sentence talks about the existence of evaluations. If these evaluations are limited, why do the authors feel the need to report it in this limited space? The third sentence is from a very old citation of the lead author's own work and this figure would surely have been updated in the last 15 years. It may work in a case study or the following section on economic impacts, but it does not fit in with the flow of this section. Furthermore, the point of this paragraph seems to be that considering costs and benefits is a good thing for social inequity. I'm not sure that is true (cost benefit analyses may suggest protecting higher value property is more beneficial, for example), and even if it was, I doubt that is a policy the USGCRP would want to advocate. Strongly suggest deleting entire paragraph	The paragraphs were edited for concisensess and clarity. Adaptation can reduce risks and social inequities; whether communities and states decide to do so is up to policymakers. Sadly, Ebi et al. 2004 has not been updated.
Allison	Crimmins	142260	Text Region	14. Human Health		524	526	11	13	With the exception of the last paragraph of this section, this section is well written and valuable. This creates a stark contrast to the box and badly-drawn stick diagram (?) on early warning and response systems, which is about weather and not climate and seems to be an advertisement for the government's toolkit. This section under Key Message #2 would be greatly strengthened by deleting Text box 14.3. Some of the citations in that text box could be moved to the paragraph on page 525 lines 29-38 where it already talks about forecasts and advisories, etc.	Text from the box edited incorporated into the section and the box and figure removed.
Allison	Crimmins	142261	Text Region	14. Human Health		524	526	15	30	Strongly suggest dropping this text box (14.3) and accompanying drawing. This seems like a perfect text box for a public health document or medical report, but is not appropriate for a climate assessment. Early warning and response systems are by very nature related to weather and not climate. By publishing this text box here in a climate report, the authors are adding to the public confusion over weather and climate and doing themselves a disservice. I realise these are adaptation measures, but they are already captured as such in the text above this box. Devoting so much space to "outbreak" and weather information, which is relevant to the public health or health policy world but not this one, creates a vulnerability to this climate report. It is also rather general in nature. Lines 23-27 smack of the government advertising their own policies and toolkits. The link provided takes the reader to a heat advisory page- not anything to do with climate change or partnering with local entities. On lines 28-30, the text says the figure depicts how incorporating information about drivers of illness and death into planning can provide more time for developing interventions-- but the figure does not depict this at all. The figure looks more like a conceptual drawing than an actual figure. There is no data in it, there is no information about a disease, there is the number -120 but it is unclear what that number means, there are boxes with meaningless text in them that point to other boxes with meaningless text in them-- but nowhere does it depict that this text says it depicts. Delete.	Text from the box edited and incorporated into the section and the box and figure removed.
Allison	Crimmins	142262	Text Region	14. Human Health		524	527	11	12	The sentence "Healthcare facilities…of additional climate change" is vague and redundant. Delete. The rest of this paragraph is strong enough without it.	Sentence deleted.
Allison	Crimmins	142263	Text Region	14. Human Health		524	527	12	13	Doesn't this figure also show hospitals in the 500 year flood plain? Has this been updated with FEMA floodplain updates? Have these hospitals made modifications since this 2013 study (which will be 6 years old by the time this assessment comes out)? Also, how is this an example of the need for modifications? What modifications? One could look at the few hospitals in the floodplain and think they've been doing good so far, so no modifications are needed. There seems to be a causal chain that has been skipped here.	Figure replaced with another example showing hospitals facing inundation during hurricanes.
Allison	Crimmins	142264	Text Region	14. Human Health		524	527	16	16	Again, why is the climate resilience toolkit cited here? The toolkit is just a repository of info, not the source of information itself. This is an inappropriate citation that feels like the authors promoting their own federal programs. If these two hospitals invested in air filters, there is likely some other source from the hospitals themselves or press releases or other documentation that could be cited. Also, when did these adaptations occur? Have they been successful? Did the cost/benefit pan out? Are the authors suggesting these were good adaptations to take? How did these steps work out for the hospitals in the recent fires in California this year? Here are a few suggested citations: Federal Emergency Management Agency (FEMA), âÒForward and AcknowledgementsâÓ, Design Guide for Improving Hospital Safety in Earthquakes, Floods, and High Winds: Providing Protection to Buildings and People (product #577), page: i, June 2007. Steve Storbakken, Director of Safety and Emergency Preparedness for Providence San Fernando Valley Area, presentation at the AMSâÕ âÒRising Above the WeatherâÓ Forum, April 2009.	Reference to the climate resilience toolkit removed. Additional information, to the extent it was available, was summarized and included. The suggested references were not included because they are about a decade old.
Allison	Crimmins	142265	Text Region	14. Human Health		524	527	10	14	Suggest deleting everything from "Healthcare facilities…" through "…western states like" and just starting the second sentence with: "For example, Providence Holy Cross…"	This section has been edited in a way that reflecs input from the commenter.
Allison	Crimmins	142266	Text Region	14. Human Health		524	527	16	19	When did this happen? Why? Were these retrofits successful? How did they fare in the recent hurricanes? Were they good investments or have good cost/benefits? What range of technology retrofits? Also, the end of the sentence "to children" is a bit redundant to "Miami Children's Hospital"	Excellent questions for which answers are not available. Formal pre- and post-evaluations were not conducted. We added anecdotal information on the functioning of the facility after hurricane Irma.
Allison	Crimmins	142267	Text Region	14. Human Health		525	529	10	6	Strongly suggest combining the two sections on hospitals into one comprehensive text box. This is good information, but could be better combined. Delete box 14.3 and put box 14.4 between Key Message #2 and #3, then have that combined text box cover healthcare facilities all in one spot. The info on hospital information under Key Message #2 right now is very vague- hospitals need to do stuff, here are three examples of hospitals that did something (but the text doesn't say what they did, when, or whether it was effective). The information in box 14.4 right now gets into more details- the years hospitals took action, the costs saved, whether the adaptation action was effective, etc. Combining these may even allow for room to discuss mitigation/adaptation options hospitals can take that are not electricity-related, like water reductions, greener purchasing, ventilation systems, landscaping, reductions of food waste in cafeterias, etc.	The text on hospitals under key message 2 was reduced and the text on healthcare in key messages 2 and 3 were combined.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142268	Text Region	14. Human Health		525	529	5	5	A citation to the landing page of the federal climate resilience toolkit site is not an appropriate citation. Even if the reader were to navigate through the toolkit site to the page on Greenwich, there are no citations on that page. There needs to be a citation specific to Greenwich Hospital. Preferably one that is not advertising the federal government's programs. For example, authors could cite this: https://www1.eere.energy.gov/manufacturing/distributedenergy/pdfs/chp_cr...	This text was removed.
Allison	Crimmins	142269	Text Region	14. Human Health		525	528	23	23	Is that estimated $15 billion per year? One-time savings? Cumulative savings over the lifetime of the hospital? For every hospital in the US, or for each hospital in the US? Is there a more recent estimate of this (as this citation will be 6-7 years old by the time this is published) based on the hospitals that have taken action, such as the examples the authors provided?	The estimate was over 10 years; this is now specified.
Allison	Crimmins	142270	Text Region	14. Human Health		525	529	3	4	Authors may want to note when Superstorm Sandy occurred. That may be common knowledge on the east coast, but not the west.	Specific reference to Superstorm Sandy was removed.
Allison	Crimmins	142271	Text Region	14. Human Health		525	528	7	10	Authors may want to consider using the language established in the About this report/overview section on "higher" and "lower" scenarios, which could help cut down on the two uses of "reducing" in this first sentence. For instance, say "By the end of this century, thousands of lives could be saved each year and hundreds of billions of dollars in health-related economic benefits could be produced each year under a lower emissions scenario…." The current text is not bad- just potential to be more consistent with report style/language.	That language is now used in this section, and the text revised.
Allison	Crimmins	142272	Text Region	14. Human Health		525	529	8	9	What air pollutants? Reduced exposures to what? Is this ozone? PM? Wildfire? Aeroallergens? Also, since there is a chapter on Air Quality, I'm not sure you need this example here. Since the first sentence repeats the sentence on page 528 line 11 (reducing emissions benefits health) and the second sentence is vague and probably better covered in the air quality chapter, suggest deleting these two sentences. The rest of the paragraph works well without the first two sentences and the third sentence is a strong statement.	Sentence deleted.
Allison	Crimmins	142273	Text Region	14. Human Health		525	529	16	17	I think I understand what you're saying, and I like that you mention hard-to-quantify costs like mental health, but the phrase "could increase these estimates" is confusing. Which estimates? The one in the previous sentence is the estimated differences between two scenarios. So are you saying that including these benefits would widen the gap between the two scenarios? It would also be helpful to include the word "avoided", as in "Including benefits of avoided impacts that are difficult to quantify, such as mental health…" since it sounds like mental health impacts are benefits. By "long-term impacts" do you mean impacts that take a long time to occur (like droughts) or that occur over the span of a person's lifetime (chronic/ accumulating impacts)?	Sentence edited for clariy.
Allison	Crimmins	142274	Text Region	14. Human Health		525	529	23	23	If you say in the next sentence "considering acclimatization or other adaptations", then do you need to say "without considering adaptation" here?	The text was revised.
Allison	Crimmins	142275	Text Region	14. Human Health		525	529	29	29	Suggest moving "in 2090" either after "deaths" or to the very end of the sentence to keep the flow of $ under 8.5 and $ under 4.5 easier to follow	Sentence edited.
Allison	Crimmins	142276	Text Region	14. Human Health		525	529	24	24	May want to say "both extreme heat and extreme cold" in the parentheses, as I didn't catch at first that this was talking about the net impacts of more heat events and less cold events, which is an important point	Sentence edited for clarity.
Allison	Crimmins	142277	Text Region	14. Human Health		525	529	20	20	Suggest rewording the section title here, as the other sections seem to be more about people, or at least the health impact, rather than the physical climate driver. For instance "Temperature related deaths"	Section title changed.
Allison	Crimmins	142278	Text Region	14. Human Health		525	529	33	33	What is an example of a high risk sector?	Changed to jobs with greater exposure to heat.
Allison	Crimmins	142279	Text Region	14. Human Health		526	530	1	1	What is the citation for $1 billion in hospitalization costs and premature deaths?	Text was edited for clarity.
Allison	Crimmins	142280	Text Region	14. Human Health		526	530	4	4	The rest of these sections are very quantitative- can this water quality section also be? For instance, can you say how much increase in harmful concentrations there will be? Or how much lower risks would be under 4.5?	Text was revised and quantifications added.
Allison	Crimmins	142281	Text Region	14. Human Health		527	541	30	30	Formatting error here	Fixed.
Allison	Crimmins	142282	Text Region	14. Human Health		527	518	8	8	Air pollution is not mentioned as a health threat in this opening paragraph. We suggest revising to "… quality and safety of air, food, and water…" to capture this important environmental risk factor.	Air pollution is an important health threat and is covered in a separate chapter.
Allison	Crimmins	142283	Text Region	14. Human Health		527	518	22	24	In addition to changes in average temperatures and temperature variability, change in minimum temperature is a key metric for health that should be included. Minimum temperature is important metric to consider because, in addition to heightened daytime exposures to extreme heat, elevated overnight temperatures reduce the body's natural ability to dissipate heat and reduce stress on the circulatory system. See: McGeehin, Michael A., and Maria Mirabelli. 2001. "The Potential Impacts of Climate Variability and Change on Temperature-related Morbidity and Mortality in the United States." Environmental Health Perspectives 109 (Suppl 2): 185	The text edited to refer to ambient temperature, capturing this point.
Allison	Crimmins	142284	Text Region	14. Human Health		527	519	1	1	The cooling benefit of green infrastructure is generally local. To make this point clear, the phrase should be revised to "… benefits by cooling ambient temperatures locally and attenuating storm water flows."	The text was deleted.
Allison	Crimmins	142285	Text Region	14. Human Health		527	519	6	6	The term "benefits of impacts" is misleading and vague, it should be revised to "benefits of climate change mitigation."	impacts' changed to health outcomes.
Allison	Crimmins	142286	Text Region	14. Human Health		527	519	12	14	The acronym "PWMs" is used in the figure legend, but the acronym is not referenced in the figure caption. Consider revising to "preliminary work maps (PWMs)." More generally, the meaning/use of preliminary work maps by FEMA is not mentioned in the figure caption.	Figure deleted.
Allison	Crimmins	142287	Text Region	14. Human Health		527	520	4	6	In addition to changes in average temperatures and temperature variability, change in minimum temperature is a key metric for health that should be included. Minimum temperature is important metric to consider because, in addition to heightened daytime exposures to extreme heat, elevated overnight temperatures reduce the body's natural ability to dissipate heat and reduce stress on the circulatory system. See: McGeehin, Michael A., and Maria Mirabelli. 2001. "The Potential Impacts of Climate Variability and Change on Temperature-related Morbidity and Mortality in the United States." Environmental Health Perspectives 109 (Suppl 2): 185	This paragraph was deleted.
Allison	Crimmins	142288	Text Region	14. Human Health		527	522	1	1	Another reference to add to this statement is: Li, Tiantian, Radley M. Horton, and Patrick L. Kinney. 2013. "Projections of Seasonal Patterns in Temperature- Related Deaths for Manhattan, New York." Nature Climate Change, May. https://doi.org/10.1038/nclimate1902.	The chapter is an update from the 2016 Climate and Health Assessment, which included this paper.
Allison	Crimmins	142289	Text Region	14. Human Health		527	522	10	11	This statement needs more explanation. Consider revising to, "Health risks may be higher earlier in the summer season when populations are less accustomed to experiencing elevated temperatures."	Change made.
Allison	Crimmins	142290	Text Region	14. Human Health		528	524	5	21	No mention of mental health risks particular to Alaskan Native populations, which is alluded to in line 38.	The text was revised to include tribal communities as a vulnerable population.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142291	Text Region	14. Human Health		528	528	3	5	The acronym "PWMs" is used in the figure legend, but the acronym is not referenced in the figure caption. Consider revising to "preliminary work maps (PWMs)." More generally, the meaning/use of preliminary work maps by FEMA is not mentioned in the figure caption.	Figure deleted.
Allison	Crimmins	142292	Text Region	14. Human Health		528	529	14	17	It seems beyond question that inclusion of mental health impacts and co-benefits associated with greenhouse gas reductions would (rather than "could") increase these estimates. Consider revising to better reflect the state of the science.	Sentence edited for clarity.
Allison	Crimmins	142293	Text Region	14. Human Health		528	531	16	23	Air pollution is not mentioned as a health threat in this paragraph. We suggest revising to "… quality and safety of air, food, and water…" to capture this important environmental risk factor.	Air pollution is an important health threat and is covered in a separate chapter.
Allison	Crimmins	142294	Text Region	14. Human Health		528	533	13	13	References to the RCPs should be made more clear by describing them as emissions scenarios, since many people are not familiar with the specifics of the RCPs. We suggest revising to "RCP 4.5 (low emissions) compared to RCP 8.5 (high emissions)."	Section edited to refer to lower and higher emission scenarios.
Allison	Crimmins	142295	Text Region	14. Human Health		528	534	2	2	References to the RCPs should be made more clear by describing them as emissions scenarios, since many people are not familiar with the specifics of the RCPs. We suggest revising to "RCP 8.5 (high emissions)."	Section edited to refer to lower and higher emission scenarios.
Allison	Crimmins	142296	Text Region	14. Human Health		528	534	16	18	References to the RCPs should be made more clear by describing them as emissions scenarios, since many people are not familiar with the specifics of the RCPs. We suggest revising to "RCP 4.5 (low emissions) compared to RCP 8.5 (high emissions)."	Section edited to refer to lower and higher emission scenarios.
Allison	Crimmins	142297	Text Region	14. Human Health		529	527	12	13	Figure 14.2 shows hospitals in the 100-year and 500-year floodplain in NYC not just the 100-year floodplain.	Figure and replaced with another focusing on potential inundation following hurricanes of varying strengths.
Allison	Crimmins	142298	Text Region	14. Human Health		529	533	2	4	Could you provide references for "There is high confidence that with sufficient human and financial resources, adaptation policies, and programs can reduce the current burden of climate-sensitive health outcomes."? Collectively we have only just touched the tip of the iceberg on this issue when it comes to our most vulnerable populations. There are many factors at play.	References provided.
Allison	Crimmins	142299	Text Region	14. Human Health		529	523	13	29	Comment. Chapter 14, page 523. ‰ÛÏWater-Related Illnesses and Death‰Û In the section, Water-Related Illnesses and Death in Chapter 14, you might consider adding two additional citations describing the growing evidence regarding the relationship between diarrheal diseases, temperature and precipitation (described below). In light of the evidence in these peer-reviewed publications, you might also consider stating directly that heavy rainfall, flooding and high temperatures have been linked to increases in enteric disease. Publication 1. My research group published a systematic review of the literature on the relationship between diarrheal diseases and four meteorological conditions that are expected to increase with climate change: ambient temperature, heavy rainfall, drought, and flooding (Levy et al. 2016). We reviewed 141 articles, evaluated the weight of the evidence, potential sources of bias, and the biological plausibility of observed associations. The key areas of agreement include 1) a positive association between ambient temperature and diarrheal diseases, with the exception of viral diarrhea, and 2) an increase in diarrheal disease following heavy rainfall and flooding events. Insufficient evidence was available to evaluate the effects of drought on diarrhea. These associations were observed in low-, middle- and high-income countries, including the United States. We found considerable evidence from the literature describing biophysical and behavioral explanatory mechanisms to support the biological plausibility of the above climate-diarrhea associations. Publication 2. We additionally conducted a meta-analysis of the subset of 26 manuscripts from our systematic review that provided quantitative estimates of the association between temperature and diarrheal diseases (Carlton et al. 2016). This analysis showed the relationship between temperature and diarrhea varies by pathogen taxa. We found a positive association between ambient temperature and all-cause diarrhea (incidence rate ratio (IRR) 1.07; 95% confidence interval (CI) 1.03, 1.10) and bacterial diarrhea (IRR 1.07; 95% CI 1.04, 1.10), but not viral diarrhea (IRR 0.96; 95% CI 0.82, 1.11). In light of the above, you might consider stating directly that heavy rainfall, flooding and high temperatures have been linked to increases in enteric disease. Alternatively, you could add the citations described above, to those listed on p. 523, lines 18 & 19. References Carlton EJ, Woster AP, DeWitt P, Goldstein RS, Levy K. A systematic review and meta-analysis of ambient	References reviewed and content added
Allison	Crimmins	142300	Text Region	14. Human Health		529	518	6	8	This chapter needs to be more explicitly linked to the air quality chapter. Changes in air quality resulting from climate change is one of the larger contributors to health impacts from climate change. Acknowledging that here and then referring the reader to Chapter 13 would be appropriate. Otherwise, someone reading this chapter but not the air quality chapter might miss the point that air quality changes are a driver for climate health impacts. The existing sentence does not even acknowledge air quality impacts on health. The first real specific mention of air quality impacts in on page 520, and there it redirects to Chapter 13 without giving any sense of the magnitude of the health impact relative to other health impacts of climate change.	The beginning of the chapter refers the reader to the air quality chapter.
Allison	Crimmins	142301	Text Region	14. Human Health		529	521	7	8	Please provide an example of a new strategy for working with children and adolescents in all phases of a disaster.	That sentence and the associated reference have been deleted from the report
Allison	Crimmins	142302	Text Region	14. Human Health		529	522	31	32	In the extreme temperatures section, please provide text linking to the air quality chapter, which discusses how high temperatures can exacerbate poor air quality and also increase responses to poor air quality.	Sentence added.
Allison	Crimmins	142303	Text Region	14. Human Health		529	522	13	20	Please include some text about the importance of urban adaptation to either exacerbating or mitigating the risks from increased range of disease vectors. For example, Vazquez-Prokopec et al (2016) highlight that housing improvements (screens, reductions in areas where standing water collects, etc.) can be effective ways of addressing mosquito borne risks. Gonzalo M. Vazquez-Prokopec, Audrey Lenhart, Pablo Manrique-Saide; Housing improvement: a novel paradigm for urban vector-borne disease control?, Transactions of The Royal Society of Tropical Medicine and Hygiene, Volume 110, Issue 10, 1 December 2016, Pages 567--569, https://doi.org/10.1093/trstmh/trw070 WHO. 2017. Keeping the vector out - Housing improvements for vector control and sustainable development: Policy brief. http://www.who.int/social_determinants/publications/keeping-the-vector-o…	Reference to Vazquez-Prokopec 2017 was inluded in the section on vector-borne diseases.
Allison	Crimmins	142304	Text Region	14. Human Health		529	524	5	21	Please connect this discussion with the discussion on page 521. In the discussion on 521, other mental health effects are highlighted based on additional references, e.g. Vins et al 2015 and Friel et al 2014.	The text was revised to include vulnerable populations and impacts from drought.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142305	Text Region	14. Human Health		529	524	33	34	Typo here, need to either add the word 'that' before the first 'are' in the sentence, or add the word 'and' directly before the second 'are' in the sentence. Thus should read either 'Recent research shows that low-income communities and communities of color that are often already overburdened with poor environmental conditions are disproportionately affected by, and less resilient to, the health impacts of climate change' or 'Recent research shows that low-income communities and communities of color are often already overburdened with poor environmental conditions and are disproportionately affected by, and less resilient to, the health impacts of climate change'	Sentence edited for clarity.
Allison	Crimmins	142306	Text Region	14. Human Health		529	525	12	23	Please add some discussion of how alterations to the built environment can mitigate increased risks from vector borne disease. For example, Vazquez-Prokopec et al (2016) highlight that housing improvements (screens, reductions in areas where standing water collects, etc.) can be effective ways of addressing mosquito borne risks. Gonzalo M. Vazquez-Prokopec, Audrey Lenhart, Pablo Manrique-Saide; Housing improvement: a novel paradigm for urban vector-borne disease control?, Transactions of The Royal Society of Tropical Medicine and Hygiene, Volume 110, Issue 10, 1 December 2016, Pages 567--569, https://doi.org/10.1093/trstmh/trw070 WHO. 2017. Keeping the vector out - Housing improvements for vector control and sustainable development: Policy brief. http://www.who.int/social_determinants/publications/keeping-the-vector-o…	Reference to Vazquez-Prokopec 2017 was inluded in the section on vector-borne diseases.
Allison	Crimmins	142307	Text Region	14. Human Health		529	529	8	19	Please cross-reference this discussion with the air quality chapter 13. Their 3rd key message addresses this subject.	Reference to the air quality chapter added.
Allison	Crimmins	142308	Text Region	14. Human Health		529	533	17	18	The text for this line is the following: "The economic benefits of greenhouse gas emissions to the health sector could be on the order of hundreds of billions of dollars annually by the end of the century." A word is missing. The text should be: ‰ÛÏThe economic benefits of greenhouse gas emissions [reductions] to the health sector‰Û_ ‰Û	Sentence edited for clarity.
Allison	Crimmins	142309	Text Region	14. Human Health		530	533	1	4	This sentence seems vague to me. Can ‰ÛÏsufficient human and financial resources‰Û be measured or quantified? Also, can the amount that the current burden would be reduced be quantified? It would be nice to see how much effort and money is required to make a change, and how large that change would be.	It is very difficult to be explict given the thousands of health departments across the nation. Vulnerability and adaptation assessments provide the information needed at local to state levels to determine resources required and extent to which health burdens could be reduced by specific adaptation options.
Allison	Crimmins	142310	Text Region	14. Human Health		530	518	16	16	Use of "could" does no really convey useful information. Good practice would be to use the lexicon. So perhaps replace "could save" by "would likely be preventing"	Key message was rephrased.
Allison	Crimmins	142311	Text Region	14. Human Health		531	518	15	17	I don't understand why this is saying only "thousands" instead of some much higher number given how much climate change is projected for the end of the century if no action is taken. And what does "reducing the severity of climate change" mean--is this referring to mitigation and/or to adaptation and by how much would the reduction be and from which scenario? Sea level rise will also be displacing millions by then or soon thereafter. I'm just not clear on what actions would be saving those lives, etc.	The numbers are referenced later in the chapter; 'severity' changed to 'extent'.
Allison	Crimmins	142312	Text Region	14. Human Health		531	525	11	11	It seems to me that a better title would be something like "Benefits of Enhancing Resilience to the Health Risks of Climate Change"--somehow saying "Adapting" seems to me to basically just accommodate (well, yes, the death rate goes up--that is just the way it is) rather than be proactive in taking steps to reduce the risks.	Adaptation is the term of art used for managing the risks of climate change.
Allison	Crimmins	142313	Text Region	14. Human Health		531	528	7	10	See previous comments. I'd also better indicate that the effort needs to go on all through the century. Indeed, steps that have been taken to date (e.g., having moved off of CFCs, etc. which are powerful GHGs and would have had temperatures well above present values are already contributing to the saving of lives. And then there has been the saving from all of the efficiency and conservation efforts to limit GHG emissions that have also helped slow climate change. So, I do think this point would benefit from some revision and clarification.	It appears the comment refers to the CSSR for physical scientific basis of emissions, concentrations, and continuing climate change (e.g. temperature change). The rest of the comments are outside the remit of the health chapter. See also Key Message 2 of this chapter for information on adaptation measures. Evaluation of impacts of reducing CFCs is outside the remit of this chapter.
Allison	Crimmins	142314	Text Region	14. Human Health		531	528	11	12	Perhaps it would help here to save "Further reductions in ìà" given some have already been done. Also, however, it needs to be said that the cuts need to be substantial--just doing little bits won't really help much. Given the international pledge to get to zero emissions in the second half of the century (a good start), perhaps what to say here is "Eliminating greenhouse gas emissions over coming decades would provide substantial benefits for the health of Americans and all the world's people in the near and long term." So, there needs to be an indication about the size of the needed reduction, and just focusing on Americans seems quite provincial.	Sentence changed to start with 'further'. The rest of the comment is outside the remit of the health chapter.
Allison	Crimmins	142315	Text Region	14. Human Health		531	518	24	27	Including the aspect of multiple time scales in this sentence is slightly confusing. It would be helpful to add an additional sentence that defines these time scales.	References to timescales was removed throughout the chapter.
Juanita	Constible	142536	Text Region	14. Human Health		531	519	6	8	This sentence could be worded more clearly. Perhaps ‰ÛÒ ‰ÛÏBecause some health impacts are difficult to quantify (list examples of these impacts), the actual benefits of a lower emission pathways would likely be even greater.‰Û It would also help to define what is meant by ‰ÛÏco-benefits associated with reducing greenhouse gases.‰Û	Sentence edited for clarity.
Juanita	Constible	142537	Traceable Account	14. Human Health		532	531	4	4	This does not appear to be true. By a quick scan of your references, almost 30% of the citations are from 2014 and before. It is unclear how many of the 2015s came before the fall cut off, but that would increase this estimate. It is appropriate that older citations would be used if they are seminal works, or used in the sections of this chapter that were not in the other report (e.g. adaptation, economics). I would suggest moving that point from lines 12-14 up here. But in the section for Key Message #1, older references seems less appropriate for providing an update from the 2016 report. Furthermore, there are a number of key citations (provided in other comments) that have been published since 2015 that the authors have missed.	Changed to references not included in the 2016 Climate and Health Assessment; references updated.
Juanita	Constible	142538	Traceable Account	14. Human Health		532	531	8	8	What does "health authors" mean?	"health" deleted to clarify we interacted with authors in other chapters of the NCA4
Juanita	Constible	142539	Traceable Account	14. Human Health		532	531	3	14	This traceable account section does not describe the methods used to select authors, nor the decisions made about the scope of the chapter. This would benefit from a description of how the authors decided upon the key messages, what topics are in other chapters, like air quality or adaptation, and what topics were considered out of scope. See other chapters for examples.	The process for the chapter is described. Author selection was added (based on expertise).
Juanita	Constible	142540	Traceable Account	14. Human Health		532	531	27	27	The phrase "indicating sensitivity to weather patterns" is very odd. How does sea level rise fit into this? This phrase is unnecessary and potentially confounding.	The sentence mentions weather variables not sea level rise.
Juanita	Constible	142541	Traceable Account	14. Human Health		533	531	35	37	This sentence is good, but could be interpreted as something new- some new finding that was just discovered in 2017. To better describe the evidence, I suggest the authors use descriptors like "recent research confirms the large body of research and wide consensus that…"	Sentence edited to "Recent research confirms projections …."

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142542	Traceable Account	14. Human Health		533	532	2	6	The intention of this paragraph is very good, but I did find the part about "creating uncertainty in the magnitude and pattern of projected risks" awkward. First, it makes it sound like uncertainty will increase in the coming decades, when it should decrease with further research. Second, non-climate factors don't create uncertainty- the uncertainty is already there. And lastly, it was unclear what risks were being discussed. In the last sentence is says "Certainty will be higher". The use of the words "will be" imply that uncertainty will decrease in the future, but the reader is left wondering why? Why isn't uncertainty lower in near term projections right now? Do the authors mean "Certainty is higher in near-term projections…"?	Sentence edited for clarity. The level of uncertainty may or may not decrease with additional research. Climate sensitivity has not decreased with significant research investment. The penultimate sentence edited to "Inadequate consideration of these factors create uncertainties in projections of the magnitude and pattern of health risks over coming decades. " The last sentence does say there is greater certainty in near-term projections.
Juanita	Constible	142543	Traceable Account	14. Human Health		533	532	8	10	While I agree with the likelihood and confidence statements in this sentence, it is unclear why the topic of adaptation is in here and not mitigation. It seems that "without additional adaptation efforts" should be deleted, as it is covered elsewhere. But if the authors feel the need to keep it here, then mitigation should also be included: "without additional mitigation or adaptation efforts". I would strongly suggest dropping adaptation from this sentence, as health RISKS will increase under climate change with or without adaptation, though adaptation may help people avoid health IMPACTS. Even if adaptation reduced some risks, it would not reduce all of them, for everyone, everywhere. Only mitigation would do that.	Mitigation added to the sentence. Adaptation and mitigation could reduce future vulnerability and exposure, which would reduce risk.
Juanita	Constible	142544	Traceable Account	14. Human Health		533	532	11	14	In the bold text it says adaptation reduces risks, but in the key message it says adaptation reduces impacts, in the form of number of injuries, illnesses, and deaths. Also, why would adaptation only reduce the number of these impacts and not the severity or frequency of occurrence? It seems possible that the severity of illnesses may be lessened by adaptation.	Sentence edited for accuracy and clarity.
Juanita	Constible	142545	Traceable Account	14. Human Health		533	532	18	26	The authors state several times that "there is evidence that…". But this section is not called "Existence of evidence base" but "Description of evidence base". Suggest looking at other chapters for examples of good descriptors of the amount, quality, consensus, etc. of evidence base and revising accordingly. This will help readers understand why this message has high confidence. As is, this paragraph just re-states the chapter text with the word "evidence" thrown in a few times. Also, this paragraph focuses on the effectiveness of adaptation programs, but does not describe the evidence for the part of the key message that claims it will "reduce the number of injuries, illnesses, and deaths" or impart "beneficial health consequences". Please add and describe the literature that supports this. Some of these references are, for some reason, in the following section on description of confidence and likelihood.	Paragraph edited to focus on evidence.
Juanita	Constible	142546	Traceable Account	14. Human Health		533	533	2	4	It is unclear why "sufficient human and financial resources" is introduced here when it is not part of the key message or described in the Description of Evidence Base section. Also, since two confidence levels were provided in the key message, two "high confidence" descriptors should be here.	Adaptation policies and programs without sufficient resources, human and financial, will fail. Therefore, this needs to be stated. Change made on number of confidence statements.
Juanita	Constible	142547	Traceable Account	14. Human Health		534	534	20	7	This description of evidence section of the traceable account just repeats what is in the chapter and doesn't describe the evidence. However, the first paragraph page 533 lines 11-19 does describe the evidence very well. I would suggest cutting all this text and either actually describe the evidence for each topic area or just put the topic header and related citations, for example: "Heat: Oleson et al 2015; Anderson et al 2016…"	The traceable account for this key message was extensively edited to provide the evidence.
Juanita	Constible	142548	Traceable Account	14. Human Health		534	534	9	14	May want to add that these economic estimates do not take into account healthcare costs or impacts on the healthcare system.	Relevant text has been added that reflects this commenters input.
Juanita	Constible	142549	Traceable Account	14. Human Health		534	534	16	21	In this paragraph, there are likelihood statements, but the key message above does not have these likelihood statements included. In addition, I would disagree with the "as likely as not" estimate for labor. This is a sector that actually has multiple references, is heat based, and doesn't measure health outcomes so much as labor hours where people are unable to work, thus reducing the uncertainties that would come with people's sensitivity or other factors that play into whether someone experiences an injury or illness. So labor would have even greater likelihood than, say, west Nile disease.	Text was revised for clarity.
Juanita	Constible	142550	Whole Chapter	14. Human Health		534				Thanks for this excellent summary of the health impacts of climate change. Clearly a lot of hard work has gone into this document. I think that the respiratory (and mental health) effects of increasing wildfires due to drought deserve mention. Interpersonal violence has been show to increase with increasing temperatures as well. Finally, the co-threat of burning fossil fuels and resultant air pollution on both climate change and human health (asthma, chronic lung disease, cardiovascular disease and stroke) deserve consideration. Thanks again for your work! Val Wangler, MD Zuni, New Mexico	There is limited literature since the 2016 Climate and Health Assessment on these topics. The Air Quality chapter includes discussions of the health risks of changing air quality. Health co-benefits are discussed in the last key message.
Tomi	Vest	142779	Whole Chapter	14. Human Health		541				Because this chapter needs to cut a lot of text, I would strongly suggest having only two text boxes. Though Text box 14.1 is well written and good information, it was also covered in the 2016 climate assessment, also in a text box. Suggest deleting that one. Text box 14.3 is not relevant to a climate assessment and the figure is poorly conceived. Suggest deleting that one. Then, combine the information on healthcare facilities from the end of Key Message #2 text section and box 14.4 into one text box on hospitals. Thereby leaving one text box on Zika and one on hospitals- both topics not covered in the 2016 report.	The chapter was extensively edited to shorten and clarify the content. The text boxes were changed.
Ken	Moraff	143171	Whole Chapter	14. Human Health						This chapter is a good start but would benefit from several things. First, many pages need to be cut down. In several places, such as key message 1 section, the text reads more like a laundry list than a comprehensive story told to the audience so that they walk away with just the most important messages. The text boxes are nice, but there are too many of them. Key message 2 section is well written but too long and the figures are very poorly conceived. Instead of adding or expanding on the messages of the chapter, they take away from the main points. This space could be better used by including figures that could be helpful to the NCA audience (general public) in communicating key impacts of climate change on human health. Think about the type of figures that this chapter's audience could use in their newsletters, social media, or other communications. It is not an old figure that already exists and has been in circulation for years, nor is it a conceptual box-and-arrow diagram with no concrete information. Most importantly, the chapter needs a thorough literature review to support the findings with current peer reviewed sources that are relevant to the sentences to which they are cited. It is not evident that this was done, nor that the references that are cited were checked for their appropriateness, as many were completely irrelevant to the sentences to which they were attached. This does not represent the level of professionalism expected of a national assessment. Finally, the traceable accounts need more attention so that they do not merely repeat what is already in the chapter-- see other chapters for how this is done.	The chapter was extensively edited to shorten and clarify the content. The text boxes were changed, and references were checked.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Ken	Moraff	143172	Whole Chapter	14. Human Health						Please review Munro et al 2017 (https://www.sciencedirect.com/science/article/pii/S2542519617300475). Though this study takes place in the UK, it may have some relevant and new information about climate change related flooding and impacts on mental health outcomes (and you already cite Waite et al 2017 which is UK-based). In fact, there is an interesting conversation between the Munro authors and US scientists, who observed similar results in New York after Sandy. The US authors have revisited their surveyed patients to provide an update on mental health impacts. See: https://www.sciencedirect.com/science/article/pii/S2542519617301389 Please also review and consider citing if appropriate (UK citations for flooding and mental health impacts): Milojevic et al 2017 (http://jech.bmj.com/content/early/2017/08/31/jech-2017-208899?utm_source… Tempest 2017 (https://academic.oup.com/eurpub/article/27/6/1042/4566124)	References reviewed and content added
Carole	LeBlanc	143197	Whole Chapter	14. Human Health						Please review and consider citing Prudent et al 2016 (https://digitalcommons.unl.edu/cgi/viewcontent.cgi?referer=https://schol…) to see if it is a relevant citation to add to sections on adaptation or environmental justice.	We were unable to locate this reference with the information provided.
Social Science	Coordinating Committee	143230	Whole Chapter	14. Human Health						Please review and consider citing, if appropriate, these 2016-and-newer studies on climate and food security: Springmann et al 2016. http://ebrary.ifpri.org/cdm/singleitem/collection/p15738coll5/id/5295 Hasegawa et al 2016. https://link.springer.com/article/10.1007/s10584-016-1606-4	This paper was added.
Social Science	Coordinating Committee	143231	Whole Chapter	14. Human Health						Please review and consider citing Canyon et al 2016 (https://www.cambridge.org/core/journals/disaster-medicine-and-public-hea…). This citation may be relevant for the vectorborne disease section, or for recommendation to the Hawaii/Pacific Islands chapter.	Review of the suggested citation indicated it was not appropriate for inclusion in the chapter.
Social Science	Coordinating Committee	143232	Whole Chapter	14. Human Health						Please review and consider citing McIver et al 2016 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5089897/) for climate health impacts in Pacific Islands, or potentially to recommend inclusion in the Hawaii/Pacific Islands chapter.	As noted in the comment, this publication is more relevant for the chapter on the Pacific.
Social Science	Coordinating Committee	143233	Whole Chapter	14. Human Health						Please review and consider citing Wu et al 2016 (http://www.sciencedirect.com/science/article/pii/S0160412015300489) and Liang et al 2017 (http://www.sciencedirect.com/science/article/pii/S0160412016309758) for information on climate change and water or vector borne disease.	Review of the suggested citation indicated it was not appropriate for inclusion in the chapter.
Social Science	Coordinating Committee	143234	Whole Chapter	14. Human Health						Please review and consider citing Butterworth et al 2017 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5381975/) for information on climate change and dengue in the Southeast US	Reference to Butterworth et al. was included in the section on vector-borne diseases.
Social Science	Coordinating Committee	143235	Whole Chapter	14. Human Health						Please review and consider citing Linthicum et al 2016 (https://www.ncbi.nlm.nih.gov/books/NBK390440/) for information on climate and vectorborne disease. This may be relevant to the box on El Nino and Zika.	Reference to Linthicum et al. 2016 was inluded in the section on vector-borne diseases.
Social Science	Coordinating Committee	143236	Whole Chapter	14. Human Health						Please review and consider citing, if appropriate, these 2016-and-newer sources on climate and vector bourne diseases: Ogden et al 2016. http://www.sciencedirect.com/science/article/pii/S1471492216300320 Obenauer et al 2017. https://dc.etsu.edu/etsu-works/24/	Reference to Ogden et al. was included in the section on vector-borne diseases.
Social Science	Coordinating Committee	143237	Whole Chapter	14. Human Health						Please review and consider citing Caminade et al 2014 (http://www.pnas.org/content/111/9/3286.long) for information on malaria distribution into the United States	Review of the suggested citation indicated it was not appropriate for inclusion in the chapter.
Social Science	Coordinating Committee	143238	Whole Chapter	14. Human Health						Though this is mostly based in Europe, please review and consider citing O'Dwyer et al 2016 (https://www.researchgate.net/profile/Jean_Odwyer/publication/265651315_T…) for information on climate change and water borne disease	Review of the suggested citation indicated it was not appropriate for inclusion in the chapter.
Social Science	Coordinating Committee	143239	Whole Chapter	14. Human Health						Please review and consider citing these 2016-and-newer sources on Vibrio and climate change: Baker-Austin et al 2017 (http://www.aoml.noaa.gov/phod/CellPress_Baker-Austin_Trinanes.pdf) Semenza et al 2017 (https://ueaeprints.uea.ac.uk/65361/1/Published_manuscript.pdf) Froelich et al 2016 (http://rstb.royalsocietypublishing.org/content/371/1689/20150209) Muhling et al 2017 (http://onlinelibrary.wiley.com/doi/10.1002/2017GH000089/full)	References reviewed and content added
Carole	LeBlanc	143584	Whole Chapter	14. Human Health						Please review and consider citing Schulte et al 2016 (http://oeh.tandfonline.com/doi/full/10.1080/15459624.2016.1179388#.Wl56V…) Kiefer et al. 2016 (https://scielosp.org/scielo.php?script=sci_arttext&pid=S1020-49892016000…) for information on climate change and worker safety, and potential adaptation implications	The references were included in the chapter.
John	Fleming	143644	Whole Chapter	14. Human Health						Please review and consider citing, if appropriate, these 2016-and-newer sources on climate change and food/water borne disease (especially Salmonella and Campylobacter): Sterk et al 2016. http://www.sciencedirect.com/science/article/pii/S0043135416301324 Stephen et al 2017. https://eprints.qut.edu.au/115055/ Hellberg et al 2016. http://www.tandfonline.com/doi/abs/10.3109/1040841X.2014.972335 Adriana et al. 2017. http://online.liebertpub.com/doi/abs/10.1089/fpd.2016.2201 Veenema et al 2017. https://www.ncbi.nlm.nih.gov/pubmed/28834176 Milazzo et al 2017. https://www.ncbi.nlm.nih.gov/pubmed/28693637 Yun et al 2016. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4914963/ Lake 2017. https://ehjournal.biomedcentral.com/articles/10.1186/s12940-017-0327-0	The publications were reviewed and appropriate citations added.
Sam	Kuiper	143666	Whole Chapter	14. Human Health						Please review and consider citing, if appropriate, these 2016-and-newer sources on climate change and environmental justice/ health issues: Kabisch et al 2017. https://link.springer.com/chapter/10.1007/978-3-319-56091-5_12 (potential citation for the adaptation section, to bring in EJ topics to the co-benefits discussion) Vicker et al 2016. http://www.tandfonline.com/doi/abs/10.1080/08941920.2015.1045644?journal… (potential citation for tribal section, or Tribal chapter) Gutierrez et al 2016. http://www.mdpi.com/1660-4601/13/2/189/htm (climate justice in rural southeastern US) Forman et al 2016. https://www.collabra.org/articles/10.1525/collabra.67/ Nicholas et al 2017. http://onlinelibrary.wiley.com/doi/10.1111/jnu.12326/full Ziegler et al. 2017. http://www.primarycare.theclinics.com/article/S0095-4543(16)30074-4/pdf	All suggested references were included except for the reference from Zeigler that does not add any additional or new information.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Sam	Kuiper	143669	Whole Chapter	14. Human Health						Please review and consider citing, if appropriate in either this chapter (section on extremes) or the air quality chapter, these 2016-and-newer sources on climate change, wildfires, and health: Liu et al 2016. http://iopscience.iop.org/article/10.1088/1748-9326/11/12/124018 Liu et al 2016b. https://link.springer.com/article/10.1007/s10584-016-1762-6 Cisneros et al 2017. https://link.springer.com/chapter/10.1007/978-3-319-61346-8_8 Knorr et al 2017. https://www.atmos-chem-phys.net/17/9223/2017/ Adelaine et al. 2017. https://doi.org/10.1017/S1049023X17006586 (may be appropriate for the adaptation box on preparing hospitals for climate impacts) Silva et al. 2017. https://www.nature.com/articles/nclimate3354 Reid et al. 2016. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5010409/ Reid et al 2016b. http://www.sciencedirect.com/science/article/pii/S001393511630247X Black et al 2017. https://www.sciencedirect.com/science/article/pii/S1382668917302478	The health risks of air quality are assessed in Chapter 13.
Mitch	Knoor	143920	Whole Chapter	14. Human Health						Please review and consider citing, if appropriate, these 2016-and-newer sources on climate change, hurricanes, and health (mostly mental health): Bejamin 2016. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4941976/ Gifford 2016. http://web.uvic.ca/~esplab/sites/default/files/Gifford%20%26%20Gifford%2… Burger et al, 2017. https://link.springer.com/article/10.1007/s11252-017-0678-x Ahmed and Mernish, 2017. http://www.travelmedicinejournal.com/article/S1477-8939(16)30211-3/fulltext	Review of the suggested citation indicated it was not appropriate for inclusion in the chapter
Michael	MacCracken	144396	Whole Chapter	14. Human Health						Please review and consider citing, if appropriate, these 2016-and-newer sources on climate change, extreme heat, and health: Giorgini et al 2017. http://www.ingentaconnect.com/content/ben/cpd/2017/00000023/00000022/art… Barreca et al 2016. http://www.journals.uchicago.edu/doi/abs/10.1086/684582 Cil and Cameron. 2017. https://pdfs.semanticscholar.org/e1d2/1e7a184aa486f1f247134dd8046603781c… Mitchell et al. 2016. http://iopscience.iop.org/article/10.1088/1748-9326/11/7/074006/meta Schmeltz et al. 2016. https://link.springer.com/article/10.1007/s10584-016-1747-5 Diem et al 2017. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0177937 Glaser et al 2016. http://cjasn.asnjournals.org/content/11/8/1472.short Gronlund et al 2016b. https://link.springer.com/article/10.1007/s10584-016-1638-9 Petitti et al. 2016. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4749077/ Mora et al 2017. https://www.nature.com/articles/nclimate3322 Weinberger et al 2017. https://www.ncbi.nlm.nih.gov/pubmed/28750225 Gasparrini et al 2017. http://www.thelancet.com/pdfs/journals/lanplh/PIIS2542-5196(17)30156-0.pdf Ross et al. 2017. https://www.sciencedirect.com/science/article/pii/S0013935117317565	We reviewed the suggested publications and incorporated the most relevant.
Michael	MacCracken	144397	Whole Chapter	14. Human Health						Though there may only be a few papers on this topic currently, it would represent a significant advancement if this chapter could talk about overlapping health impacts, or impacts of multiple stressors at the same time. The 2016 report did not do much of that. At least, this could be mentioned as a source of uncertainty in the traceable account for key message 1.	Overlapping health risks is now mentioned in the Traceable Account.
Michael	MacCracken	144398	Whole Chapter	14. Human Health						This chapter on Human Health deals largely with the impacts from water and water related health risks. However, it should also look more closely at the impacts from air quality. Although Chapter 13 deals with Air Quality, which also could be enhanced with the addition of the impacts on indoor air, this chapter should add that combustion is a major health risk and levels from combustion products can become more concentrated due to occupants' actions in response to climate change impacts/extreme weather events. For example, a power outage could result in the use of portable generators that burn fossil fuels, emitting carbon monoxide which will further compromise the indoor air quality of that indoor environment.	This chapter includes the health risks of climate change from a wide range of health outcomes, except those covered in Chapter 13. Please refer to Chapter 13 for issues related to air quality.
Michael	MacCracken	144399	Whole Chapter	14. Human Health						The recently updated report, Death by Degrees: The Health Crisis of Climate Change in Maine, by Physicians for Social Responsibility (PSR) provides a number of local impacts of climate change on human health and the environment which may be of interest to the Reader: http://www.psr.org/chapters/maine/resources/death-by-degrees.html	The chapter focuses on peer-reviewed publications.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144400	Whole Chapter	14. Human Health						Mitchell Knoor- Environmental Chemistry I chose to study chapter 14 on human health Comment 1 KM2- The first part of KM2 talks about how to implement policies that prepare for climate change risks. These policies are aimed at reducing the number of climate-change-related injuries and sicknesses. The second part of KM2 talks about how to explicitly add climate change risks into the building of infrastructure in the future. Although both parts of KM2 are important for the future, these two topics do not really seem very related. The first part seems to be focusing more on legislation and political change while the second part seems to be focusing more on building design. It doesn‰Ûªt really make a lot of sense to have these two together in the same key message since they don‰Ûªt appear to be related. Combining them could potentially make it so neither part is effectively implemented. So my question is: Why are both of these ideas in the same key message and not separate key messages? Comment 2 Infrastructure planning as it relates to climate change seems to be mostly focused on the distant future. Very little talk is focused on how to make changes to existing buildings. Page 525 line 35 discuses how to make changes to infrastructure from climate change projections ‰ÛÏover a scale of several decades.‰Û Climate change will certainly be a problem in the future, but it is also a problem now. It seems like there is a need to quickly make changes to buildings already in existence. The effects of climate change are seen in the present as well and plans should be put in place to make current buildings more sturdy. The lack of discussion on changes in the near future seems to be an omission that could negatively impact others. So my question is: Why is there little emphasis on short term fixes to current infrastructure in order to make it more climate-change resistant? Comment three Page 528 (line 19)-pg 529 (line 5) discusses the benefits of hospitals themselves reducing greenhouse gas emissions and being more energy-efficient. Obviously, this is a very important endeavor to pursue. Wasteful energy use and emissions harmful to the environment should be reduced as much as possible. However, potential drawbacks and how to accomplish this in a safe and effective manner is not mentioned in this section. Changing how energy is used in a hospital will likely not be perfectly seamless. Malfunctions could possibly	The first sentence in this key message states "Individuals, communities, public health departments, healthcare facilities, organizations, and others are taking action to reduce health vulnerability to current climate change and to increase resilience to the risks projected in coming decades" to make clear that adaptation is needed from individual to infrastructure. The information on infrastructure adaptation was moved to a new text box on healthcare.
Julie	Maldonado	144755	Whole Page	14. Human Health						There is a qualiative and important difference between direct impacts (like from increased fungal growth) vs mediated effects, e.g. income related worsening of mental health impacts. To what extent does the literature provide understanding of why impacts on household property and finances causes physical and mental health impacts? Is it do to a lack of a safety net or insurance? Is it because of reduced availability of money for other health care needs? Does this hold true regardless of income levels or housing price? This is important because policies should be directed at the underlying causes. I would move the sentence at the end of the section (lines 25-29) up to the first paragraph (before line 10), and frame the discussion within the conceptual causal model used by Vins et al 2015. It does a good job of laying out the complex causal pathways and highlights direct vs indirect effects.	The text box provides a high level assessment, focused on the health risks of climate change. A detailed discussion along the lines suggested is beyond the purvue of this chapter.
Rebecca	Laurent	144756	Whole Page	14. Human Health						The construction of the section is confusing. You have temperature extremes as a subsection, but then you have labor productivity as a separate subsection, but it is in fact a subset of the impacts from extreme temperatures. In addition, you should cross-reference to the air quality chapter (13) which dicusses the air quality related impacts from temperature extremes.	The subsection headings were edited for clarity. A cross-reference was made to the air quality chapter.
Elizaveta Barrett	Ristroph	140907	Text Region	15. Tribal and Indigenous Communities		552	552	14	14	not clear what "federally listed animals and plans" means here, should it be "species listed under the Endangered Species Act"?	We have made this suggested edit.
Elizaveta Barrett	Ristroph	140908	Text Region	15. Tribal and Indigenous Communities		553	553	16	17	I could be wrong but I have not seem walrus skins used for clothes (have seen them used for boats)--could be more accurate to replace "walrus skins and tusks" with "skins, furs, and walrus tusks"	We have made this suggested edit.
Elizaveta Barrett	Ristroph	140909	Text Region	15. Tribal and Indigenous Communities		557	557	19	22	Consider adding a line or a footnote after the first sentence in the paragraph that says something like "But this does not apply to 228 federally recognized tribes in Alaska who lack reservations that are held in trust." Possible citation could be Ristroph, E.B. 2017. "When Climate Takes a Village: Legal Pathways Toward the Relocation of Alaska Native Villages." Climate Law 7(4): 259-289.	This section and the State of the Sector section have been substantially revised to ackowledge the complicated array of land jurisdiction statuses, recognitions, and authorities bestowed upon tribes in the US and how these impact adaptive capacity, however we refrain from naming a specific place to avoid listing each place with a unique status, which would overwhelm our space limitations. The citation listed has been cited in the section's discussion of slow-onset disasters.
Elizaveta Barrett	Ristroph	140910	Text Region	15. Tribal and Indigenous Communities		558	558	9	12	This could be misleading because there are federal programs designed to prevent disasters and address erosion--it's just that the federal Stafford Act (which provides for federal disaster declarations) does not provide for slow-moving disasters other than drought. Suggested rewrite of second sentence in this paragraph: "Presidential disaster declarations, which yield large amounts of federal funding, only apply after sudden disasters." I recommend citing the actual law (42 U.S.C. â¤ 5122) rather than a journal article. You could add, "More limited funding is available to address erosion outside of disaster declarations." Possible citation could be Ristroph, E.B. 2017. "When Climate Takes a Village: Legal Pathways Toward the Relocation of Alaska Native Villages." Climate Law 7(4): 259-289.	The text has been edited to incorpoate the commenter's perspective, and the citation suggested by the commenter has been cited in the section's discussion of slow-onset disasters.
Elizaveta Barrett	Ristroph	140911	Figure	15. Tribal and Indigenous Communities	1	558				The photo from Shorezone.org shown on the right is of Kivalina, not Shishmaref	We have made this correction.
Elizaveta Barrett	Ristroph	140912	Text Region	15. Tribal and Indigenous Communities		559	559	2	2	it may be an overstatement to suggest that Indigenous peoples are considering relocation in every region of the USA--I am only familiar with planned relocation in Louisiana, the Pacific Northwest, and Alaska. Suggest deleting the phrase "In nearly every region of the United States"	We have made edits to incorporate the commenter's perspective. We have identitied examples of relocation in Alaska (see Ch. 26: Alaska); the Southeast (see Ch. 19: Southeast), the Pacific Islands (see Ch. 27: Hawai'i and Pacific Islands); and the Pacific Northwest (see Ch. 24: Northwest).
Elizaveta Barrett	Ristroph	140913	Text Region	15. Tribal and Indigenous Communities		559	559	13	13	suggest changing "many" to "some" to avoid overstating the planning that has actually been occurring	We have made this suggested edit.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Elizaveta Barrett	Ristroph	140914	Text Region	15. Tribal and Indigenous Communities		561	561	1	6	There are some studies on indigenous economic resilience that you might not want to overlook, including Chapin, F. Stuart, III, Michael Hoel, Steven R. Carpenter, Jay Lubchenco, Brian Walker, Terry V. Callaghan, Carl Folke, et al. 2006. "Building Resilience and Adaptation to Manage Arctic Change." Ambio 35 (4): 198âÐ202; and Wuttunee, Wanda. 2004. Living Rhythms: Lessons in Aboriginal Economic Resilience and Vision. Montrl©al?; Ithaca: Mcgill Queens Univ Pr.	The authors were tasked with using and citing the more recent/current research literature available. Following author guidance for the report, the team focused on literature within the last 10 years (2008-2018). Additional studies were added that relate to economic resilience of tribes more generally (not solely focused on Arctic tribes and villages). These include articles by Anderson et al. 2016; Shoemaker 2017; Miller, 2016; and Miller, 2012. Scholarly economic analyses specific to Indigenous peoples and climate adaptation is limited and the need for this work is highlighted in the Traceable Acccounts section.
Elizaveta Barrett	Ristroph	140915	Text Region	15. Tribal and Indigenous Communities		561	561	7	7	I suggest adding an additional study on cultural resilience: Wexler, Lisa. 2014. âÖLooking across Three Generations of Alaska Natives to Explore How Culture Fosters Indigenous Resilience." Transcultural Psychiatry 51 (1):73âÐ92. https://doi.org/10.1177/1363461513497417.	After consideration of the suggested citation, the author team has determined that the current references are appropriate and adequate. The suggested study is about Indigenous resislience but not in the context of climate change, so the author team does not have a basis to extrapolate any of its findings to a climate change context.
Elizaveta Barrett	Ristroph	140916	Text Region	15. Tribal and Indigenous Communities		562	562	23	23	Suggest adding an additional study on indigenous adaptation: Ristroph, E.B. 2017. "Presenting a Picture of Alaska Native Village Adaptation: A Method of Analysis." International Journal of Sociology and Anthropology 5(9): 762-775.	This citation has been added under the Key Message 3 and Traceable Accounts sections.
David	Wojick	141697	Text Region	15. Tribal and Indigenous Communities		552	552	3	7	The present text says this: 3 Key Message 1: Climate change threatens Indigenous peoples‰Ûª livelihoods and economies, 4 including agriculture, fishing, forestry, recreation, and tourism. These activities rely on 5 water, land, and other natural resources, as well as infrastructure and related human 6 services that are adversely impacted and will be increasingly impacted by changes in 7 climate. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models.	Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. The discussion of the evidence-based literature, including indicators of confidence levels, that supports this chapter's Key Messages is included in the Traceable Accounts.
David	Wojick	141698	Text Region	15. Tribal and Indigenous Communities		554	554	11	13	This is the present text: 11 Key Message 2: Climate change adversely affects cultural identities, food security, and the 12 determinants of physical and mental health for Indigenous peoples and communities through 13 disruption of interconnected social, physical, and ecological systems. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models.	Assertions that global climate models are not useful or adequate for making climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. The discussion of the evidence-based literature, including indicators of confidence levels, that supports this chapter's Key Messages is included in the Traceable Accounts.
Allissa	Stutte	141851	Text Region	15. Tribal and Indigenous Communities		548	548	18	18	Sentence should read "uniquely and disproportionately". 'Unique' by itself does not adequately point to the disproportionality of climate change impacts on Indigenous peoples as compared to non-Indigenous peoples.	We have made this suggested edit.
Allissa	Stutte	141852	Text Region	15. Tribal and Indigenous Communities		548	548	18	22	This section could benefit from the inclusion of the concept of Traditional Ecological Knowledge (TEK) in order for readers to draw connections to other adaptation options utilizing TEK and identified by that name.	We have added text discussing traditional knowledge systems to the Executive Summary and how these knowledges can improve our understanding of climate change and help with the development of adaptation strategies. In the State of the Sector, we discuss how the term Indigenous knowledges includes traditional ecological knowledge (TEK) but is broader and more encompassing of knowledges that may not be solely ecological in nature. The authors have decided to use this broader terminology throughout the chapter rather than TEK.
Allissa	Stutte	141853	Text Region	15. Tribal and Indigenous Communities		548	548	4	7	Removal of the first "impacted" in this sentence will help make the sentence clearer. The sentence also reads as if "human services" will be impacted rather than the aforementioned "activities" and could benefit from a comma after the word 'services.'	We have edited this Key Message to increase clarity.
Allissa	Stutte	141854	Text Region	15. Tribal and Indigenous Communities		548	548	26	28	Add "and associated socioeconomic effects" after "historical trauma" to more fully address the social and economic effects of loss of homeland and traditional ways of life.	We have not made this suggested edit because the focus of this sentence is on how mental health impacts of climate change occur on top of existing historical trauma. The literature refers to historical trauma in the context of colonialism and not specifically economic effects.
Allissa	Stutte	141855	Text Region	15. Tribal and Indigenous Communities		550	550	2	6	Is this paragraph intentionally repeated verbatim from page 548?	Pages 548-549 in the Public Review Draft are the Executive Summary for Chapter 15. The text has been extensively revised since the time of this review; however, the format of the Executive Summary for all the NCA chapters is to intentionally use verbatim some text and graphics from the underlying chapter in order to summarize the key messages (in this chapter, that text begins on page 550 of the Public Review Draft).
Allissa	Stutte	141856	Text Region	15. Tribal and Indigenous Communities		550	550	7	8	Include "and non-federally recognized tribes" in this sentence.	We have made edits based on this suggestion.
Allissa	Stutte	141857	Text Region	15. Tribal and Indigenous Communities		551	551	19	20	Use of the word "strongest" in "strongest concentration" indicates a value judgement, replace with "highest concentration."	We have made this suggested edit and have also moved the sentence to the caption of Figure 15.1 to clarify that the statement is based on a review of the projects identified in the database for Figure 15.1.
Allissa	Stutte	141858	Text Region	15. Tribal and Indigenous Communities		552	552	20	20	Change "The climate impacts on" to "The impacts of climate change on". The sentence as it currently reads addresses climate impacts but is referring to climate change impacts.	Authors responded to this comment and modified this section heavily so this idea is now described as "climate change threatens." We note that throughout NCA4, "climate impacts" is a shorthand phrase used interchangeably with "impacts of climate change."
Allissa	Stutte	141859	Text Region	15. Tribal and Indigenous Communities		553	553	7	22	Although declining sea ice may increase access to coastal Alaska Native communities, many of these communities will be, perhaps more importantly, affected by concurrent sea level rise and eroding shorelines due to lack of storm protection as a result of decreased ice pack. This contradicts other potential benefits from decreased sea ice and lead to larger adaptation requirements such as relocation. See references "The impact of climate change on tribal communities in the US: displacement, relocation, and human rights" https://link.springer.com/article/10.1007/s10584-013-0746-z and https://toolkit.climate.gov/case-studies/relocating-kivalina	After lengthy deliberation and investigation as well as consultation with the authors of the Alaska Chapter, we determined that the section pertaining to opportunities be omitted from the chapter. This comment thus no longer applies.
Allissa	Stutte	141860	Text Region	15. Tribal and Indigenous Communities		556	556	8	10	Please elaborate on the mental health impacts due to degraded water quality.	The text has been edited for clarity and to add additional detail to explain how degraded water quality can affect mental health through impacts on sacred water sources and subsistence practices.
Allissa	Stutte	141861	Text Region	15. Tribal and Indigenous Communities		556	557	19	17	This section could benefit from the inclusion of the concept of Traditional Ecological Knowledge (TEK) in order for readers to draw connections to other adaptation options utilizing TEK and identified by that name.	After consideration, the author team determined that the original terminology of indigenous knowledge systems is more appropriate in this context because it refers to knowledges that include, but are broader than, the environment-based knowledge of TEK. We added definitions of indigenous knowledge systems and traditional ecoglogical knowledge up front in the State of the Sector section in order to provide a better introductory grounding for the whole chapter's discussion of traditional and Indigenous knowledges.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Joel	Porcaro	141862	Text Region	15. Tribal and Indigenous Communities		558	558	12	14	The sentence reads as if the Indigenous people themselves are limited by size and rural context; add the word "lands" or "homelands" or "reservations" or "territories" after Indigenous peoples to accurately describe what is being limited by size and rural context.	We have changed this sentence to incorporate the commenter's perspective by identifying low population and rural contexts of Indigenous communities rather than peoples as a key component to negative scoring.
Indur	Goklany	141865	Text Region	15. Tribal and Indigenous Communities		554	556	10	18	Key Message 2: Mental and Physical Health Risks should have at least one citation for this report: Donatuto, J., Grossman, E.E., Konovsky, J., Grossman, S. and Campbell, L.W., 2014. Indigenous community health and climate change: integrating biophysical and social science indicators. Coastal Management, 42(4), pp.355-373. This article describe indigenous health indicators that illustrate indigenous health is affected by impacts to culture, natural resources, sovereignty and self-determination and well-being in a way that could strengthen an understanding of climate impacts on mental and physical health.	We have included this citation, related citations, and new text describing how indigenous definitions of health are more holistic and encompassing of non-physiological health factors such as natural resources security, cultural use, community connection and self-determination.
Kathy	Lynn	141867	Whole Chapter	15. Tribal and Indigenous Communities						There is no specific reference to the role of traditional knowledges/traditional ecological knowledge in understanding and adapting to climate change. While it is clear that the chapter builds on the 3rd National Climate Assessment, the lack of a reference to TKs/TEK doesn't provide the reader with a direct pathway to more information on how TKs/TEK are driving indigenous efforts to address climate change and why it is important to consider and ensure protections for TKs in climate change research, planning and action. Citations to consider including are here: Whyte, Kyle, Indigenous Climate Change Studies: Indigenizing Futures, Decolonizing the Anthropocene. Fall 2017. English Language Notes. Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2925514 Ford, J.D., Cameron, L., Rubis, J., Maillet, M., Nakashima, D., Willox, A.C. and Pearce, T., 2016. Including indigenous knowledge and experience in IPCC assessment reports. Nature Climate Change, 6(4), p.349. Climate and Traditional Knowledges Workgroup. 2015. Guidelines for Considering Traditional Knowledges in Climate Change Initiatives. https://climatetkw.wordpress.com/	We added definitions of Indigenous knowledge systems and traditional ecoglogical knowledge up front in the State of the Sector section in order to provide a better introductory grounding for the whole chapter's discussion of traditional and Indigenous knowledges. The author team notes that the sections supporting each of the Key Messages included discussion of traditional knowledges either directly or indirectly in the broader discussion about Indigenous peoples' relationships to the lands, water, and resources of their ancestors. Key Message 3 already included an entire subsection devoted to "Incorporating Indigenous Knowledge in Adaptation," but we have added language to regarding the importance of considering and ensuring protections for Indigenous knowledges. The chapter also already includes a citation of the Whyte 2017 publication.
Kathy	Lynn	141868	Whole Chapter	15. Tribal and Indigenous Communities						I think the issue of tribal sovereignty and self-determination could be addressed in more depth. For example, pg. 552 line 12 states: ‰ÛÏFederally recognized tribes are the largest 13 private owner of agricultural lands in the United States (NCAI 2013).‰Û However, the NCAI report actually focuses on the issue that because most of that land is held in trust and managed by the BIA, tribes have limited ability to manage this land. This pertains to forest and rangelands as well. Overall, the chapter should address the importance of how management of and decision-making over off-reservation lands and resources in the context of climate change. This could be addressed in the closing paragraph for Key message 1 (pg. 553 after line 30). Specifically, a statement could be added to discuss the need for government-to-government consultation for the management of off-reservation natural and cultural resources that are impacted by climate change and threatening the loss of indigenous knowledges, culture and resources. Citations to consider on this topic include: Whyte, K.P. 2013. Justice forward: tribes, climate adaptation and responsibility. Climatic Change. 3: 517‰ÛÒ530. DOI 10.1007/s10584-013-0743-2 (ALREADY CITED IN THE CHAPTER) Ford, J.K. and Giles, E., 2015. Climate change adaptation in Indian Country: Tribal regulation of reservation lands and natural resources. Wm. Mitchell L. Rev., 41, p.519. Gruenig, B.; Lynn, K.; Voggesser, G.; Whyte, K.P. 2015. Tribal climate change principles responding to federal policies and actions to address climate change. Unpublished report. On file with: Tribal Climate Change Project, University of Oregon. (ALREADY CITED IN CHAPTER)	We appreciate these suggestions and have made a number of edits throughout the chapter (notably under Key Messages 1 and 3) to emphasize the variety and complexity of tribal land and resource management statuses (including off-reservation resource rights) and how they affect tribes' ability to (1) exercise self-determination in some cases, and (2) implement climate adaptation strategies. More detail about government-to-government consultation and the federal government's role in supporting consultation and self-determination has been added to the State of the Sector section.
Casey	Thornbrugh	141964	Text Region	15. Tribal and Indigenous Communities		547	547	1	1	Re-word the chapter title from "Tribal and Indigenous Peoples" to "Indigenous Peoples and Tribal Nations." Reason: When the term Tribal stands alone it can be interpreted to have multiple or even vague meanings. Tribal Nations, however is a term used by the National Congress of American Indians (NCAI) and the United South and Eastern Tribes (USET) Inc. to refer to the 567 (as of January 2018) federally recognized sovereign Tribal Nations (variously called tribes, bands, pueblos, communities, and Alaska Native villages) that have a "nation-to-nation relationship"Û with the U.S. Government. See the NCAI Guide to Tribal Nations and the United States for more information: http://www.ncai.org/resources/ncai_publications/tribal-nations-and-the-united-states-an-introduction	We have reworded the title to "Tribes and Indigenous Peoples" to maintain broad, inclusive language for Indigenous peoples of all statuses in the United States. "Tribes" refers to collective, self-governing entities and "Indigenous peoples" includes all other relevant groups and individuals. We acknowledge that "Nations" is a term used by organizations like the National Congress of American Indians (NCAI) and the United South and Eastern Tribes (USET); however, not all federally recognized tribes are members of these organizations and the term "Nations" is not universally inclusive of how all federally recognized tribes wish to be referred to.
Casey	Thornbrugh	141965	Whole Chapter	15. Tribal and Indigenous Communities						In the beginning of the chapter, precisely identify examples of Indigenous peoples in the United States and its territories for the reader. Recommendation: Use the following paragraph as an example. Although there remains no formal definition of ‰ÛÏIndigenous peoples‰ÛÓ on the International level, it is acknowledged that Indigenous peoples are composed of the communities, peoples and nations which existed prior to the colonial societies and the countries that developed on and now occupy their ancestral lands and seaways (OHCHR-APF, 2013). Within the United States, Indigenous peoples are represented by the more than 500 Tribal nations (e.g. American Indian tribes, nations, bands, pueblos, communities and Alaska Native villages) federally recognized as sovereign Tribal nations with a government-to-government relationship with the U.S. established through treaties or congressional acts (NCAI, 2017). In addition, Indigenous peoples are also represented by the many American Indian tribes recognized by the states (i.e. ‰ÛÏstate recognized tribes‰ÛÓ) where and within their communities ancestrally have remained. Indigenous peoples in the U.S. are also represented by Native Hawaiians and those indigenous to the U.S. island territories in the Pacific and Caribbean. Also, part of the Indigenous peoples‰Ûª cultural fabric within the U.S. are the communities who have ancestral links to pre-colonial societies in the Americas outside the U.S. such as those in Canada, Mì©xico as well as Central and South American countries. For the citations please see: OHCHR-APF (2013), page 6 at http://www.ohchr.org/Documents/Issues/IPeoples/UNDRIPManualForNHRIs.pdf NCAI (2017), pages 9 and 17 at http://www.ncai.org/resources/ncai_publications/tribal-nations-and-the-united-states-an-introduction	Given space constraints, the author team did not include the suggested paragraph. A brief descriptor of Indigenous peoples is provided in the State of the Sector section, and the authors have added a reference to a new glossary that will house a longer, more comprehensive defintion of Indigenous peoples.
Nicholas	Rajkovich	141966	Text Region	15. Tribal and Indigenous Communities		548	548	11	15	For Key Message 3, ‰ÛÏMany Indigenous peoples have been proactively identifying and addressing climate impacts; however, many communities face obstacles to adaptation, including limited capacity to implement adaptation strategies, limited access to traditional territory and resources, and limitations of existing policies, programs, collaborations, and funding mechanisms‰ÛÓ add: ‰ÛÏrange shifts of plant and animal species of cultural significance out of traditional territories.‰ÛÓ	Range shifts are discussed in the text supporting Key Message 3 as an example supporting the broader point about reservation boundaries and limited access to traditional territory being barriers to adaptation. Thus, the suggested language was not added because the Key Messages are meant to focus on high-level summaries of the main findings and cannot include every detail or example in the underlying text.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Casey	Thornbrugh	141968	Text Region	15. Tribal and Indigenous Communities		548	548	19	20	Revise the sentence, "Many Indigenous peoples have developed governments, cultures, and economies designed to adapt to seasonal and interannual environmental changes" To: "Indigenous peoples have governments, cultures, and economies designed to adapt to seasonal and interannual environmental changes." Reason: The use of the wording "have developed" implies a recent development of governments, cultures, and economies when in fact Indigenous governments, cultures, and Indigenous economies (e.g. Pacific Northwest potlatches) pre-date the United States and colonial governments.	The Executive Summary has been heavily edited and no longer contains this language.
Casey	Thornbrugh	141969	Text Region	15. Tribal and Indigenous Communities		550	550	2	5	Revise the sentence, ‰ÛÏMany Indigenous peoples have developed governments, cultures, and economies designed to adapt to seasonal and interannual environmental changes‰Û_.‰Û To: ‰ÛÏIndigenous peoples have governments, cultures, and economies designed to adapt to seasonal and interannual environmental changes‰Û_.‰Û Reason: The use of the wording ‰ÛÏhave developed‰Û implies a recent development of governments, cultures, and economies when in fact Indigenous governments, cultures, and Indigenous economies (e.g. Pacific Northwest potlatches) pre-date the United States and colonial governments.	Edits have been made based on this suggestion.
Nicholas	Rajkovich	141970	Text Region	15. Tribal and Indigenous Communities		550	550	9	10	Add to the sentence, ‰ÛÏThe U.S. has a trust responsibility to work with federally recognized tribes on a government-to-government basis.‰Û ‰ÛÏIn exchange for the relinquishment of vast tracts of American Indian and Alaska Native lands and in many cases, the forced removal and relocation of entire tribal communities, the U.S. has obligated itself to a trust responsibility, which is to, work with federally recognized tribes on a government-to-government basis, acknowledge and respect tribal self-determination, protect remaining tribal lands, and provide support for key services such as education, health, public safety, and environmental protection.‰Û Reason: It is important to elaborate on ‰ÛÏwhy‰Û the U.S. has a trust responsibility to tribes and what that trust responsibility entails.	In the State of the Sector section, we have added a short definition of "trust responsibility" and text pertaining to government-to-government consultion. We have incorporated some but not all of your suggested language due to space constraints and to trying to incorporate other suggested language as well. The forced removal of tribal communities is discussed under Key Message 3 in the Displacement and Relocation section.
Nicholas	Rajkovich	141972	Text Region	15. Tribal and Indigenous Communities		550	550	9	10	After the sentence, ‰ÛÏThe U.S. has a trust responsibility to work with federally recognized tribes on a government-to-government basis.‰Û add: ‰ÛÏNon-federally recognized tribes, Native Hawaiians, Indigenous peoples from areas beyond the continental U.S. and Alaska are not beneficiaries of the U.S. trust responsibility, and therefore have had to develop other strategies toward self-determination to protect their cultures, ancestral lands, and to provide services to their communities.‰Û	We have made edits based on this suggestion.
Juanita	Constible	142551	Whole Chapter	15. Tribal and Indigenous Communities						This chapter does a good job of explaining the unique impacts of climate change on indigenous communities throughout the United States and its territories. However, it could have included additional examples, specifically highlighting existing efforts of indigenous communities to adapt to and mitigate climate change. Building on that, it would be helpful for the chapter to explore in greater detail the difference in access to resources between federally recognized and non-recognized tribes. A prime example of a non-recognized tribe that could be cited, with examples of how they are approaching the climate issue, despite lacking federal recognition is the United Houma Nation in Louisiana.	We have added new text and citations regarding adaptation barriers for tribes that lack federal recognition, and have further explains key differences between federally recognized and non-federally recognized tribes in multiple sections of the chapter (primarily the State of the Sector, Key Message 1 and Key Message 3), including those related to federal trust responsbility and authority/access to traditional territory and resources. We have added new text under Key Message 1 that discusses energy infrastructure and economic development that makes reference to current examples of tribes' climate mitigation efforts. In Key Messages 1, 2, and 3 we have added more cross-references to other regional chapters of NCA4 and new examples of current tribal adaptation efforts.
Juanita	Constible	142552	Whole Chapter	15. Tribal and Indigenous Communities						While the chapter explores adaptation, it fails to mention mitigation strategies. While this may not be the NCA's purpose, in the context of indigenous communities, it is essential, particularly because both mitigation and adaptation in indigenous communities relies so heavily on traditional ecological knowledge and intergenerational power. Examples of mitigation include: https://www.geni.org/globalenergy/research/renewable-energy-on-tribal-la…	We have added new text under Key Message 1 that discusses energy infrastructure and economic development that makes reference to tribes' climate mitigation efforts.
Juanita	Constible	142553	Whole Chapter	15. Tribal and Indigenous Communities						This chapter treats indigenous communities, to a certain extent, as a monolithic entity. Recommendation: Beginning on page 551 with Figure 15.1, or maybe at the very beginning of the chapter, the authors should state clearly that significant variation exists across different geographies and different federal recognition statuses, especially when it comes to climate resilience and mitigation strategies.	We have added new text in multiple sections of the chapter that further explains key differences between federally recognized and non-federally recognized tribes, including those related to federal trust responsbility and authority/access to traditional territory and resources.
Juanita	Constible	142554	Text Region	15. Tribal and Indigenous Communities		548	548	3	4	Add "cultural practices" after "indigenous peoples" and before "livelihoods"	After consideration of this point, we have determined that the existing text is appropriate because cultural practices are included throughout this section as they relate directly to economies and livelihoods. Cultural practices are also included in other sections of the chapter.
Juanita	Constible	142555	Text Region	15. Tribal and Indigenous Communities		548	548	26	28	Instead of the word "loss of homelands and their traditional ways of life," would use "removal from their homelands and loss of their traditional ways of life…" In this context, it is important to recognize colonial history.	The Executive Summary has been heavily edited and no longer contains this specific language. However, historical trauma is still mentioned in the Executive Summary, in reference to the underlying text in Key Message 2 that discusses historical trauma stemming from forced removal from homelands. The lingering effects of colonialism and forced relocation are also discussed in Key Message 3 in the Displacement and Relocation section.
Juanita	Constible	142556	Text Region	15. Tribal and Indigenous Communities		550	550	9	10	It would be useful to describe what a "trust responsibility" is. Per Seminole Nation v. United States, 1942, the federal Indian trust responsibility is a legal obligation under which the United States "has charged itself with moral obligations of the highest responsibility and trust" toward Indian tribes. Outlining that the U.S. government has a legal obligation to protect tribal sovereignty and treaty rights seems relevant here in a climate context. https://www.doi.gov/sites/doi.gov/files/migrated/cobell/commission/uploa…	We have made edits based on this suggestion. The State of the Sector now includes new text on the federal trust responsibility.
Juanita	Constible	142557	Whole Page	15. Tribal and Indigenous Communities		551				It would serve the document to include more detailed examples of how certain tribes are addressing climate in their adaptation planning, vulnerability assessments, and increasing training capacity. A specific call-out of monitoring and research initiatives (examples of what those look like), as well as capacity building, cultural continuity and youth engagement, would also improve the quick mention of tribal climate initiatives and plans.	Limits on the length of the chapter control its level of detail, but Figure 15.1 provides a link to an interactive mapping application to explore actions in more detail (internal review link at https://biamaps.doi.gov/ncatest/ - to be placed at https://biamaps.doi.gov/nca/ and listed as a link in the Figure 15.1 caption). Actions may be filtered to access additional online information on the topic by category for: Planning and Assessment, Adaptation and Implementation, Monitoring and Research, Governance and Capacity Building, and Youth and Traditional Knowledges, which would include cultural continuity-focused efforts. Examples and cross-references to examples in other chapters were added to the text throughout the chapter to highlight adaptation actions taken by tribes.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142558	Whole Page	15. Tribal and Indigenous Communities		552				Worth mentioning here that in addition to the unique ecology of reservations that oil, gas and coal extraction continue to occur on indigenous lands, further driving the climate problem, and also driving other impacts, including increased sexual violence. According to the Energy Information Administration, crude oil production on all Indian lands more than quadrupled from 10 million barrels in 2003 to 46 million barrels in 2013. Reference here: https://www.eia.gov/todayinenergy/detail.php?id=17011#More recent figures aren't available, based upon recent research.	The authors appreciate the commenter's concern regarding increased sexual violence. However, they do not see this chapter as the place to discuss this because the focus is on the impacts of climate change on Indigenous peoples. The violence that may accompany intensive fossil fuel extraction operations is viewed as a social impact that may coincide with the extraction activity rather than the outcome of climate change impacts (e.g., warmer temperatures, drought, flooding, etc.). To address the issue of energy production on tribal lands, additional research literature and statements have been added to Key Message 1. These include pointing out the pervasive issue of federal regulatory framework that includes a complex system of property rights that prohibit tribes from fully and sustainably manaing their natural resources which include energy production and distribution. Research literature that provides evidence of this is cited. Also, chapter 29 of the assesment addresses the impacts of fossil fuels on the climate problem and addresses greenhouse gas mitigation.
Juanita	Constible	142559	Text Region	15. Tribal and Indigenous Communities		553	553	7	8	The use of the word "opportunities" here seems misguided. Declining sea ice will disproportionately impact native communities in Alaska. Would recommend reframing this paragraph as further examples of negative impacts associated with increased temperatures, and delete the sentence beginning on line 7, as well as "For example" in line 8.	After lengthy deliberation and investigation as well as consultation with the authors of the Alaska Chapter, we determined that the section pertaining to opportunities be omitted from the chapter. This comment thus no longer applies.
Juanita	Constible	142560	Text Region	15. Tribal and Indigenous Communities		553	553	23	30	This paragraph only mentions barriers in adaptation planning on federally recognized tribes, and fails to mention planning in non-recognized communities. Would recommend following this paragraph with specific mention that non-recognized tribes exist in a completely different context, with little to no support from government agencies, which exacerbates their vulnerability and adaptation potential.	We have incorporated this suggested point in the State of the Sector section because it helps to provide larger context for all the Key Messages, not just Key Message 1 that was the focus of this commenter. Additional edits in Key Message 3 distinguish between federally recognized and non-recognized tribes to effectively plan and implement adaptation.
Juanita	Constible	142561	Text Region	15. Tribal and Indigenous Communities		555	555	5	8	"Limit" in line 7 should be "limited"	The word "Limit" was grammatically correct and so the author team has kept the word, however, we have split the sentence into two separate sentences to increase clarity.
Juanita	Constible	142562	Text Region	15. Tribal and Indigenous Communities		555	555	17	18	Would rewrite this sentence as "Indigenous peoples have a unique and interconnected relationship with ecological systems."	The text has been edited to incorporate this suggestion.
Juanita	Constible	142563	Text Region	15. Tribal and Indigenous Communities		555	555	22	26	include the words "traditional ecological" in between "share" and "knowledge" to clarify what type of knowledge is being referenced. Citation here, if needed to describe TEK in greater detail: https://www.fws.gov/nativeamerican/pdf/tek-fact-sheet.pdf	We have decided to discuss the act of sharing of "traditional knowledges" because we believe this phrase is more appropriate in this context because it refers to knowledges that include, but are broader than, the environment-based knowledge of TEK.
Juanita	Constible	142564	Text Region	15. Tribal and Indigenous Communities		555	555	26	29	Add "inter" to the word "generational" to demonstrate the scope of how information is shared. So the word would be "intergenerational" instead of "generational."	The text has been edited to incorporate this suggestion.
Juanita	Constible	142565	Text Region	15. Tribal and Indigenous Communities		558	558	20	23	Would include the word "colonial" in between "settler" and "governments" to clarify this sentence.	We have made this suggested edit.
Casey	Thornbrugh	143095	Text Region	15. Tribal and Indigenous Communities		552	552	11	12	Revise the sentence, ‰ÛÏApproximately 1.14 million (22%) of federally recognized American Indians and Alaska Natives live on or near reservation lands.‰Û To: ‰ÛÏApproximately 1.14 million (22%) of American Indians and Alaska Natives from federally recognized tribes live on or near tribal trust lands or reservations.‰Û	Upon further examination of this sentence, the authors decided to remove it alltogether. This figure came from the 2010 Census but is based on self-identification and included all respondents who identified as indigenous, including federally recognized, state-recognized, and non-recognized tribal groups. To compound this, the "American Indian or Alaska Native" race and ethnicity category does not include "Native Hawaiians or Other Pacific Islanders" and there is no category for Caribbean Indigenous peoples. Given the confusion this could cause and the broad term, "Indigenous" used in this chapter, the authors decided that this statement could cause some confusion as to the actual numbers of Indigenous peoples across the U.S. and its territories, and so removed it.
Casey	Thornbrugh	143096	Text Region	15. Tribal and Indigenous Communities		552	552	30	33	Insert ‰ÛÏaquaculture‰Û and ‰ÛÏwaterways‰Û in the sentence, ‰ÛÏIncreased wildfire, diminished snowpack, pervasive drought, flooding, ocean acidification, and sea level rise directly threaten the viability of agriculture, fisheries, and forestry enterprises on Indigenous lands across the United States.‰Û So it reads: ‰ÛÏIncreased wildfire, diminished snowpack, pervasive drought, flooding, ocean acidification, and sea level rise directly threaten the viability of agriculture, aquaculture, fisheries, and forestry enterprises on Indigenous lands and waterways across the United States.‰Û	The sentence referenced by the reviewer has been extensively edited, so that "waterways"is no longer appropriate to add to the sentence. Authors decided not to add "Aquaculture" to this sentence because there is currently a lack of literature on wide-scale tribal aquaculture impacts due to climate change that would be appropriate for this national-scale chapter.
Casey	Thornbrugh	143097	Text Region	15. Tribal and Indigenous Communities		553	553	16	16	Capitalize ‰ÛÏindigenous‰Û in the sentence that ends with, ‰ÛÏthat are part of indigenous economies.‰Û	The sentence in question has been edited and we have capitalized Indigenous in the revised sentence.
Casey	Thornbrugh	143098	Text Region	15. Tribal and Indigenous Communities		553	553	23	24	Some clarification is needed for the sentence, ‰ÛÏA recognized barrier to adaptation planning that has significant implications for tribal economies is the capacity of federally recognized tribes to implement water rights.‰Û Please revise the sentence to address these questions: 1. How is the capacity to implement water rights a barrier to adaptation planning? 2. Is this sentence meant to imply federally recognized tribes have a limited capacity to implement water rights? If so, state it more directly, and provide an example if applicable.	We have edited this section to include more details on why the capacity to quantify and implement water rights is a barrier to adaptation planning for federally recognized tribes with resource constraints. The authors decided not to include a specific example because the experiences are so diverse, one example might provide the reader the false impression that that example is representative when each state has different water laws and restrictions that affect the tribe. Additionally, the authors wanted to focus on adaptations and solutions rather than only impacts and barriers (per peer reviewer comments), and so provided the citation to the approximately 30 water rights settlements (Cosens and Chaffin, 2016).
Casey	Thornbrugh	143099	Text Region	15. Tribal and Indigenous Communities		556	556	20	26	For Key Message 3, ‰ÛÏMany Indigenous peoples have been proactively identifying and addressing climate impacts; however, many communities face obstacles to adaptation, including limited capacity to implement adaptation strategies, limited access to traditional territory and resources, and limitations of existing policies, programs, collaborations, and funding mechanisms‰Û add: ‰ÛÏrange shifts of plant and animal species of cultural significance out of traditional territories.‰Û	While the reviewer's specific language was not included, the text in Key Message 3 has been edited to include the broader point that ecosystems or species' habitats or migration routes that shift due to changes in climate affect tribes' rights to gather, hunt, trap, and fish within recognized areas are constrained by reservation or other legally defined borders, and that this can act as a barrier to adaptation.
Social Science	Coordinating Committee	143206	Whole Page	15. Tribal and Indigenous Communities		554				Key Message 2: mental and physial health risks section is missing supporting statistic like on lines 8-15, and supporting examples of tribes as in the other two key message sections. This could be added in any or all of the paragraphs starting on line 17	The section on human health intentionally references the Human Heath Chapter 14 instead of repeating statistics from that chapter. The author team has added a supporting example about diabetes prevalence being twice as high for federally recognized tribes compared to the general U.S. population, and that people with diabetes are more vulnerable to climate impacts from extreme heat and air quality.
Brendan	Murphy	143404	Text Region	15. Tribal and Indigenous Communities		550	550	2	6	This entire paragraph has already been word- for- word used on page 548, lines 18-22. It is suggested that the whole section be scratched and begin with a different opening paragraph.	Pages 548-549 in the Public Review Draft are the Executive Summary for Chapter 15. The text has been extensively revised since the time of this review; however, the format of the Executive Summary for all the NCA chapters is to intentionally use verbatim some text and graphics from the underlying chapter in order to summarize the key messages (in this chapter, that text begins on page 550 of the Public Review Draft).

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Brendan	Murphy	143405	Text Region	15. Tribal and Indigenous Communities		551	551	2	9	This figure, 15.1, and its legend are both already used on page 549, lines 3-10. It is recommended that the one on page 549 is omitted, mainly due to the fact that the following paragraph on page 551 is about the figure itself. Additionally, it may appear better when placed after the paragraph on page 551, lines 10-20. This would alleviate the initial confusion by readers regarding why this figure and legend is where it is (versus after, where the reader gains insight and then the opportunity to both observe the map as well as follow the links).	Pages 548-549 in the public review draft are the Executive Summary for Chapter 15. The authors intentionally use verbatim some text and graphics from the underlying chapter that begins on page 550. Thus, the chapter has not been revised as suggested by the commenter. The placement of the graphics will change in the final formatted version of the report. The Executive Summaries of each of the chapters will be pulled out and separately packaged at the front of the NCA4 report, and the graphics and photographs in the chapter will be inserted according to space and layout constraints that the authors do not have control over. The State of the Sector section has been extensively modified and reorganized to better integrate discussion of tribal adaptation activities and Figure 15.1.
Brendan	Murphy	143587	Text Region	15. Tribal and Indigenous Communities		553	553	7	11	This block of text about the possible benefits of climate change against indigenous people does nothing to further the argument being made in the Key Section it's under. It's understood that not every change would be bad in the wake of climate change, but to mention it here seeks to cancel out any argument being made. Suggestions would be to either: - Omit the text. - Take time to mention that these benefits come nowhere close to outweighing the detrimental effects that climate change comes with. Overall, though, the most highly recommended action would be to simply omit this section.	After lengthy deliberation and investigation as well as consultation with the authors of the Alaska Chapter, we determined that the section pertaining to opportunities be omitted from the chapter. This comment thus no longer applies.
Amber	Ziegler	143592	Whole Chapter	15. Tribal and Indigenous Communities						It would be useful for each of the three key messages to each tie back into the concept of self-determination (introduced on page 550). This is an essential concept which could be effectively expanded upon in relevant ways.	Edits have been made throughout the chapter as suggested by the commenter to tie back to the concept of self-determination.
Amber	Ziegler	143593	Text Region	15. Tribal and Indigenous Communities		550	550	15	16	A short statement about what NCA 3 addressed in the chapter on Indigenous peoples would be useful for orienting the reader to the current document and chapter. Without something explaining what material from NCA3 is being built upon, the current chapter feels ungrounded.	We appreciate this suggestion, but space is limited and so the author team cannot provide a summary of NCA3's indigenous peoples' chapter. We have deliberated and agreed on the most relevant information and illustrations to include as a state-of-the-science update for this version of the NCA, and provide the citation to NCA3 if readers would like to see what has been written previously.
Julie	Maldonado	143633	Text Region	15. Tribal and Indigenous Communities		548	548	28	33	In addition to physical and mental health, could also include impacts on spiritual health and wellbeing.	The commenter references two sentences in the Executive Summary pertaining to the chapter's Key Message 2 section. We have extensively edited the Executive Summary to reflect changes in the underlying chapter text and to better balance the level of detail provided about each of the Key Messages, and so have deleted these sentences and replaced them with other text. The language of Key Message 2 now includes climate change threats to sites, practices, and relationships with cultural, spiritual, or ceremonial importance. Spiritual health is also noted in the text supporting Key Message 2.
Julie	Maldonado	143642	Text Region	15. Tribal and Indigenous Communities		550	550	7	8	In this sentence, could add: including, but not limited to, federally recognized tribes; to acknowledge the many non-federally recognized Indigenous peoples and tribes that also practice cultural self-determination, not decided by the US government alone.	We have made edits based on this suggestion.
Julie	Maldonado	143654	Text Region	15. Tribal and Indigenous Communities		554	556	10	18	I appreciate the focus on physical and mental health for Key Message #2. For a more holistic approach, could consider including physical, mental, emotional and spiritual health aspects, which can be experienced at the individual, community, and tribal levels.	We had an existing discussion of social and cultural identity that was meant to include spiritual practices, but we have edited the text as suggested by the commenter to more explicitly identify spiritual health, spiritual practices, and spiritual identity. We have also added new references and included intangible cultural heritage under Key Message 2, which could also encompass spirituality. We have not included specific terminology about emotional health because we believe it to be encompassed by the broad term "mental health." In terms of health impacts experienced at different levels, while we cannot discuss these issues comprehensively given space constraints, we have included new text and associated citations about Indigenous values-based understandings of health, which include "community connection."
Julie	Maldonado	143660	Text Region	15. Tribal and Indigenous Communities		556	556	19	19	For the short title of key message #3, a more accurate depiction of what tribes in the US that are forced into the difficult decision of relocation, could be: "Adaptation, Disaster Management, and Community-led Relocation." The language of "managed retreat" is a physical/geographically-focused militarized vision that disregards the social and cultural losses at risk in relocation. Relocation is more than just managing the physical movement of people and material structures; it also includes maintaining important social, cultural, and livelihood practices, which enable a community to survive and thrive.	The authors note that "managed retreat" is a common term used in the scientific literature with regard to climate adaptation, but agree that alternative wording would be apprpriate in this context. The short title of the section has been edited to incorporate the perspective of the commenter.
Julie	Maldonado	143662	Text Region	15. Tribal and Indigenous Communities		559	559	2	2	Perhaps more accurate to say in nearly every "coastal region" of the United States.	We have changed the wording to be more precise, acknowledging both coastal and riverine flooding, and permafrost thawing, as contributors to conditions that force Indigenous communites to consider relocation. There are a range of current climate change impact scenarios that are forcing tribes to relocate that aren't specifically related to "coastal" changes. Relocation examples include Isle de Jean Charles, which is located in marshlands of Southern Louisiana. The island is at risk due to coastal changes as well as diversion of Mississippi river sediments, the lack of which is causing land subsidence. Other tribes in Alaska are considering or planning relocation in response to inland riverine flooding and permafrost thaw. We added citation that documents some of these.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Patty	Ferguson-Bohnee	143889	Whole Chapter	15. Tribal and Indigenous Communities						The Indian Legal Program and the Indian Legal Clinic at the Sandra Day Connor College Law hosted a conference titled Cultures Under Water: Climate Impacts on Tribal Cultural Heritage Conference on December 6 and 7, 2017. Much of this comment is based on either panel discussions or small group discussions from that event. This comment includes three main areas. First, the Chapter could be improved by including a discussion on how climate change affects intangible cultural heritage. Second, Key Message 3 could include more details about challenges a Tribal government may face when implementing a resettlement plan. Finally, the Assessment includes a discussion on potential solutions to the myriad of challenges that Tribes experience in accessing federal funding, protecting intangible cultural heritage, and promoting Tribal self-determination; this comment suggests additional solutions. I. Intangible Cultural Heritage The discussion on cultural heritage including built environments, monuments, and historical sites, could be improved by including more discussion of intangible cultural heritage. The intangibles of cultural heritage are just as integral to preserving a people‰Ûªs way of life as is their homes and infrastructure. The Assessment references the impact that climate change has on the mental health of Indigenous Peoples, the Assessment could be improved with a discussion on the importance of intangible cultural heritage for the continued health and welfare of Indigenous Peoples. Intangible cultural heritage as defined by the United Nations Educational, Scientific and Cultural Organization (‰ÛÏUNESCO‰Û¨) ‰ÛÏincludes traditions or living expressions inherited from our ancestors and passed on to our descendants, such as oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe or the knowledge and skills to produce traditional crafts.‰Û¨ (United Nations Educational, Scientific and Cultural Organization, Intangible Cultural Heritage, What is Intangible Cultural Heritage?, page 3 (January 31, 2018) https://ich.unesco.org/en/what-is-intangible-heritage-00003). The Pocantico Call to Action on Climate Impacts and Cultural Heritage aims to protect cultural heritage, including the intangibles, by challenging policy-makers, government decision-makers, institutions and individuals to collaborate with the same goal of preserving cultural heritage. The Pocantico Call to Action recognizes that ‰ÛÏculture heritage is a human right and that the changing climate puts some aspects of cultural heritage at additional risk; Neither costs of addressing climate change impacts on cultural heritage, nor the knowledge we	The authors recognized and appreciate the extensive thought and suggestions of this comment. We have added text and a citation (UNESCO 2018) to bring in the specific terminology of "intangible cultural heritage," and note that the chapter already contained discussion of these concepts related to passing down or sharing traditional knowledges to sustain place-based cultural identity, which is foundational for Indigenous physical and mental health. Regarding the second component on challenges with respect to resettlement planning and implementation, the authors have added text to the Displacement and Relocation section of Key Message 3 that discusses such challenges, which include the lack of a comprehensive federal program to assist tribes with relocation and the lack of models on how to maintain community and cultural continuity in the face of relocation. Regarding the third component of the comment on broad solutions, while these suggestions are valuable in discussing solutions, the authors were instructed not to be policy prescriptive because the NCA4 is a state-of-the-science assessment and not a policy document. However, the authors across the NCA4 were focused on adaptation strategies and identifying literature to support adaptation actions as examples. We have added examples of adaptation to the text and cross-referenced other chapters that contain adaptation examples. More specifically, the authors note that of the content the commenter mentioned, renewable energy is now included in Key Message 1. In addition, an example from the Republic of the Marshall Islands describes Indigenous-led adaptation that emphasizes self-determination and has been included under Key Message 2. Unfortunately, the requirements on page limitations constrained the amount of detail authors were able to include.
Anne	Jensen	143967	Text Region	15. Tribal and Indigenous Communities		548	548	28	28	"Agriculture, fisheries and forestry enterprises" are completely irrelevant in North and Northwest Alaska. Hunting needs to be added as an activity under threat.	The authors disagree with the statement that these enterprises are irrelevant, because the scope of this chapter is broader than just Alaska. Different subsistence and commercial enterprises are important in different locations. However, "hunting" was added to the list of enterprises throughout Key Message 1.
Anne	Jensen	143968	Text Region	15. Tribal and Indigenous Communities		552	552	32	32	"Agriculture, fisheries and forestry enterprises" are completely irrelevant in North and Northwest Alaska. Hunting needs to be added as an activity under threat.	The authors disagree with the statement that these enterprises are irrelevant because the scope of this chapter is broader than just Alaska. Different subsistence and commercial enterprises are important in different locations. However, "hunting" was added to the list of enterprises throughout Key Message 1.
Anne	Jensen	143969	Text Region	15. Tribal and Indigenous Communities		548	548	4	4	Hunting should be specifically referred to here. There are many people in the US who are unaware that the food security of residents of many Alaska Native villages is largely dependent on subsistence hunting, not fishing.	We have edited this Key Message to include hunting and gathering.
Anne	Jensen	143971	Text Region	15. Tribal and Indigenous Communities		553	553	12	13	The main problem with increased vessel traffic is more direct and more certain than possible invasive species. Vessels make noise. The animals which many Alaska Coastal Natives depend on for food security don't like the noise, so they go elsewhere, out of practical and safe hunting ranges.	After lengthy deliberation and investigation as well as consultation with the authors of the Alaska Chapter, we determined that the section pertaining to opportunities and discussion of vessel traffic be omitted from the chapter. This comment thus no longer applies.
Anne	Jensen	143972	Text Region	15. Tribal and Indigenous Communities		553	553	10	10	It is not clear that tourism jobs fit well with subsistence lifestyles, nor is it clear that it is economical for them to pay a living wage in higher-cost areas like rural Alaska.	After lengthy deliberation and investigation as well as consultation with the authors of the Alaska Chapter, we determined that the section pertaining to opportunities be omitted from the chapter. This comment thus no longer applies.
Anne	Jensen	143973	Text Region	15. Tribal and Indigenous Communities		555	556	17	3	The loss of tangible cultural heritage as archaeological sites, cemeteries, and Traditional Cultural Properties should be referenced in this section somewhere, since it is a separate problem leading to similar effects. The term "infrastructure" does not necessarily indicate these types of resources to the reader.	The text has been extensively edited in Key Message 2 and we no longer reference "infrastructure." We now include specific text and a reference for damages to cultural heritage sites. "Sites" is also included now in the Key Message 2 text itself at the beginning of the section.
Anne	Jensen	143974	Figure	15. Tribal and Indigenous Communities	1	549				The underlying figure has some issues. It is only possible to click the top dot so readers can't access information on more than on action per community from this map. Secondly, most tribes in Alaska have no land base, so these actions may also be take by cities, municipal (borough) governments, or Alaska Native Corporations (which are landholders). Some of the sources are rather dated.	This comment refers to the interactive figure at: https://biamaps.doi.gov/nca/reportview/, which is designed to be embedded in the online version of the chapter for Figure 15.1. There may have been a temporary technical issue if the reader could not click on the interactive map. The user may zoom to better select a single Tribe or group, and the resulting popup will show multiple results, if more than one action is included for the community at that location. The reader can click on the colored circles opens a pop-up for each tribe, listing a brief title and link to more information. An interactive mapping application will be placed at https://biamaps.doi.gov/nca/ and listed as a link in the Figure 15.1 caption. This mapping application will include additional navigation, selection, and filter functionality. There are over 800 adaptation actions in this interactive figure. There are over 800 adaptation actions in this interactive figure. Regarding the comment about tribes in Alaska, the resilience actions (plans, studies, trainings, etc.) in the figure are primarily those supported by federal funding provided directly to tribes and intertribal groups, including Alaska Native Villages. However, the interactive mapping application has a feedback form via which participants could request that actions taken by cities, borough governments, or Alaska Native Corporations be added. Regarding the date of sources, the activities included primarily represent the last decade; however, again, the interactive mapping application includes a Feedback Form to add new actions and request link updates as necessary to permit the interactive map to serve as a sustained component of the chapter.
Anne	Jensen	143975	Figure	15. Tribal and Indigenous Communities	1	551				This is a duplicate of the figure 1 on page 549.	Pages 548-549 in the public review draft are the Executive Summary for Chapter 15. The authors intentionally use verbatim some text and graphics from the underlying chapter that begins on page 550.
Julie	Maldonado	143982	Text Region	15. Tribal and Indigenous Communities		559	559	8	8	Suggest changing the word non-Indigenous to western in this sentence.	After consideration, the author team determined that both the original modifying term "non-Indigenous" or "Western" would be accurate, but decided that "non-Indigenous" is more in line with the recent literature in this context.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Julie	Maldonado	144381	Text Region	15. Tribal and Indigenous Communities		559	559	13	16	Suggest changing caption to read, Many tribal communities at risk of displacement from climate change are actively planning whole-community relocation strategies. As part of the resettlement of the Isle de Jean Charles Tribal community, residents are working with the Lowlander Center (a local non-governmental organization), the State of Louisiana, and other scientists, researchers, and planners to finalize and implement a relocation plan that reflects the culture, social structure, and livelihoods of the community. Also, review the Isle de Jean Charles case study in the Southeast Chapter to ensure consistency in the messaging in that case study section and what is included about the same case study in this section.	We have made some wording changes to the caption to reflect points made in this comment. In making edits, chapter authors worked closely with authors of the Southeast Chapter case study to ensure consistency.
Michael	MacCracken	144401	Text Region	15. Tribal and Indigenous Communities		548	548	18	18	This is a bit of a strange sentence as the comparison is not complete--is it referring to other in the United States or Indigenous peoples around the world. I'd suggest dropping the "in the United States"--or starting the sentence by saying "Compared to Americans as a whole, Indigenous peoples are often …"	We have edited this sentence to increase clarity as suggested.
Michael	MacCracken	144402	Text Region	15. Tribal and Indigenous Communities		548	548	18	21	And then there is this sentence, which I imagine is intended to refer just to the US, but really applies to those all over the world. Perhaps it would be best after all to just drop "in the United States" in the first sentence and then have the first paragraph apply to Indigenous peoples worldwide.	We have not made this suggested change because the specific charge to this author team for the National Climate Assessment is to assess impacts to Indigenous peoples in the United States or U.S.-affiliated territories. This sentence was meant to compare U.S. indigenous peoples to the U.S. general population as a whole, so text has been added to clarify the basis of comparison.
Michael	MacCracken	144403	Text Region	15. Tribal and Indigenous Communities		548	548	26	26	So, lines 23-25 does have a reference to the United States, but to really make it clear on line 26 by saying "Many tribes in the United States still ì ä"	This suggestion has been incorporated into the text.
Michael	MacCracken	144404	Text Region	15. Tribal and Indigenous Communities		548	548	33	33	I'd suggest changing "affects" to "can affect" or even, if one thinks of those in Alaska or the relocation going on in Louisiana, "are already affecting"	The Executive Summary has been heavily edited and no longer contains this exact language from the Public Review Draft. Throughout the chapter, we have included the "can" phrases suggested ("can compound", "can be exacerbated by", "can also influence , "can affect ", etc.). Impacts are discussed in the present tense when appropriate as noted by the commenter.
Michael	MacCracken	144405	Text Region	15. Tribal and Indigenous Communities		548	548	34	37	So, having been the liaison from the National Assessment team to the Native Peoples for the first National Assessment, we heard this statement about having a long history of adapting to climate variability, and so we asked them how they did this, and what became clear was that their primary adaptation strategy was to move to where the resources were, where food species had moved, where water was more abundant--summarized most simply as 'to follow the buffalo.' As various of the Indigenous participants in our effort were proudly saying this, one could see the realization in their eyes that this primary strategy is no longer available to them due to their communities being now on reservations, so that they are really unable to just relocate to wherever the resources would now be. That this is the case seems to me to be far too obscure in the lines of text in the chapter--"dynamical relations to the natural environment" does not clearly indicate that what is presumably meant involved substantial relocation, and "barriers to adaptation" does not really convey the problem of being restricted to reservations (as a tribal group as opposed to individuals being able to relocate, but outside their cultural and linguistic home). So, I think this paragraph needs to be rewritten to more clearly explain the "unique" aspect of their situation as a result of the impossibility now of simply moving across the American landscape to meet historic needs. Yes, through treaties there are situations where they could access public lands to harvest various types of traditional flora and fauna that are shifting, but this is difficult to arrange and can raise animosities among those not allowed to take such harvests (e.g., collecting feathers, plants, salmon, etc.). There is the whole treaty system (an area of law said to be more complex that US tax law) that applies and introduces all sorts of privileges and complications, some being contested by various parties. I just don't think the uniqueness aspect really comes across very well.	The Executive Summary has been heavily edited and no longer contains this exact language from the Public Review Draft. However, the text supporting Key Message 3 has been edited to incorporate the commenter's perspective on how historical adaptation strategies associated with being highly mobile are largely no longer available to tribes.
Michael	MacCracken	144406	Text Region	15. Tribal and Indigenous Communities		549	549	4	4	I don't really get the impression that the types of actions listed are really "steps to adapt to climate change impacts"--it seems to me they are more taking steps to learn more about the difficult situation that lies ahead. It thus seems to me that the first sentence is a bit of an overstatement of what the plot shows.	After consideration of this point, we have determined that the existing text is clear and accurate and no changes were made. The author team interprets adaptation more broadly than the commenter to be inclusive of information-gathering and planning activities to understand climate vulnerabilities and risks. The chapter already acknowleges that the majority of project types are planning-related including adaptation planning, vulnerability assessments, and attending trainings to increase skills and capacity of tribal staff and management.
Michael	MacCracken	144407	Text Region	15. Tribal and Indigenous Communities		550	550	6	6	Again, the primary strategy through their histories has been to relocate--move to where there are resources, not to say in one place and figure out then how to deal with the situation. I'd suggest that the phrase "strategies for adaptation" is rather optimistic.	The text in Key Message 3 has been edited to incorporate the commenter's perspective on how historical adaptation strategies associated with being highly mobile are largely no longer available to tribes (see section entitled "Limited Access to Traditional Territory and Decision-making"). However, the existing text about "strategies for adaptation" that is referenced by the commenter in the State of the Sector section has not been changed because the author team provides in-depth explanation and citations throughout the chapter that supports our statement that Indigenous peoples are distinctly suited to develop local strategies for adaptation in ways that honor their cultures, histories, and place-based traditional knowledges.
Michael	MacCracken	144408	Text Region	15. Tribal and Indigenous Communities		550	550	15	16	I hope there was also a checking of the results of the first national assessment, which was a bottom up exercise from the tribes that grew out of a Native Peoples/Native Homelands workshop that had representatives of something like 100 tribes, as I recall, something that has not, as I understand it, occurred for any of the national assessments since. There is a NP/NH report that includes results of the workshop and the resulting chapter and summary that were part of the National Assessment that came out in 2000. You can download the Native Peoples/Native Homelands workshop report that was part of the Assessment effort (and the report also includes the related chapter from the assessment itself) at https://downloads.globalchange.gov/nca/nca1/native.pdf . It provides a quite comprehensive coverage of issues that arose during the discussions, and a good bit more specific discussion and identification of key issues, etc. Also, if you look at https://www.globalchange.gov/browse/reports/climate-change-impacts-unite… you can see the Overview Report, which identified several key issues for the NP/NH area. While I do like the key messages of this chapter, I think it would be more helpful if there were more specifics identified from the bottom up.	The authors appreciate all the previous work from earlier assessments and resulting products. We are aware of the 2000 NCA and the Native People/Native Homelands workshop and subsequent report; this chapter was developed to build off of and update the assessments that have come before. This chapter focuses on national trends that are broadly applicable and seeks to highlight topics that have not had in-depth coverage in past reports. In the State of the Sector, the text states that NCA4 represents and update to NCA3 and now clarifies that it builds upon previous assessments as well. Also, we have updated the Traceable Accounts to provide more details about the author team's tribal outreach efforts and the "on the ground" input that was received as part of the chapter development process from tribal environmental practitioners working in the climate change field. This includes many meetings, webinars, and working groups to solicit Tribal input on the NCA4 process and content from Travel support for tribal representatives to attend and provide input to NCA4 regional engagement workshops held in 2017. Mini-grants for several Tribes to host community meetings to discuss climate change impacts was also provided. The feedback and reports from these activities was used to ensure that the key messages and supporting text included the most prominent topics and themes that emerged from the engagement.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144409	Text Region	15. Tribal and Indigenous Communities		560	560	3	9	I'm rather amazed that the chapter (in the Traceable Account section) apparently did not have a significant outreach to the Indigenous People themselves. Back for the first National Assessment, BIA would have nothing to do with it and the tribal representatives would not have trusted BIA to be leading the effort to describe their situation--part of the trauma that still exists among some, at least. That this chapter seems mainly to have come from the Federal perspective seems a potentially significant shortcoming to me. I would also note that the main part of the chapter seemed to have virtually nothing about the Indigenous Peoples of Alaska and the island nations, etc.	The chapter team notes that the text was developed collaboratively and with consensus of all contributing authors, and has added more background description of our chapter development process to the Traceable Accounts section to clarify the process for readers. The BIA is the administrative lead for the chapter because the National Climate Assessment is a federal report mandated by Congress. The author team disagrees that there was not significant outreach or opportunities for input from Indigenous peoples themselves. Throughout 2016-2018, the Chapter Authors worked with tribal partners to identify and develop content for this Chapter. In particular, the BIA worked with the College of Menominee Nation and Salish Kootenai College to develop and execute an outreach plan for the Chapter. This included awarding mini-grants for community meetings in the fall of 2016, attending and presenting at tribally-focused meetings such as Native American Fish and Wildlife Society, National Adaptation Forum (2017), Rising Voices 2016 and 2017, and the BIA Providers Conference in Alaska (November 2017), among many others. Additionally, through these tribal partners, BIA provided travel scholarships to Regional Engagement Workshops (28 requested and provided in early 2017) for interested tribal partners to attend and comment on regional climate concerns and issues. The chapter team also publicized USGCRP's formal requests for public comment and participated in public webinars hosted by USGCRP for the purpose of soliciting input from Indigenous peoples. The authors also held or participated in conference calls with regional organizations such as the Northwest Tribal Climate Network. The formal open calls for public comment were publicized through multiple channels including multiple webinars, website notices on the BIA Tribal Resilience page, and email notices through BIA, EPA, university, and partner email lists. In addition, BIA solicited comments on completeness of the interactive map in Figure 15.1 from multiple tribal partners. Regarding text about Indigenous peoples of Alaska and the island nations, the author team disagrees that the chapter does not address this. Key Message 1 discussed subsistence and commercial activities in Alaska and Key Message 3 provided an Indigenous knowledge example from Alaska and discussed community-led relocation in Alaska. More cross-references to information from the Pacific islands and the Caribbean regions have been included, and an example from the Marshall Islands has been added to Key Message 2. The author team has made edits throughout the chapter to further clarify and expand on these discussions where possible given space constraints and support from the peer-reviewed literature.
Michael	MacCracken	144410	Whole Chapter	15. Tribal and Indigenous Communities						The chapter seemed to be very general with very few specifics of the types of key issues, etc. That the chapter had to be prepared without, apparently, a major bringing together of tribal participants seems to me quite unfortunate such that I don't get a sense of advancement of efforts in this area over the past two decades, especially of the aspects that do make the situation of the Indigenous Peoples particularly unique. Perhaps these points are raised in the various references cited or the specific regional chapters, but the key points really need to be presented in this chapter, especially explaining better why the tribal/indigenous peoples situation is unique.	The author team has made extensive edits throughout the chapter to better explain how the tribal and Indigenous situation is unique. The State of the Sector section now clarifies that this NCA4 chapter represents an update from the NCA3 chapter on Indigenous peoples because it focuses on three key themes (in the key messages) that were not covered in depth in previous assessments. The chapter has been edited to provide more examples for each of these topics where possible given space constraints and where supported by the peer reviewed literature. We agree that the references cited are provided to point the reader to where to find more detailed information than can be included in this summary chapter. Regarding the development of the chapter, the author team realizes now that the Traceable Account did not describe the extensive engagement that was conducted for the chapter. Text has been added to the Traceable Account to describe this. Throughout 2016-2018, the chapter authors worked with tribal partners to identify and develop content for this chapter. In particular, the BIA worked with the College of Menominee Nation and Salish Kootenai College to develop and execute an outreach plan for the Chapter. This included awarding mini-grants for community meetings in the fall of 2016, attending and presenting at tribally-focused meetings such as Native American Fish and Wildlife Society, National Adaptation Forum (2017), Rising Voices 2016 and 2017, and the BIA Providers Conference in Alaska (November 2017), among many others. Additionally, through these tribal partners, BIA provided travel scholarships to Regional Engagement Workshops (28 requested and provided in early 2017) for interested tribal partners to attend and comment on regional climate concerns and issues. The chapter team also publicized USGCRP's formal requests for public comment and participated in public webinars hosted by USGCRP for the purpose of soliciting input from Indigenous peoples. The authors also held or participated in conference calls with regional organizations such as the Northwest Tribal Climate Network. The formal open calls for public comment were publicized through multiple channels including multiple webinars, website notices on the BIA Tribal Resilience page, and email notices through BIA, EPA, university, and partner email lists.
Gyami	Shrestha	144749	Text Region	15. Tribal and Indigenous Communities		559	559	21	23	I realize there is limited space, but a key few words to add at the end of this sentence after the words there is no planned ongoing support for other community-led resettlements is to include wording to reflect also the lack of flexibility in individual-based policies to allow for whole-community endeavors.	We have added langauge to address this issue and cited Marino 2018.
Lesley	Jantarasami	144771	Whole Chapter	15. Tribal and Indigenous Communities						This chapter was very insightful on the impacts climate change has on indigenous populations. Learning about the hardships these populations face in terms of climate impacts is an interesting experience because research on these populations specifically is not as common.	We greatly appreciate the reviewer's comment about the chapter and hope that the content is useful.
Lesley	Jantarasami	144774	Whole Chapter	15. Tribal and Indigenous Communities						I would recommend incorporating some additional language regarding the unique challenges faced by Tribes that do not currently have federal recognition. Their inability to access various federal programs in support of climate adaptation efforts, and the limitations in the recognition of their sovereignty by State actors create significant challenges.	We have added new text in multiple sections of the chapter that further explains key differences between federally recognized and non-federally recognized tribes, including those related to federal trust responsbility and authority/access to traditional territory and resources.
Lesley	Jantarasami	144777	Whole Chapter	15. Tribal and Indigenous Communities						Regarding the references to the Isle de Jean Charles Resettlement, the State has clearly and publicly stated that the resettlement is of a community and not a Tribe. This language should be amended to show the changes in the project from what was submitted in the application to what is actually occurring.	We have described the resettlement of the Island community, and clarified how the Tribe is included in this resettlement. We have also clarified that the State is managing the resettlement grant.
Al	Scovenna	140852	Text Region	16. Climate Effects on U.S. International Interests		582	584	20	3	-This section lacks new implementation plans for the response of increased humanitarian aid that will be demanded worldwide. -Change the language regarding "military intervention" to seem less aggressive/intrusive to a foreign government. Switch the phrase to a willingness to provide "peacekeepers". -How does the U.S plan on dealing with the increased demand for humanitarian aid? Increase funding or social awareness (public)? -No need for addressing a new market for the U.S to enter because they were providing humanitarian aid.	This section is not intended to discuss new or potential plans, or proposals for new actions. According to the UN (https://peacekeeping.un.org/sites/default/files/contributions_by_country.pdf) the US only has 57 peacekeepers as of 1/31/2018.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Kashja	Iler	140853	Text Region	16. Climate Effects on U.S. International Interests		582	582	33	34	"(and possible military intervention; see "National Security" below)" This is slightly aggressive language. Instead write something along the lines of: "….and necessitate more humanitarian assistance, including military peace keeping operations to aide citizens when necessary (See "National Security" below)." As military intervention has more negative connotations than typically implemented in extreme event based scenarios, as discussed in this section.	We have rephrased the language. The word "intervention" has multiple meanings and was selected intentionally.
Robert	Kopp	141178	Text Region	16. Climate Effects on U.S. International Interests		581	581	34	34	Basic economics tells us that, not only is it reasonable to "expect that these price can affect" businesses abroad, exports, and imports, they WILL affect them.	In response to this comment, we have revised the sentence to: "These price changes can affect U.S. businesses abroad as well as U.S. exports and imports."
Robert	Kopp	141179	Text Region	16. Climate Effects on U.S. International Interests		585	585	6	17	The absence of a discussion of the (controversial) literature on climate and the Syrian conflict is notable here. This literature does exist and it is pecuiliar that it is not mentioned here.	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the clearest examples to include in the text. The traceable account includes literature examining the Syrian Conflict and it degree of uncertainty.
Robert	Kopp	141180	Text Region	16. Climate Effects on U.S. International Interests		585	585	6	17	"The Concept of Climate Migration Advocacy and its Prospects" by Benoit Mayer has some framing material that would be useful here.	The article has been considered, found relevant, and recent; therefore, it has been included as a cite.
Robert	Kopp	141181	Traceable Account	16. Climate Effects on U.S. International Interests		593	593	25	29	The discussion of the Syrian conflict I was looking for in the main text is found here, but it is one sided and does not cite some of the literature arguing for a detectable role of climate change in the conflict.	After review of the comment, the authors changed the sentence as follows: "The importance of climate variability (i.e., drought), the contribution … " and added the Gleick, 2014 reference.
Robert	Kopp	141182	Traceable Account	16. Climate Effects on U.S. International Interests		593	593	33	34	Almost everything in this document is uncertain to some degree -- that is why there is formal likelihood and confidence language in the NCA, to express degrees of certainty and uncertainty. Saying that "attribution is uncertain" is inane. A more thoughtful discussion is found in section 3.4 of the CSSR.	In response to the comment we have revised the statement to remove that clause.
David	Wojick	141699	Text Region	16. Climate Effects on U.S. International Interests		581	581	17	19	The present text says this: 17 Key Message 1: Climate variability and change outside the United States is impacting and will 18 increasingly impact our trade and economy, including U.S. businesses with overseas 19 operations, overseas supply chains, and import and export prices. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models.	The portion of the conclusion that pertains to the past is based on empirical information. The portion that pertains to the future is based on combination of empirical relationships and climate model projections. This commenter disagrees with scientific consensus about the reliability of climate models (see, e.g., the Climate Science Special Report for a description of the current state of knowledge regarding climate models).
David	Wojick	141700	Text Region	16. Climate Effects on U.S. International Interests		584	584	5	6	Here is the present text: 5 Key Message 3: Climate extremes and change, in conjunction with other factors, can exacerbate 6 conflict which has implications for U.S. national security. Comment: This text falsely states speculative projections established physical facts. These projections appear to be based primarily on the use of questionable computer models.	Our assessment of the literature is based primarily on observations, not projections of future climate change.
David	Wojick	141701	Text Region	16. Climate Effects on U.S. International Interests		585	585	19	21	The present text is this: 19 Key Message 4: Shared resources along the United States‰Ûª land and maritime borders, which 20 provide direct benefits to Americans, are vulnerable to the impacts of climate variability and 21 change. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models.	Thank you for your comment, but we strongly disagree, as it is inconsistent with the current state of the science on this topic. The impacts listed in this section are not projections, but are examples of impacts that have already been experienced, and which are well documented in the scientific literature.
Susanne	Moser	141803	Text Region	16. Climate Effects on U.S. International Interests		582	582	5	12	Good use of examples here. A citation or reference to a more detailed list would be helpful too.	We have added a reference to the TCFD as follows, which includes a listing of hundreds of corporate partners as of February 2018: "The Financial Stability Board Task Force on Climate-related Financial Disclosures (TCFD) has encouraged businesses to report risks associated with climate change, with hundreds of businesses currently enlisted as partners."
Rebecca	Ambresh	141813	Text Region	16. Climate Effects on U.S. International Interests		583	583	5	18	These are good examples. It would be beneficial to explicitly state how these improved/affected economics and trade, international development and humanitarian assistance, national security and/or transboundary resources as far as the US is concerned since these are the main talking points of this chapter.	These are 2 examples of international development efforts within the international development section of the chapter. The first cites a valuation study. The second may be too new to have undergone evaluation.
Rebecca	Ambresh	141814	Text Region	16. Climate Effects on U.S. International Interests		593	593	25	29	This section states that "is not possible to draw conclusions on the role of climate" as far as the conflict in Syria is concerned. Now that time has passed since this was written, could it be updated with new relevant information? It is believed now, that the drought in Syria caused farmers to move to the city and look for work resulting in unrest which contributed to the conflict we see in Syria now.	After consideration of this point, we still feel the existing text is clear and accurate. We have an additional relevant reference as recommended by the NAS.
David	Iinouye	141815	Text Region	16. Climate Effects on U.S. International Interests		585	585	6	17	This area talks about a very important issue; displaced people as a result of climate change. There are some areas that could be expanded. It would be beneficial to add 1. Expand on the national security issues associated with this. Namely, addressing the fact that the US might have to take in refugees as a result. This will not only affect the US economy but there are issues with the risk of increased terrorism associated with this. 2. Include predictions of places that will likely have a large population of displaced people with no where to go (like Bangladesh.)	While the comment suggests potential topics for inclusion examples, the authors feel the existing examples are appropriate and adequate given the space available.
George	Backus	141842	Text Region	16. Climate Effects on U.S. International Interests		585	585	17	17	Add sentence and references: Nonetheless, recent literature continues to suggest a meaningful relationship between temperature and migration and between temperature, drought and conflict. [Fli¦rke, Martina, Christof Schneider, and Robert I. McDonald. "Water competition between cities and agriculture driven by climate change and urban growth." Nature Sustainability 1, no. 1 (2018): 51. And Missirian, Anouch, and Wolfram Schlenker. "Asylum applications respond to temperature fluctuations." Science 358, no. 6370 (2017): 1610-1614. And Femia, F. and Werrell, C., 2017. An unstable, stable nation? Climate, water, migration and security in Syria from 2006‰ÛÒ2011. In Climate Hazard Crises in Asian Societies and Environments, 1-10. Freeman, Laura. "Environmental Change, Migration, and Conflict in Africa: A Critical Examination of the Interconnections." The Journal of Environment & Development 26, no. 4 (2017): 351-374.]	We added the Freeman and Maier citations but due to space limitations could not include all the suggested references.
George	Backus	141843	Text Region	16. Climate Effects on U.S. International Interests		590	590	11	11	At end of sentence add ‰ÛÏwhich both had prolonged and cascading impacts across many countries and economic sectors.‰ÛÏ Otherwise the paragraph remains too abstract for the reader to appreciate the implications. Although not peer-reviewed literature, the following news report highlights the issue https://www.ft.com/content/f0f9a234-fb33-11e0-8756-00144feab49a.	In response to this reviewers's comment the adjectives "prolonged and cascading" have been added to modify the comment about impacts from the 2011 Bangkok flooding.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
George	Backus	141844	Text Region	16. Climate Effects on U.S. International Interests		589	589	15	15	This a brief chapter containing information that can only be completely gleaned through assimilating all the content of the references. A summary section that ties it all together would be useful. Here is some proposed added text: BEGINNING OF TEXT: The climate effects that lead to concerns for U.S. international interests are many and result from the interactions among the topics discussed in the previous chapters. In general, the climate and its compounding effects cause economic and societal stresses which can lead to migration and conflict. These responses reinforce economic and environmental stressors, which can produce humanitarian crises, possible requirements for military intervention, and impacts on the U.S. economy. Figure 16.2 [Figure sent to the ‰ÛÏreview‰Û email address.] depicts some of the key relationships described in this chapter and its references. The figure also visually highlights how each of the topics in the previous chapters, in an international setting, contribute to issues of U.S. concern. The concept of ‰ÛÏRegion‰Û in the diagram is meant to imply that the migration and stress can be associated with neighboring areas. Figure 16.2 Title: The Myriad Climate Effects on US. International Interests [Figure sent to the ‰ÛÏreview‰Û email address.] (Figure 16.2 is declared to be public domain with no restriction on use and no requirement for attribution or reference. GB) Caption: This diagram shows several of the relationships noted within the chapters and the literature it references. It uses directed arcs to illustrate the causal interconnections between the topic elements. Elements in red designate climate drivers. Those elements in a green font symbolize chapter topics. Sea-level rise is used to capture the concepts of Chapters 8: Coastal Effects. Seafood and ocean warming are used as proxies for the concerns of Chapter 9: Ocean and Marine Resources. A black font indicates dependencies among the variables. An orange font denotes U.S. interests. The element ‰ÛÏU.S. import prices‰Û is a proxy implying the large U.S. economic impacts. The arrow heads show the direction of causality or influence, from-to. The plus (+) or minus (-) sign shown at the arrow heads signify the direction of relationship. A plus implies a positive or reinforcing relationship, where the more the quantity on the source side changes, the more of the variable at the terminal (arrow) side changes in the same direction. This applies whether it is a more-the-more, or a less-the-less response. An arrow with a minus sign indicates a negative or countering response, where the more the	We are considering drafting a summary statement for the chapter.
Allison	Crimmins	142316	Whole Chapter	16. Climate Effects on U.S. International Interests						This was a really well-written chapter, one of the best chapter I read. Good job! The authors did an amazing job covering a lot of ground in a short amount of space. Yet they kept to their page limit, which made this chapter actually pleasurable to read. The key messages were really thoughtful and distinct from one another, and then well supported by the chapter text. The chapter could be improved by 1) strengthening the figure, 2) revising the traceable accounts, and 3) being a bit more careful about not appearing to advocate/advertise for certain government programs. More detail on these three topics are in subsequent comments.	We appreciate the reviewer's comment and compliments. We removed the figure, revised the KMs, and revisited how we describe governments programs. On the latter point we include government policies and programs as evidence of how climate is affecting U.S. interests.
Allison	Crimmins	142317	Text Region	16. Climate Effects on U.S. International Interests		578	578	3	3	The distinction between "climate variability" and "climate change" in key message 1 is something that may be better suited in the main text, and not in a short, high level key message. In this key message, it may confuse readers who already do not have a strong understanding of the difference between climate and weather. It is also difficult for knowledgeable readers to know if you mean long-term change in climate variability (climate change leading to more variance) or just plain "extreme weather". It is also strange that you are talking about 'climate change outside the United States'. I believe what you mean is 'climate change IMPACTS outside the United States', since of course the climate is changing everywhere. Furthermore, you use "impact" and "impacting" in the same sentence, but neither provide a clear direction of magnitude of impacts. I would therefore suggest a slight rewording, possibly to "The impacts of climate change occurring outside the United States will increasingly [disrupt/threaten/impair] our trade and economy…"	We think to fully assess the implications of climate for U.S. national interests it is important to include climate variability and change. We think our analysis is strengthened by including extreme events whether or not they have been completely or partially attributed to anthropogenic climate change. Events such as Hurricane Mitch are indicative of the impacts of climate and weather on US interests. We contend that even without attribution, such events are useful to include because these types of events are projected to become more frequent and severe with climate change.We are intentionally not indicating that all of the changes have harmful impacts to the U.S. economy and trade since some can be negative and some can be positive. For example, an increase in global wheat prices can increase profits for U.S. farmers but can hurt U.S. wheat consumers. Therefore, we prefer use of the words "impact" and "impacting," which are somewhat neutral with respect to the nature of the effect.
Allison	Crimmins	142318	Text Region	16. Climate Effects on U.S. International Interests		578	578	6	9	The first phrase says "…slow or reverse development". Development of what? While the authors of this chapter, and maybe of the entire report, likely know you mean international or economic development, a lot of the readers who are not academics may not know this inside-the-beltway jargon. I think you could make this clearer to a broader audience by revising the language a little. Perhaps something like: "Climate change can slow or reverse social and economic progress in developing countries, undermining international aid and investments made by the United States, and increasing the need for additional humanitarian assistance, disaster relief, and military intervention." I would drop the "even" on line 8 and "and natural disasters" on line 6, since this could confuse people. Natural disasters could include earthquakes, which can undermine aid and relief, but is not climate related.	Comment accepted.
Allison	Crimmins	142319	Text Region	16. Climate Effects on U.S. International Interests		578	578	9	9	Suggest dropping "as a response". It begs the question, in response to what? But also it seems contradictory to saying we provide aid so countries can better anticipate impacts.	We agree and removed "as a response" from that final sentence.
Allison	Crimmins	142320	Text Region	16. Climate Effects on U.S. International Interests		578	578	12	12	Suggest dropping "in conjunction with other factors", since the word "exacerbate" obviates this clause	After careful consideration, we think that the clause adds important context to the key message.
Allison	Crimmins	142321	Text Region	16. Climate Effects on U.S. International Interests		578	578	13	13	The word "implications" here doesn't have much specificity in terms of whether these are good or bad implications. Some directional wording would help. For example: "threatens", "puts pressure on", "challenges", etc.	We appreciate the suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations relevant for this section. The effects of health impacts on military personnnel is mentioned in the Box 16.1 on Health.
Allison	Crimmins	142322	Text Region	16. Climate Effects on U.S. International Interests		578	578	18	18	What is a "multinational framework"? I have no idea what you're referring to, but this seems like vague jargon.	The term "multinational framework" is commonly used in the context of agreements between nations. It refers to the collection of collaborative arrangements, agreements, structures, procedures, etc., often spelled out in detail in formal agreements between nations. For reader clarity, we will include this term in the glossary
Allison	Crimmins	142323	Text Region	16. Climate Effects on U.S. International Interests		578	578	17	18	Suggest dropping "variability and" and just saying "climate change". While there is room to include the idea of variability in the text, it is hard to get that nuance across in a high level key message. For instance, do you mean long terms trends in the variability of weather phenomena? Do you just mean ups and downs, so extremes?	This issue is being resolved for the Chapter as a whole. In general we will refer to climate change and extremes.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142324	Text Region	16. Climate Effects on U.S. International Interests		578	578		36	I realize this chapter is on international impacts that affect the US, but I think it is well worth a sentence at the beginning of the executive summary and main text that acknowledges that international impacts have their own worth (outside of what it means for the US), that the damages incurred affect many people around the world and those people have intrinsic value in and of themselves. Given that, those impacts ALSO affect the US. It is ok that this chapter is about the "also affect the US" part, but it just sounds heartless to not clearly state that other people's suffering has value outside of what it costs Americans.	We added a sentence clarify that our focus on the implications of climate for U.S. interests is not meant to minimize the importance of impacts of climate change outside the country. We cite Americans' international volunteering and contributions to international charities as evidence.
Allison	Crimmins	142325	Text Region	16. Climate Effects on U.S. International Interests		578	578	27	27	"Some US-led" is a bit vague (what does some mean?). Perhaps provide examples or a rough estimate of the percent of companies, etc. and say they are "already" reducing climate risks.	We have provided more specificity in the body of the text, including on the Coca-Cola example, to support this statement in the Summary. Here is the augmented text in the body: "Some U.S.-led businesses are reducing their climate risks abroad, including through partnerships with environmental groups. For example, Starbucks and Conservation International have partnered to strengthen the capacity of coffee farmers and supply chains to manage climate risks (Thorpe and Fennell 2012), while Coca-Cola and the World Wildlife Fund (WWF) are working together to protect foreign watersheds that Coca-Cola uses for water supply (WWF 2013). Coca-Cola increased its company-wide water efficiency from 2004 to 2012 by 21.4 percent, which avoided approximately USD $600 million in costs and tended to increase resilience in the face of water shortages (UN Global Compact 2015)."
Allison	Crimmins	142326	Text Region	16. Climate Effects on U.S. International Interests		579	579	4	4	Suggest including mention of safety to soldiers/ troops in this section, and perhaps more on this subject in the underlying text. The health assessment has a text box on this subject that can be referenced. Highlighting the impacts of climate change on deployed/training troops helps bring home the climate change message well with dismissive audiences.	We appreciate the suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations relevant for this section.
Allison	Crimmins	142327	Text Region	16. Climate Effects on U.S. International Interests		579	579	5	7	This sentence is a bit awkward and a word or some words seem to be missing from the second sentence (between incorporate and climate risk)	The second sentence has been edited to remove the extra word ('are'), and has been reworded for clarification.
Allison	Crimmins	142328	Figure	16. Climate Effects on U.S. International Interests	1	579				This is the only figure in the chapter and I'm afraid it is a little lacking. I realize the icons in the map are examples, but they are oddly sparse. If you were only providing one example for each type, that would make more sense. But, for instance, there are two examples of instability (I'm guessing from the symbol this has something to do with water?) and those are in Ethiopia and Russia, to my best estimate. Why? Why those examples, why not others? It is also really hard to tell where some of these icons are placed- is the demand for humanitarian aid icon in Somalia? Vietnam? Taiwan? Then some icons are more specific than others- why is just coffee singled out? Why is just electronics singled out in the World Bank icon? Why is the shipping route icon east of Greenland and not north of Alaska? I'm not convinced this is the most compelling figure for this chapter, and I'm not convinced that a map is useful. Showing that there are impacts all over the world doesn't seem like the main message this chapter is trying to convey. A figure that focuses on just one or two Key Messages may be better. For example, if there was a way to show where military troops are deployed and overlay that with maps of extreme weather impacts or natural disasters or maybe economic impacts, etc. that may more directly relate to the key messages. For the current figure, if these are 8 examples of the types of impacts this chapter covers, maybe just a table with the 8 topics and a sentence or two explaining these examples would be more helpful than dropping icons on a map without details. If the authors would like to keep the map, I would suggest using just one example for each icon and finding a way to include a sentence that explains that example. For example, an interactive map would allow a pop-up box next to each icon that explains- in one sentence- what the coffee production issue in (Chile? Peru?) is and how that affects the US. There are a lot of good citations in this figure caption, but it makes me curious what the results of those studies are. Also, I would have fewer icons in the US itself, since this chapter is about international impacts that affect the US. The fish one seems like the only appropriate example, since it relates to KM4.	The authors agree that the figure is lacking, for reasons the reviewier identified and for other reasons. The original figure has been removed from the chapter, as it does not reflect accurately the complexity of topics addressed in this chapter.
Allison	Crimmins	142329	Text Region	16. Climate Effects on U.S. International Interests		581	581	5	6	Though this sentence hints at impacts in other countries, I think this section needs to more explicitly state that 1) climate affects other countries and 2) that's not what we're talking about here. This is skated over so quickly that it leaves the reader feeling like the authors are not sympathetic to the fact that climate impacts outside the US hurt people outside the US, and that that fact is important on its own, without tallying up how it also hurts Americans.	We have revised the language to briefly reflect the commentor's issues.
Allison	Crimmins	142330	Text Region	16. Climate Effects on U.S. International Interests		581	581	12	15	All of this information can be moved to the opening paragraph of the traceable accounts, which explains the scope of the chapter. The discussion of what is in and what is out is more appropriate for that paragraph.	We have added in the Traceable Accounts section a desciption of the process used to develop and staff the chapter, as well as seek public input. This material has been moved to that section.
Allison	Crimmins	142331	Text Region	16. Climate Effects on U.S. International Interests		581	581	30	35	Suggest rewording to: "…can affect US economics and trade in many ways. For example, impacts on the price of agricultural products, mining commodities, and manufactured goods can be affected by availability of irrigation water…". Also, on line 34, where the sentence discusses "price changes", can the authors be more specific? Are these prices changes going up? going down? are they more volatile, etc.?	The reviewer's first recommendation has been implemented as follows: "For example, the price of agricultural and mining commodities and manufactured goods can be affected by year-to-year variations in the availability of irrigation water for agriculture or hydroelectric power (von Braun and Tedesse 2012; Ubilava 2016). Regarding the reviewer's second comment about the directionality of price changes: there is not a clear directionality, as illustrated in the newly added example about 2011 wheat prices.
Allison	Crimmins	142332	Text Region	16. Climate Effects on U.S. International Interests		582	582	1	1	Suggest replacing "Conversely," with "At the same time" since this sentence does not cancel out the previous sentence.	We have adopted this reviewer's recommendation.
Allison	Crimmins	142333	Text Region	16. Climate Effects on U.S. International Interests		582	582	8	9	Both examples here are very old and will be even older by the time this assessment is out. If they are so old, then there must be stats on whether these actions were effective. These examples would be more persuasive "best practice" type recommendations if there were statistics on their effectiveness or pros/cons included. Just be sure the authors avoid advocacy or endorsement of specific programs.	We added a reference that describes the efficacy of one aspect of Coca -Cola's investments as follows: "Coca-Cola increased its company-wide water efficiency from 2004 to 2012 by 21.4 percent, which avoided approximately USD $600 million in costs and tended to increase resilience in the face of water shortages (UN Global Compact 2015)."
Allison	Crimmins	142334	Text Region	16. Climate Effects on U.S. International Interests		582	582	13	14	It may be worth mentioning that shifting production of goods and services (with an s) to other places is not free. It is not exactly an organic event, but costs money and time and some companies may be winners or losers in this process.	We agree with this reviewer's comment and have added the following sentece: "These shifts generally have associated costs that are borne by consumers and have impacts on the economies in which the changes take place."
Allison	Crimmins	142335	Text Region	16. Climate Effects on U.S. International Interests		582	582	30	30	Do these citations hold true under the new administration? Are there better, more academic (i.e. peer reviewed) sources for this sentence that could be used? An impartial source would be better, as these seem to imply endorsement of Obama programs (and perhaps, the author's own former projects?)	The point of citing US policy is that policy is a reflection of of US interests, the theme of this chapter. At the time of writing, cited policies are still operational. We have updated as appropriate.
Allison	Crimmins	142336	Text Region	16. Climate Effects on U.S. International Interests		582	582	28	28	Suggest deleting "as well as expands the middle class". I'm sure policy wonks understand why expanding the middle class is desirable, but the readers of the NCA likely do not, and it is not worth the time to explain that concept here. Plus it is redundant to the phrase "promote political and economic stability" which immediately precedes it.	Comment accepted.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142337	Text Region	16. Climate Effects on U.S. International Interests		582	582	36	36	Suggest editing sentence to read: "These sectors, and these US investments in them, are sensitive…". Also consider adding sanitation to your list in the previous sentence and providing a citation.	Comment accepted.
Allison	Crimmins	142338	Text Region	16. Climate Effects on U.S. International Interests		583	583	2	4	Suggest deleting this entire last sentence. It is too much promotion of Obama era programs, sounds too advocacy-like, and does not impart much information to the reader.	The statement has been revised, but we think it is appropriate to use U.S. policy as evidence of the interests of the U.S.
Allison	Crimmins	142339	Text Region	16. Climate Effects on U.S. International Interests		583	583	5	8	This sentence needs a citation.	The two succeeding sentences elaborate and provide citations.
Allison	Crimmins	142340	Text Region	16. Climate Effects on U.S. International Interests		583	583	10	10	These stats are very confusing. Why would impacts to farmers that self identify be higher? Wouldn't those who identify climate risks as a major concern use the drought forecasts (and therefore see their losses cut in half as implied by the next sentence?)	We have made an edit to clarify. This is explained in the referenced paper and in an upcoming book chapter.
Allison	Crimmins	142341	Text Region	16. Climate Effects on U.S. International Interests		583	583	15	18	Can you show how that has helped the U.S.?	The larger point being made elsewhere in the section (and chapter) is that helping countries manage climate risks can help to reduce costs of humanitarian assistance and the likelihood of regional insecurity, create markets, etc. and this advances US interests.
Allison	Crimmins	142342	Text Region	16. Climate Effects on U.S. International Interests		583	583	19	26	This paragraph is not very helpful. First, lines 19-22 are repetitive to the lines on page 582 line 36-38. Second, there are too many programs listed, making it hard to follow and smack of self-congratulatory promotion of federal government programs. Next, the example is very old (1998). And finally, there is no way for readers to know whether the dollar amounts in this paragraph are a lot or a little- no context is provided. $190 million doesn't sound like very much to me, especially given how expensive recent extreme events in the US were. While the following paragraph is an even older example (there will be readers of this who weren't even born then!), the paragraph is better written and provides more context to the aid amounts.	The reference to 1984 was a historical reference to the creation of FEWS Net; the example itself was from 2015-16. We have removed the dollar amounts.
Allison	Crimmins	142343	Text Region	16. Climate Effects on U.S. International Interests		583	583	33	33	Wasn't the point of this that there was an early warning system? So shouldn't "As drought and a food crisis materialized…" be changed to "Even before the drought and subsequent food crisis materialized…"	We have made an edit to clarify.
Allison	Crimmins	142344	Text Region	16. Climate Effects on U.S. International Interests		584	584	10	10	Suggest including information on military personnel here. Also the use of the word "affecting" is rather tepid. Can you provide a direction or magnitude for this statement, such as "exacerbating" or "increasing threats of", etc.	After consideration of this point, we still feel the existing text is clear and accurate. The focus of the KM3 discussion is risk to assets in the form of fixed, physical infrastrcture. People are DoD assets which are not fixed and are impacted by health effects which are addressed elsewhere in Box 16.1
Allison	Crimmins	142345	Text Region	16. Climate Effects on U.S. International Interests		584	584	12	14	Could include mention of impacts that occur after the events, such as mold leading to health issues, clean up concerns or conflict, disease, violence, etc.	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations relevant for this section.
Allison	Crimmins	142346	Text Region	16. Climate Effects on U.S. International Interests		584	584	22	23	A risk-based examination of climate risks? You don't say.	This comment does not seem to raise any question or suggest any revision.
Allison	Crimmins	142347	Text Region	16. Climate Effects on U.S. International Interests		584	584	24	27	This language is very jargon filled and academic. Suggest revising with audience in mind.	After consideration of this point, we still feel the existing text is clear and accurate.
Allison	Crimmins	142348	Text Region	16. Climate Effects on U.S. International Interests		584	584	28	31	In other words, where there is the least ability to prepare for/ adapt to climate change	This comment does not seem to raise any question or suggest any revision.
Allison	Crimmins	142349	Text Region	16. Climate Effects on U.S. International Interests		584	584	32	38	Have climate attribution analyses been conducted on these events? Can you say whether these were definitively climate-induced or related? If so, that would strengthen the argument.	This is a good point. As intended, we believe that the existing text indicates the partial attribution of the unrest to the climate events. We have made the citation clearer.
Allison	Crimmins	142350	Text Region	16. Climate Effects on U.S. International Interests		584	584	35	35	Citation needed. Also provide the year that the Egyptian Revolution took place. This won't be common knowledge to NCA readers.	This is a good point. As intended, we believe that the existing text indicates the partial attribution of the unrest to the climate events. We have made the citation clearer.
Allison	Crimmins	142351	Text Region	16. Climate Effects on U.S. International Interests		584	584	38	38	Can you be more specific than "some"? E.g. men? Boys? Farmers?	This is a good point. As intended, we believe that the existing text indicates the partial attribution of the unrest to the climate events. We have made the citation clearer.
Allison	Crimmins	142352	Text Region	16. Climate Effects on U.S. International Interests		585	585	1	5	Suggest moving this sentence to the third paragraph of KM3 (p 584 lines 24-31)	We appreciate and thank the reviewer and respect their comment; hoever, the author team has deliberated and the chapter has not been restructured in this way.
Allison	Crimmins	142353	Text Region	16. Climate Effects on U.S. International Interests		585	585	11	11	Please provide citation for attribution study	We have added a citation in our chapter assessment.
Allison	Crimmins	142354	Text Region	16. Climate Effects on U.S. International Interests		585	585	15	17	Really? I find this surprising. Isn't there ample evidence of this?	The assesment of the evidence is still uncertain and contradictory, we have included several additional refereneces to accurately capture the ongoing debate.
Allison	Crimmins	142355	Text Region	16. Climate Effects on U.S. International Interests		585	585	35	35	Authors could mention the marine species indicator here, or even use the NOAA/EPA figure: https://www.epa.gov/climate-indicators/climate-change-indicators-marine-…	We have decided to not include reference to the NOAA/EPA marine species indicator reference as it does not address the specific point being made in this chapter. Chapter 9 on Oceans covers this topic more thoroughly
Allison	Crimmins	142356	Text Region	16. Climate Effects on U.S. International Interests		586	586	5	5	Cite the USGCRP 2016 climate and health assessment here, which has an entire box on climate related health impacts to military personnel	Agree. The citation was added.
Allison	Crimmins	142357	Text Region	16. Climate Effects on U.S. International Interests		586	586	23	23	Suggest deleting mention of the 2012 Minute 219 agreement- no one will know what this is or why it is important and it just comes off sounding like promotion of government programs.	The mention of the 2012 Minute 219 agreement has been removed
Allison	Crimmins	142358	Text Region	16. Climate Effects on U.S. International Interests		586	586	37	38	The text lists examples of private foundations, but does not list examples of NGOs or academic institutions. Why? Suggest deleting examples, or providing examples for all of the categories, as this could be seen as federal government endorsement.	The examples have been removed

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	142359	Text Region	16. Climate Effects on U.S. International Interests		587	587	10	10	Citation needed	Agree. Added the following citations: 1) Sweet, W.V., R.E. Kopp, C.P. Weaver, J. Obeysekera, R.M. Horton, E.R. Thieler, and C. Zervas, 2017: Glob- al and Regional Sea Level Rise Scenarios for the Unit- ed States. National Oceanic and Atmospheric Ad- ministration, National Ocean Service, Silver Spring, MD. 75 pp. https://tidesandcurrents.noaa.gov/pub- lications/techrpt83_Global_and_Regional_SLR_Sce- narios_for_the_US_ nal.pdf; 2) Kopp, R.E., R.M. Horton, C.M. Little, J.X. Mitrovica, M. Oppenheimer, D.J. Rasmussen, B.H. Strauss, and C. Tebaldi, 2014: Probabilistic 21st and 22nd centu- ry sea-level projections at a global network of tide- gauge sites. Earth's Future, 2, 383-406. http://dx.doi. org/10.1002/2014EF000239; 3) Hall, J.A., S. Gill, J. Obeysekera, W. Sweet, K. Knu- uti, and J. Marburger, 2016: Regional Sea Level Sce- narios for Coastal Risk Management: Managing the Uncertainty of Future Sea Level Change and Extreme Water Levels for Department of Defense Coastal Sites Worldwide. U.S. Department of Defense, Strategic Environmental Research and Development Pro- gram, Alexandria VA. 224 pp. https://www.usfsp. edu/icar/files/2015/08/CARSWG-SLR-FINAL- April-2016.pdf; 4) Sweet, W.V., R. Horton, R.E. Kopp, A.N. LeGrande, and A. Romanou, 2017: Sea level rise. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 333-363, doi: 10.7930/J0VM49F2.
Allison	Crimmins	142360	Text Region	16. Climate Effects on U.S. International Interests		587	587	15	15	Cite the CSSR here	Agree. We added the following citation: Perlwitz, J., T. Knutson, J.P. Kossin, and A.N. LeGrande, 2017: Large-scale circulation and climate variability. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 161-184, doi: 10.7930/J0RV0KVQ.
Allison	Crimmins	142361	Text Region	16. Climate Effects on U.S. International Interests		587	588	19	10	This is a great list, but strongly recommend that the examples are dropped from all these bullets. In most cases the examples are captured by the citations provided. For example, in the fourth bullet you list WCRP and Future Early, then provide citations to WCRP and Future Earth. Just keep the citations and cut back on the text.	We agree that the providing examples in the bullets is unnecessary, and will delete them in order to tighten up the text.
Allison	Crimmins	142362	Traceable Account	16. Climate Effects on U.S. International Interests		590	590	1	1	This chapter was very well written, but the traceable accounts needs some more work. First, the chapter is missing the introductory TA paragraphs that explain how the author team was selected, how key messages were developed, and how the scope of the chapter was determined (what is in, what is out, what is found elsewhere in the report and therefore not here, etc.) See other chapters for examples.	We added to the traceable accounts a description of the process that includes an explaination of why the chapter was structured as it is.
Allison	Crimmins	142363	Traceable Account	16. Climate Effects on U.S. International Interests		590	590	5	30	The likelihood statement on line 5 is not described in the Description of confidence and likelihood section on lines 26-30. Please add.	We have added the following to support the likelihood statement: "The portion of the main message pertaining to the past is very likely since these effects are already being seen. The portion of the main message pertaining to the future is also very likely due to the likelihood of future climate change (see Climate Science Special Report) and persistence of the sensitivity of the US economy and its trade to climate conditions."
Allison	Crimmins	142364	Traceable Account	16. Climate Effects on U.S. International Interests		590	590	8	16	This section needs to be a DESCRIPTION of the evidence base. It is inappropriate to say "see references" on line 11 (citations should be provided); "as documented in the citations related to those issues" should be deleted (lines 12-13); "of the type described in chapters 11 and 12 of IPCC" should also be deleted-- the CSSR and IPCC should just be cited on line 15; and "the types of impacts" on line 15 needs to be described. This section does not convey to the reader whether there is a lot of literature or a little, whether it is old or new, whether there is consensus or contention, whether this is emerging or established. Please revise based on guidance for writing TAs.	This paragraph has been modified as follows: "Major U.S. firms are concerned about potential climate change impacts to their business (see, e.g. Peace et al. 2013; Peace and Maher 2015; and illustrative examples of SEC filings describing climate risks to U.S. companies operating abroad). Examples include the 2011 food price spike (Trostle et al. 2011; Vocke 2012) and the 2011 Bangkok flooding and corresponding impacts to transportation and supply chains (Jira and Toffel 2013; Abe and Ye 2013; Pappis 2011). Future changes in precipitation, temperature, and sea level (among other factors) are very likely, as described in the CSSR (2017), and are very likely to exacerbate impacts on the U.S. economy and trade, relative to past impacts.
Allison	Crimmins	142365	Traceable Account	16. Climate Effects on U.S. International Interests		590	590	20	21	This statement is not exactly true- there are two big studies that quantify impacts of global climate change on the US economy- the EPA's CIRA report (which is a technical input to this report) and the Risky Business report.	Those studies do what the reviewer indicates; however, they are not focused on the subject of this section: the impacts of global climate change that occurs in other countries on US interests.
Allison	Crimmins	142366	Traceable Account	16. Climate Effects on U.S. International Interests		590	590	26	30	Suggest revising to "There is medium confidence that XYZ because there is insufficient empirical analysis…" Please note that you talk about insufficient analysis, but then have a high likelihood statement, which could be confusing. Suggest deleting everything after the word "trade" on line 28 (so line 28 through 30). Please provide less text on what you didn't do and more text that is relevant to this key message.	In response to this reviewers's comment we revised the sentence to the following: "There is medium confidence that climate change and extremes outside the United States are impacting and will increasingly impact our trade and economy because there is insufficient in the main message. There is insufficient empirical analysis on the causal relationships between past international climate variations outside the United States and U.S. economics and trade to provide higher confidence at this time."
Allison	Crimmins	142367	Traceable Account	16. Climate Effects on U.S. International Interests		590	590	35	35	Please check your likelihood and confidence statements with those in the Description of confidence and likelihood section on page 591. Also, there is no such thing as medium likelihood.	We have made edits to these statements.
Allison	Crimmins	142368	Traceable Account	16. Climate Effects on U.S. International Interests		591	591	1	17	This section really just repeats the text that is in the chapter, which is not really the purpose. This should be a description of the evidence, not a repetition of the evidence. Parts of this are good, for example the discussion of world war II helps explain how long we've known about this evidence. But more description would be better. For example, what do you mean by "broad and deep" on lines 15-16? That is a bit of a throw-away phrase. The citation on line 8 is also very odd.	We have made some edits to properly characterize the evidence.
Allison	Crimmins	142369	Traceable Account	16. Climate Effects on U.S. International Interests		591	591	19	23	Line 19: NO, this field is not relatively new (or at least, help the readers understand what it is relative to!) Lines19-21: Is it? What evidence supports that most of the work is being done there and not by others? Please provide citations. I wonder if this is just the author's bias and not actually a representation of the body of academic literature on this subject? Line 22: What about government/ local projects? Wouldn't these be publicized? Lines 19-23: Where are these studies, and where are they taking place?	We are adding some citations, and have edited the sentence about who is implementing the projects.
Allison	Crimmins	142370	Traceable Account	16. Climate Effects on U.S. International Interests		591	591	24	28	The first sentence does not reflect the EPA CIRA report (a technical input to this report) or the Risky Business report. Please check the Mitigation chapter. While the last sentence of this paragraph is likely true, I wonder whether this point is even relevant to this key message.	We have revised the discussion on economic impacts of climate change and included more references.
Allison	Crimmins	142371	Traceable Account	16. Climate Effects on U.S. International Interests		591	591	30	34	It is very surprising to read that there is high confidence in this key finding after the exhaustive text on major uncertainties immediately preceding. The second sentence says there is ample evidence, and line 32 mentions evidence, but where is this evidence? Please provide citations in the description of evidence base section. I'm a bit confused why evidence of measure to reduce climate risks in the last sentence in listed here, as it does not seem to relate to the key message. Perhaps each of these three statements need their own likelihood and confidence rankings. Suggest revisiting traceable accounts guidance.	We have made edits to these statements.

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Allison	Crimmins	142372	Traceable Account	16. Climate Effects on U.S. International Interests		591	592	37	2	The two "high confidence" statements here do not match the description of confidence and likelihood section on page 594, which says medium confidence. Check all these key messages for consistency.	The text has been revised to make the confidence statements more consistent and clearer.
Allison	Crimmins	142373	Traceable Account	16. Climate Effects on U.S. International Interests		592	592	4	27	This is very well written, but also very long. Move the text on lines 20-27 to the confidence/likelihood section.	The sections identified have been rearranged to incorporate your suggestion.
Allison	Crimmins	142374	Traceable Account	16. Climate Effects on U.S. International Interests		592	593	29	4	Delete this entire section. It is not needed or appropriate here and makes the TA way too long.	After consideration of this point, we still feel the existing text is appropriate for describing the complex subject. While it is lengthy three sentences were removed to aid brevity in response to this comment.
Allison	Crimmins	142375	Traceable Account	16. Climate Effects on U.S. International Interests		593	593	6	6	Delete "conflict is driven by many factors" That is covered in the text and doesn't need to be explained here. Just keep to the uncertainties.	The text has been revised to reflect this comment.
Allison	Crimmins	142376	Traceable Account	16. Climate Effects on U.S. International Interests		593	593	9	9	Suggest "direct causality" and consider using the phrase "attribution and detection" if appropriate.	After consideration of this point, we have revised the text along the lines of the suggestion of "direct causality." After deliberation, we do not find the "attribution and detection" are appropriate to add in this sentence.
Allison	Crimmins	142377	Traceable Account	16. Climate Effects on U.S. International Interests		593	593	16	35	Delete lines 16-17; delete the "Therefore," on line 17 and "Furthermore" on line 18; delete "these studies examine a" on line 20 and replace with "the"; delete "and" at the beginning of line 21; completely delete the paragraphs from lines 25-35. Especially near the end of this section, you don't need to be putting the entire list of climate uncertainties in this traceable account- those are covered in the CSSR. Delete "Similarly" from the beginning of line 36.	After consideration of this point, we have revised the text in accordance with several of these suggestions. However in lines 16-17 and the paragraphs beginning on lines 25 and 35 are important in conveying the complexity of the subject, and have been retained.
Allison	Crimmins	142378	Traceable Account	16. Climate Effects on U.S. International Interests		594	594	4	15	This section needs editing to be consistent with the likelihood and confidence statements. Delete lines 11-15 as they are not appropriate here. Replace with text on page 592 lines 20-27.	The text has been corrected to reflect this comment.
Allison	Crimmins	142379	Traceable Account	16. Climate Effects on U.S. International Interests		594	594	19	21	The confidence and likelihood statements do not match the rest of this traceable account. Please check carefully.	The text in the Traceable Account has been reviewed to ensure consistency throughout the section
Allison	Crimmins	142380	Traceable Account	16. Climate Effects on U.S. International Interests		594	594	23	36	Don't list, DESCRIBE the evidence. Much of this repeats the chapter or lacks a description. Delete "The citations provided in the Transboundary section document the" and then provide those citations here (lines 26-27). Provide citations at the end of line 29. Delete the sentence on line 29-30. Delete the text from lines 30-36, which only repeats the chapter. Provide descriptions of the evidence- is there a lot or little, is it old or new, emerging or established, consistent consensus or controversial contention?	Where deemed appropriate, the text has been revised to incorporate this perspective.
Allison	Crimmins	142381	Traceable Account	16. Climate Effects on U.S. International Interests		595	595	2	9	Rewrite this section. Delete the first sentence. Move line 2-7 to the previous section. Check the conf/likelihood statements.	The sections identified have been rearranged to incorporate your suggestion. The section has been rewritten for clarity and consistency.
Allison	Crimmins	142382	Traceable Account	16. Climate Effects on U.S. International Interests		595	595	13	15	This last part about expert understanding and past negotiations seems more suited to the description of evidence section.	The text has been revised to incorporate this perspective.
David	Peterson	142396	Text Region	16. Climate Effects on U.S. International Interests		582	584	20	3	This chapter provides a unique view of the U.S. leadership in humanitarian aids especially in response to the climate extremes and change adaptation. The section that interests me the most is the Key Message 2 ‰ÛÏInternational Development and Humanitarian Assistance‰Û. It is very encouraging to see the collaboration between the U.S. and foreign countries (no matter it is private or local) to find solutions to mitigate potential disaster that could save thousands of lives and properties. Based on this, I suggest adding a chart that show the amount of the U.S. expense on humanitarian aids over the decades to compare with 1) future projected humanitarian aids due to climate extremes and change without the mitigation and 2) future projected humanitarian aid but with mitigation in place in order to emphasize the significance of having climate mitigation strategy plan.	The suggestion is not feasible for this chapter given its length. We are not familiar with such estimates being published.
Juanita	Constible	142566	Whole Page	16. Climate Effects on U.S. International Interests		582				Key Message 2 does a great job discussing U.S. programs to build climate resilience abroad and prevent the need for increases to international humanitarian aid due to climate change. The section would benefit from a clearer description of the issue itself. It would be useful to quantify the potential impact and list the regions where U.S. humanitarian assistance is most likely to increase due to climate-induced events.	We point to the documentation of expected impacts or likely humanitarian hotspots elsewhere (e.g. IPCC) but do not have space to restate them. We are not able to quantify impact here.
Juanita	Constible	142567	Text Region	16. Climate Effects on U.S. International Interests		584	584	18	23	This section would benefit from quantification of the impacts on Department of Defense assets, perhaps through the value of the assets that are located in high-risk areas, or the projected economic impact in the recent risk analysis.	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information is provided. For those readers with an interest, a reference is provided which possesses specific information on value and risk.
Juanita	Constible	142568	Text Region	16. Climate Effects on U.S. International Interests		585	585	6	17	This paragraph explores the impact of climate change on migration. The section would benefit from consideration of the potential impact of climate change on immigration to the U.S.	Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity.
Juanita	Constible	142569	Text Region	16. Climate Effects on U.S. International Interests		593	593	31	35	This section explains that increases in extreme weather and climate events are increasingly attributable to climate change, but "attribution is uncertain." It would be useful to provide more detail on the uncertainty of attribution and to quantify the confidence to which the literature links events to climate change.	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information to include.
Juanita	Constible	142570	Text Region	16. Climate Effects on U.S. International Interests		594	594	19	21	The statement "Many multinational frameworks that manage shared resources are increasingly incorporating climate risk in their transboundary decision-making processes" is listed as High Confidence. The following paragraph provides evidence for this statement that appears to give it Very High Confidence. This statement would benefit from a description of the uncertainties here.	Thank you for your comment, but in keeping with the standards required of our statements of confidence, we have kept them as "high confidence." Remaining consistent with the format of other sections in this Chapter, we have included a description of the uncertainties in the traceable accounts section. See pg 595, line 2-9.
Mikko	McFeely	142864	Text Region	16. Climate Effects on U.S. International Interests		584	584	5	8	The section on climate and national security never mentions that the Dept. of Defense and the U.S. military consider climate change to be a threat multiplier. It is important to use this term somewhere in this section of text and maybe in other places of the chapter to speak the same language as the national security sector. Suggest starting by editing the second part of Key Message 3 to read: Climate change already affects U.S. military infrastructure. The U.S. military is incorporating climate risks in its planning and considers climate change to be a threat multiplier.	While the authors respect and appreciate the comment, we feel that use of the term "threat multiplier" is not helpful to the discussion. The chapter lays out the actions that DoD has taken regarding climate change and its impacts to DoD in clear language. Notwithstanding, that for a time the term was used in the context of climate change and the military, the term "threat multiplier" is an indefinite word or phrase derived from a military term of art whose meaning in this context would be unclear and not sufficiently specific.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	142865	Whole Chapter	16. Climate Effects on U.S. International Interests						It was surprising that there was very little mentioned about the climate change analysis and planning ocurring as part of the Columbia River Treaty between Canada and the U.S. The chapter should mention the climate studies developed by the Regional Management Joint Operating Committee (RMJOC), both phase I and II. RMJOC II has used state of the art modeling and a large stakeholder process to assess climate effects to Columbia River hydrology and hydroregulation. Contact Eric Prytlak at Bonneville Power Adminstration in Portland, Oregon for more information and references.	We appreciate this very good suggestion, but with limited space, we are only able to provide a couple of examples to support this key message, which you will find in the Transboundary section, beginning on pg. 585.
Social Science	Coordinating Committee	143210	Text Region	16. Climate Effects on U.S. International Interests		583	583	5	12	Example of collaboration with Jamaican meteorological service begins to provide multi-level quantification that includes social systems. Could be enhanced by discussion that move beyond economic impacts to broad social system. Why did some farmers use the system and some did not---social, cultural barriers? What were the impacts to those and how did they recover who did not use the system? Is the system still in use?	With limited space, it is difficult to cover these questions. The referenced paper covers some of these issues.
Union of Concerned Scientists	Union of Concerned Scientists	143903	Text Region	16. Climate Effects on U.S. International Interests		581	582	16	19	This section would be strengthened with examples - for example, the Russian heatwave and drought in 2010, which increased agricultural commodity prices worldwide.	We added the following example: "An example is the damaging effect that a series of short-term climate extremes in 2010-2011 had on global wheat production. These extremes included drought in Russia, Ukraine, and the United States and damaging precipitation in Australia. A corresponding reduction in wheat production, in combination with high demand, low stocks, trade policies, and other factors, contributed to a spike in global wheat prices (Trostle et al., 2011). This benefitted U.S. wheat exports while increasing the cost of flour and bread in the United States (Vocke, 2012)."
Union of Concerned Scientists	Union of Concerned Scientists	143904	Text Region	16. Climate Effects on U.S. International Interests		578	578	9	11	This sentence sounds like it is conveying a U.S. foreign policy position (which may be a wording choice issue, with support actually referring to humanitarian assistance) - presumably that is out of the scope of the NCA and this sentence should be re-worked.	We have clarified that "support" refers to both financial and technical support. This is a statement of fact, not a policy recommendation.
Union of Concerned Scientists	Union of Concerned Scientists	143905	Text Region	16. Climate Effects on U.S. International Interests		585	585	15	15	It would be slightly more descriptive to say that climate change will affect migration flows than migration.	Agreed, text is amended
Union of Concerned Scientists	Union of Concerned Scientists	143906	Whole Chapter	16. Climate Effects on U.S. International Interests						It seems like what the authors are trying to say in their high-level findings is that climate change is likely to serve as a destabilizing force in many regions, which could compromise U.S. national security. It seems like that could be a helpful way to frame the main findings.	We think the proposed statement oversimplifies the relationship between climate outside the U.S. and U.S. interests. We have tried to carefully state what relationships we think the literature supports.
Union of Concerned Scientists	Union of Concerned Scientists	143907	Whole Chapter	16. Climate Effects on U.S. International Interests						This chapter provides critical information for decision makers at the federal and state-level, and is a welcomed addition to the NCA. This angle of climate change - the risks that are posed to U.S. national interests, from a security, health, and economic angle - is very important for the American public and decision makers to be made aware of.	We appreciate the reviewer's comment.
Melissa	Hersh	143933	Whole Chapter	16. Climate Effects on U.S. International Interests						-The national security benefits of being able to predict food insecurity and political instability are expected to be mutually beneficial to the development and security sectors. Currently, the development sector prioritizes its efforts on preventing or redressing issues of food insecurity, while the security sector emphasizes its data use for the purposes of preventing or redressing political instability there is growing overlap. However, to justify the use of technological and human assets to investigate an emerging area of concern outside of known areas of environmental degradation, famine, political deterioration, and conflict several obstacles need to be overcome. Such obstacles include: differing taxonomies, languages, and acronyms; overly restricted information access; and cultural reservations and perceptions. -While thereâ€™s support that favors a correlation between food insecurity as a driver for political instability that results in conflict, conflating causality and correlation is not likely to net defense and security support on the scale and scope it is actually needed. Deploying security and defense assets towards development goals, beyond existing post conflict stabilization requirements and humanitarian assistance and disaster response in emergencies requires defensible-decision making, and therefore a proof of concept. This is also increasingly necessary for responding to hybrid or grey zone threats or incidents. -An [policy] opportunity exists to re-envision food securityâ€™s domain to more definitively include the defense and security enterprise. Due to the convergence of myriad trend lines and emerging challenges, more comprehensive collaboration beyond humanitarian assistance and disaster response should occur between the development and defense and security enterprises, respectively. Doing so will likely enhance situational awareness and lay the foundation for better integrated information sharing and decision-making that will prove mutually beneficial in meeting predicted future [and unanticipated] risk. In determining how to achieve useful integration of defense and security, development, and private sector capabilities for identification, mitigation, and future food insecurity prevention strategies itâ€™s useful to understand where there are constraints or perceived constraints, and where there is overlap in the use of technology and in the analysis of the data produced. These include: â€¢ Disparate Data, Insufficient Analysis and Comprehensive Analytical Framework, and Data Abundance Trap â€¢ Increased Likelihood of Food Insecurity Because of Population Growth, Migration, Urbanization, Climate	We appreciate the detailed comment but have very limited space itn eh chapter to address complex issues such as food security. We have attempted to address these issues as best we can with the limited space availabe.
Michael	MacCracken	144411	Text Region	16. Climate Effects on U.S. International Interests		578	578	9	11	It seems to me it might be useful to rephrase here to also, even primarily, be indicating that it is in the self-interest of the US for developing countries (and all countries generally) to be making such efforts. I would also note that "support" often means providing funds to make it happen, and given that the US has actually recently been pulling back from such efforts, the word "support" needs to be changed; whether "encouraged" can now be justified needs to be considered. It is for this latter reason that I think the rephrasing in the first sentence might be appropriate.	We have rephrased this and it reflects current USG positions and policies.
Michael	MacCracken	144412	Text Region	16. Climate Effects on U.S. International Interests		578	578	3	5	I think it might be useful to also make the point that this is occurring in addition to climate variability and change affecting the US economy itself, and our trade with others. That is, the point works each way--and indeed events here (such as impacts on grain production) can have adverse impacts overseas. Also, on the sentence here, I'd urge saying "Climate change and extremes outside … " and note that need to change to "are impacting"--I think featuring climate vulnerability is not really nearly as serious as extremes an change.	We appreciate the reviewer raising a concern about discussion on climate variability. After further consideration we have decided to clarify that focus of the chapter is on climate change and extremes. We include the latter because past extreme events, even if their occurrence has not be clearly attributed to climate change, can illustrate how climate events outside the U.S. can affect U.S. interests. We have addressed the reviewer's point about impacts "affecting the U.S. economy itself" by adding the following sentence to the opening paragraph of the Trade and Economics section: "These foreign impacts compound the impacts that climate change and extremes inside U.S. borders have on U.S. economics and trade, as described elsewhere in the report."

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Michael	MacCracken	144413	Text Region	16. Climate Effects on U.S. International Interests		578	578	12	15	Saying "can exacerbate" is an indication it is possible, whereas this is already happening--in the Middle East, melting back of the Arctic, shifts in fisheries, and so on. Also, DOD is not only responding by planning--the Navy, for example, has already been moving to refocus attention to coastal regions (to provide assistance in response to disasters, etc.) from the deep sea. I'd also suggest that it is not just conflicts that are exacerbated, but resentments that can become manifest in terrorism.	This comment provides a hypothesis, "that conflicts are exacerbated, but resentments that can become manifest in terrorism" which the authors respect and have analyzed. As a result, the comment does not raise any new question or require revision. With regard to "can exacerbate", the commenter appears to raise concerns regarding the timing of impacts, the term "can exacerbate" applies to both current observed phenomena and phenomena observed in the future. The authors have decided that in this case the possible existence of a relationship is better understood than its particulars. The formulation that "climate extremes and change can exacerbate conflict" best conveys the existing levels of certainty and uncertainty.
Michael	MacCracken	144414	Text Region	16. Climate Effects on U.S. International Interests		578	578	16	19	This text seems to me quite obscure--providing some specific examples here would be helpful (fisheries, migrating species, water resources--not to mention the atmosphere and oceans generally. And are not the decisions in the second sentence about more than just trans-boundary issues? I think this point really does not adequately encompassed our shared interests with other nations.	We appreciate this suggestion, but with limited space, we are only able to provide a couple of examples to support this key message, which you will find in the Transboundary section, beginning on pg. 585.
Michael	MacCracken	144415	Text Region	16. Climate Effects on U.S. International Interests		578	578	21	23	I think this opening statement exhibits too limited a perspective, as explained a bit more fully in my comment on lines 3-19 and what seems to be left off (specifically, the shared interest all nations have in the Earth's environment and resources). I also think it would be useful to specifically mention investments overseas (and, of course, others have investments in the US.).	We have added in the traceable accounts a description of why the chapter was structured as it is.
Michael	MacCracken	144416	Text Region	16. Climate Effects on U.S. International Interests		578	578		19	I'm surprised that there is no mention here of the common interest we all have in international health, given how infectious diseases can move around the world. There is also no mention of other personal linkages beyond humanitarian assistance--the country is one of immigrants that can maintain relations to family and others in their former countries for generations. I'd also suggest that each of these areas is also of interest to others, so concerns for their investments in the US that is vulnerable to change. Finally, I would think it needs to be said that the whole world community has an interest in the well-being of the global environment and all nations acting as proper stewards, so actions or non-actions in the US can affect diplomatic relations with other nations and so their willingness to work with us on the full range of issues. I guess what is really missing is that the US, with the largest global economy, exerts a very expansive economic and environmental footprint and somehow this chapter seems focused only on US interests and not the interests of the other nations with respect to the US, but then the chapter title is about US interests and not, more broadly, interactions with other nations.	We have a box on international health which we believe reflects the importance of the topic for U.S. interests. The point about our interest in other countries stemming from many of us being immigrants or descendents of immigrants is interesting. We have not come across literature supporting this as being a relevant considertion for climate risks. We added a sentence at the beginning of the chapter about the importance of international impacts in their own right.
Michael	MacCracken	144417	Text Region	16. Climate Effects on U.S. International Interests		579	579	6	6	The phrase "transboundary resources" is too vague--please give some examples for the reader.	The term "transboundary resource" refers to physical and biological resources that transcend across political boundaries. In the case of this chapter, we refer to those resources that are shared across political boundaries between the U.S. and other nations. Due to limited space, we only provide examples in water (Mexico) and fisheries (Canada), but many other issues along our international borders are also of interest. These include trade, health, infrastructure, energy, food security, human migration , and cultural resources, among others.
Michael	MacCracken	144418	Text Region	16. Climate Effects on U.S. International Interests		579	579	7	7	Delete "are"--and again, this sentence needs some examples--just too vague.	The unecessary word has been removed.
Michael	MacCracken	144419	Figure	16. Climate Effects on U.S. International Interests	1	579				Fascinating that the impacts on coffee production are here on a par with "Demand for US military and humanitarian aid"--I guess that really does tell us something about America. And then also specifically mentioning "Impacts on US electronics supply train" is also interesting. Taken together, showing potential impacts on coffee and electronics I guess is appropriate in that those are likely America's two most serious addictions. On specifics, why no need for aid shown in the Caribbean, of vector diseases in Africa, of fish elsewhere, of coffee in Central America, of fires in Australia, of instability in Syria, and so on; the map seems pretty incomplete.	The figure has been removed from the chapter, as it does not reflect accurately the complexity of topics addressed in this chapter.
Michael	MacCracken	144420	Text Region	16. Climate Effects on U.S. International Interests		579	579	14	14	The phrase "global impacts" seems quite vague--does this "mean impacts on the US from global climate change"?	The figure has been removed from the chapter, as it does not reflect accurately the complexity of topics addressed in this chapter.
Michael	MacCracken	144421	Text Region	16. Climate Effects on U.S. International Interests		581	581	6	6	Need to change "or" to "and"	Change has been made
Michael	MacCracken	144422	Text Region	16. Climate Effects on U.S. International Interests		581	581	6	8	This example just seems to sound very one-sided: that is, US interests all concern our specific economic interests and not really the joint interests of both nations. Somehow, the example sounds very exploitive, aimed at expanding our economic and environmental interests, rather than on providing assistance to help the particular nation develop--there being no mention of the harm that the climate change we are mainly responsible for might be impacting other peoples. Overall, this just sounds too much like "America first and last" without empathy for those in other nations. Is this really intended?	We have revised the introduction and revise to address the reviewer's issues. We added a sentence with citations stating that Americans demonstrate their concern about international welfare through volunteering and charitable contributions. However we defined the chapter to focus on how international climate impacts affect U.S. interests.
Michael	MacCracken	144423	Text Region	16. Climate Effects on U.S. International Interests		581	581	4	4	By expressing this issue as "national security" rather than "international security and development" the text seems to me to unduly focus the chapter on only one limited aspect of what US interests need to be about--namely international security, development, and well-being.	Detailed coverage of well being internationally is covered by KM2 in the development section of the chapter.
Michael	MacCracken	144424	Text Region	16. Climate Effects on U.S. International Interests		581	581	17	19	I'm not clear here why "variability" is featured here rather than extremes, as is used elsewhere. What climate change itself is doing is increasing the likelihood and intensity of climate variations (the shifting of the bell-curve distribution), so that the US is having to respond more and more often is due largely to climate change and the enhancement of extremes (yes, variability matters, but climate change and the induced disproportionate increase in climate extremes is what the main issue would seem to be). Also, subject is plural, so this needs to be "are impacting". Again, no indication that we need to be concerned about what the induced increase in impacts matters to the affected nation or others than the US. Seems just too much "America first" for my tastes.	Regarding the reviewer's comment about variability: we have changed that language. See the response to review comment 142317. We have revised the KM so that it is grammatically correct. Regarding the reviewer's comment -- "no indication that we need to be concerned about what the induced increase in impacts matters to the affected nation or others than the US.": The report does not purport to indicate appropriate levels of concern. However, we do indicate some of the key factors that are relevant to US interests. The nature of these impacts is complex. As indicated in the example for the 2011 wheat prices the impacts can be both positive and negative for the United States. Regarding the reviewer's comment -- "Seems just too much "America first" for my tastes": the focus of this report and of this KM in particular is on US interests. There are other reports such as the IPC that address impacts on international interests.
Michael	MacCracken	144425	Text Region	16. Climate Effects on U.S. International Interests		581	581	23	23	I'd suggest saying "can also have" to indicate this is a distinct issue.	We agree. The word "also" was added to this sentence per the reviewer's recommendation.
Michael	MacCracken	144426	Text Region	16. Climate Effects on U.S. International Interests		582	582	1	3	I'd be careful on this as it is not as if just melting back is all that needs to happen--there are basically no safety, rescue capabilities and broken ice can also be dangerous. I'd suggest somehow that these are potential and will require a good bit of infrastructure development, etc.	We agree with the gist of this reviewer's recommendation and have amended this text as follows: "…Khon et al. 2017), though the infrastructure to support this transportation pathway and its safety have not yet been developed. See the report's Alaska Chapter for more information on Arctic marine transport."

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144427	Text Region	16. Climate Effects on U.S. International Interests		582	582	6	9	Again, sounds very corporate-centric without any indication that they might be doing something to help in the overall region and peoples in the involved countries. I'd urge some modification to show a bit of empathy.	Although he focus of this section is on commerce and trade (i.e., inherently corporate-centric), we have added the bolded text to the final sentence in the paragraph: "As noted in the next section, U.S. government actions are helping to promote climate resilience of infrastructure services (USAID 2012, 2015a) and other factors that have the potential to create more stable conditions for American businesses operating in developing countries **as well as promote the welfare of those countries**."
Michael	MacCracken	144428	Text Region	16. Climate Effects on U.S. International Interests		582	582	9	12	First part of sentence is fine, but it would help to show some empathy in the second part, indicating that creating a more stable, more population friendly government for the people there also is an intent and matters.	See response to comment 144427.
Michael	MacCracken	144429	Text Region	16. Climate Effects on U.S. International Interests		582	582	13	15	So, this conveys the message that all that matters is an assured supply of good for the US, independent of any interest in the development and well-being of the nation--don't worry about helping people facing a more and more challenging situation, just shift to a better spot (so, pure, American focused capitalism, what is left behind being of no concern).	See response to comment 142334.
Michael	MacCracken	144430	Text Region	16. Climate Effects on U.S. International Interests		582	582	17	19	Again, a focus only on the direct corporate consequences--nothing about indirect consequences for the US or for the people in the region, etc.	The focus of this section is on impact to US economics and trade. The types of concerns mentioned in this review comment are covered in the section on international development.
Michael	MacCracken	144431	Text Region	16. Climate Effects on U.S. International Interests		582	582	31	31	I'd suggest saying "generally poses" in that there are so many different situations that I don't think that the point is always valid.	Comment accepted.
Michael	MacCracken	144432	Text Region	16. Climate Effects on U.S. International Interests		582	582	32	32	It might be worth noting that the impact not only undermine US investments but the investments of being made by all nations and international organizations in assisting developing nations, etc. Being a bit more magnanimous would seem worthy of considering.	Revised to include bilateral and multilateral aid efforts.
Michael	MacCracken	144433	Text Region	16. Climate Effects on U.S. International Interests		584	584	4	6	Climate-related situations not only can exacerbate conflicts, they can cause them--just consider the various situations that have arisen regarding rights to water resources as climate is changing.	The authors appreciate this reviewer's comment, the links between climate and conflict are the focus of scientific debate and are discussed in later paragraphs of this section.
Michael	MacCracken	144434	Text Region	16. Climate Effects on U.S. International Interests		584	584	18	23	It seems to me that some examples from overseas are needed, and a critical one is air bases established on low-lying islands, etc.--and if such a base is inundated (as can be expected in the future, this could change the whole regional presence of the US.	The text has been revised to incorporate this perspective. The referenced report was released during the public comment period and speaks directly to this comment. The text has been amended to a reference to Pacific atolls. The reference is "Storlazzi, C.D., et al., 2017, The Impact of Sea-Level Rise and Climate Change on Department of Defense Installations on Atolls in the Pacific Ocean (RC-2334): U.S. Geological Survey Administrative Report for the U.S. Department of Defense Strategic Environmental Research and Development Program, 121 p."
Michael	MacCracken	144435	Text Region	16. Climate Effects on U.S. International Interests		584	584	24	25	I would think that "risk", "relationship" and "stress" all need to be plural	The sections identified have been rearranged to incorporate your suggestion. " The risks climate change may hold for national security more broadly are connected to the relationships between climate-related stresses on societies and conflict."
Michael	MacCracken	144436	Text Region	16. Climate Effects on U.S. International Interests		584	584	28	31	I would think that limits in food supplies (or high pricing) also need to be mentioned, especially as this has already been the case--as the next sentence indicates.	After consideration, the text has been revised to reflect food, water, and shelter by using the term "basic need."
Michael	MacCracken	144437	Text Region	16. Climate Effects on U.S. International Interests		585	585	1	1	Using "may" is bad practice as it provides no useful indication of likelihood--this needs to be rephrased using the lexicon. Here, can pretty clearly say "are likely to"	The text has been revised to reflect this comment in a more careful wording of uncertainty. The author team has deliberated and decided that the possible existence of a relationship is better understood than its particulars and is best expressed in the formulation that climate extremes and change can exacerbate conflict.
Michael	MacCracken	144438	Text Region	16. Climate Effects on U.S. International Interests		585	585	11	11	This phrasing about attribution is not really optimal. What really mattered with this typhoon was that it was the most powerful ever, as I recall, and this aspect of it, which was what was most damaging, was pretty clearly attributable to climate change.	We appreciate this suggestion, but space is limited. The author team has deliberated and provided the most critical information.
Michael	MacCracken	144439	Text Region	16. Climate Effects on U.S. International Interests		585	585	15	17	So, what has happened with refugees moving from Africa toward and into Europe may not have been "violent" but it has been very disruptive. Severe tropical storms in Central America have caused displacements and migration, both in response to original direct effects and then further migration because the economies of the region did not take over. Somehow, the statement here about the results of creating refugees is not at all adequately presented.	While the comment suggests potential topics for inclusion examples, the authors feel the existing examples are appropriate and adequate given the space available.
Michael	MacCracken	144440	Text Region	16. Climate Effects on U.S. International Interests		585	585	24	35	The examples here seem a bit limited. The issue of water resources in the Rio Grande basin is increasingly serious given the population increase and the increasing dryness. The Great Lakes are another example on water resource sharing that has in the past led to many court cases. On the Pacific Hake, I'm not sure "migration" is the right word--the boundaries of the fishery shifted. And there is no mention here of migrating birds, ducks, butterflies, etc. Overall, pretty limited coverage.	Thank you very much for your excellent comment. Unfortunately, due to space limitations we needed to cut many examples from this draft, including some you mention. If we find that before the text is finalized we have additional space, we will elaborate on the Great Lakes and Rio Grande water issues. On the Pacific Hake, recognizing that migration can be temporary, short term, or permanent, we used the word "migration" as employed in the underlying literature.
Michael	MacCracken	144441	Text Region	16. Climate Effects on U.S. International Interests		585	585	36	36	Need to replace "may", perhaps with "are likely to"--and I'd specifically mention water resources.	The text has been revised to incorporate this perspective.
Michael	MacCracken	144442	Text Region	16. Climate Effects on U.S. International Interests		586	586	4	5	Phrasing needs something regarding "other U.S. interests"--as "in" is now the operative preposition.	The authors agree. The sentence has been revised.
Michael	MacCracken	144443	Text Region	16. Climate Effects on U.S. International Interests		586	586	3	15	So, why are not health effects one of the key messages, given that they have already been arising?	We feel that health is adequately addressed in the international chapter through this box. In addition, Health has it's own stand alone sector chapter. A separate KM on health may then require additional KMs on ohter climate-sensitive sectors mentioned in the chapter, and there is not sufficient room to add another KM. In response to the comment a relevant citation was added regarding attribution.
Michael	MacCracken	144444	Text Region	16. Climate Effects on U.S. International Interests		586	586	17	19	Another example might be the Arctic Council agreements regarding responsibility for the increasingly ice-free Arctic Ocean.	Thank you for your comment. While we recognize that the Arctic Council is a multinational framework covering the shared Arctic, it does not produce legally binding agreements. This section of the chapter is dedicated to highlighting where such management frameworks are evolving to incorporate climate impacts in bilateral and multilateral agreements. The Arctic Council's constitutive instrument defines its mandate as: ". . to promoting cooperation, coordination and interaction among the Arctic States, with the involvement of the Arctic indigenous peoples and other Arctic inhabitants on common Arctic issues, in particular issues of sustainable development and environmental protection in the Arctic" (The Arctic Council, 1996). Hopefully, in future, particularly as impacts of climate change on the Arctic (including the loss of sea ice) enforcable agreements will emerge to address this very serious emerging problem.

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Michael	MacCracken	144445	Text Region	16. Climate Effects on U.S. International Interests		587	587	6	7	Nice to say, but USGCRP interagency participation on the international scene certainly seems to have been lessening, not taking advantage of the benefits of cooperation mentioned here.	This section is not specifically describing USGCRP participation in international cooperative efforts or making claims about the magnitude of any investments, simply that there is broad U.S. participation in international science efforts to benefit of our nation.
Michael	MacCracken	144446	Text Region	16. Climate Effects on U.S. International Interests		593	593	25	25	Need to say "it is"	The text has been corrected to reflect this comment.
Michael	MacCracken	144447	Text Region	16. Climate Effects on U.S. International Interests		593	593	25	29	Strange explanations. First the asserted variability was pretty clearly exacerbated by climate change--as Trenberth notes, with so much human-induced climate change having occurred, everything is being affected, and this needs to be the presumption, not that one has to demonstrate to high statistical confidence that some change is not natural. Second, the second sentence is about how climate change might affect the "outcome"--well, of course not; the issue is that climate change related impacts contributed to the start of the conflict. But, again, focusing the discussion on it being variability and not change seems to me mistaken, neglecting the fact that climate change has shifted the overall baseline for the variability, etc.	After consideration of this point, the authors still believe that the current framing is appropriate. There are aspects of climate upon which there is no yet demonstrated attributable change related to human induced climate change.
Michael	MacCracken	144448	Text Region	16. Climate Effects on U.S. International Interests		593	593	31	33	I realize this chapter is on international impacts that affect the US, but I think it is well worth a sentence at the beginning of the executive summary and main text that acknowledges that international impacts have their own worth (outside of what it means for the US), that the damages incurred affect many people around the world and those people have intrinsic value in and of themselves. Given that, those impacts ALSO affect the US. It is ok that this chapter is about the "also affect the US" part, but it just sounds heartless to not clearly state that other people's suffering has value outside of what it costs Americans.	The text has been corrected to reflect this comment.
Michael	MacCracken	144449	Text Region	16. Climate Effects on U.S. International Interests		593	593	31	35	This seems a very poorly nuanced discussion of the issue. Human induced climate change is affecting everything--try proving that something is purely natural. On the statement that "attribution is uncertain"--well, yes, but to shat degree--so how uncertain? This does not mean at all that there has been no human influence. What is happening is a shift in the bell-shaped curves that is shifting the likelihood of various regimes and disturbances.	After consideration of this point, the authors still believe that the current framing is appropriate based upon the available space and the complex and varied findings of detection and attribution studies.
Michael	MacCracken	144450	Text Region	16. Climate Effects on U.S. International Interests		594	594	1	1	"across a wide variety of ecosystems"--this does not seem to me to be what is being considered--is not consideration across a wide set of defense-relevant situations. Is DOD really doing full ecosystem analyses? I doubt it--they are likely focused on the particular aspects that relate to their specific situations.	After consideration of this point, we feel the exisiting text is clear and accurate. DoD manages lands around the globe and a wide variety of ecosystems. That management responsibility results in the requirement to assess manmade and natural infrastructure vulnerability in a wide variety of ecosystems.
Michael	MacCracken	144451	Text Region	16. Climate Effects on U.S. International Interests		594	594	5	5	Need a period after "assignment"	Period has been added to the end of the sentence.
Michael	MacCracken	144452	Text Region	16. Climate Effects on U.S. International Interests		594	594	7	8	It would be helpful to have listed what these factors are. I would also note that the linkages can be direct or, more often, indirect, and such indirect linkages are often not really considered.	We appreciate this suggestion and agree that the description of linkages is importnant. We have included examples of intermediate processes in the main text. In the this section describing uncertainties, we have not repeated these processes to avoid duplication.
Michael	MacCracken	144453	Text Region	16. Climate Effects on U.S. International Interests		595	595	7	8	There are no degrees of certainty--that makes no sense at all. There can be high degrees of confidence, and that is what needs to be said here. Stick to the lexicon that is being used for this assessment report.	The text has been revised to incorporate this perspective.
Michael	MacCracken	144454	Text Region	16. Climate Effects on U.S. International Interests		594	594	1	1	There is no opening paragraph here as in the other chapters explaining what the process was for developing this chapter, so who was involved and what sorts of resources and inputs were relied upon.	A discussion of the process used to struture the chapter, select authors, and get public input as been added at the beginning of the Traceable Accounts.
Robert	Kopp	141183	Traceable Account	17. Complex Systems		619	619	34	34	Throughout the report, the document refers to results from the American Climate Prospectus or the Risky Business Report, cited alternatively as Gordon, 2014; Risky Business, 2014; Houser et al. 2014; and Houser et al. 2015. The American Climate Prospectus is the peer-reviewed technical analysis, whereas the Risky Business Report is a summary for policymakers; I would therefore suggest citing the ACP instead of the Risky Business Report. The final version of the ACP was published in 2015 by Columbia University Press; the 2014 version is a Rhodium Group report. Citations should be to Houser et al. 2015: T. Houser, S. Hsiang, R. Kopp, K. Larsen and others (2015). Economic Risks of Climate Change: An American Prospectus. New York: Columbia University Press, 384 pp.	This reference has been updated throughout the chapter.
David	Wojick	141702	Text Region	17. Complex Systems		615	615	16	22	The present text says this: 16 Key Message 1: Climate change and extreme weather directly impact electricity generation, 17 water supply, food production, human health, and other resources. Traditional approaches 18 to assessing climate change and extreme weather impacts that focus on individual sectors 19 will not yield the needed insights into understanding the interactions within and among these 20 sectors, and how they might be impacted by other stressors. It is not possible to understand 21 the full extent of climate-related impacts on the United States without considering these 22 interactions. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models.	Thank you for your comment. The conclusions about climate impacts in today's US are not necessarily based on models. They are based on observations of physical or ecological impacts that can be demonstrated to be related to change and variability in the physical climate system, mediated by other factors in many cases. The science of climate attribution has advanced considerably since the last NCA (reference the NAS report on attribution of extreme events here), which demonstrates that even for some singular events, the probability that these events would happen in a "natural" climate system unforced by human factors is very low. And in any case, we know and can demonstrate through careful analysis of observations that many features of recent climate variability are the direct result of human forcing, and in some cases are essentially outside the range of natural variability for many thousands of years. Details vary on a case-by-case basis, of course.
David	Wojick	141703	Text Region	17. Complex Systems		619	619	25	29	The present text is this: 25 Key Message 2: Climate change risk assessment requires evaluating how impacts interact 26 across sectors and scales and how they can be shaped by multiple stressors. The complex 27 risks that result often cannot be fully understood based on any one analysis. Effective 28 assessment of these risks must therefore integrate evidence and explore possible futures, 29 attentive to the ways uncertainties affect decisions and goals. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	The focus throughout this chapter is risk because there are important impacts for which the probabilities of their occurrences vary and can be hard-to-quantify. Projections along with other modes of analysis are an essential basis for risk analysis and assessment. Different types of uncertainties that are relevant – quantifiable and not – are inherent to the focus of this chapter

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
George	Backus	141845	Whole Chapter	17. Complex Systems						The use of complex-systems concept is interesting and appropriate to note in the chapter, but it not useful to the general reader. The most salient and insightful element for readers is how the chapters tie together the topics (regional and sector) of the other chapters. It enables readers to understand the interdependencies, say among, water, agriculture, forests, human health, energy production, as well as to understand spillover impacts to/from other regions that are critical to climate change adaptation planning. Focusing on one aspect in isolation could lead to significant counterproductive outcomes. Within the other chapters and even this chapter, the use of the word ‰ÛÏcomplex‰Û¯ often implies ‰Û÷complicated‰Û¯ or more precisely the complications associated with managing highly-interconnected systems undergoing multiple stressors. Therefore, to emphasize the importance to the reader rather than the expansiveness of the science, I think the chapter would be better titled: ‰ÛÏSectoral interdependencies, Multiple stressors, and Highly-Interconnected Systems.‰Û¯ Further, the use of the words ‰ÛÏComplex Systems‰Û¯ to denote this chapter in other chapters should be changed to simply ‰ÛÏCh. 17: Interdependencies.‰Û¯ Because this chapter does employ both the formal mathematical use of the term ‰ÛÏcomplex systems, and the informal ‰ÛÏcomplicated systems‰Û¯ usage, I think precise language usage is needed, for example, use ‰ÛÏcomplicated,‰Û¯ ‰ÛÏintertwined,‰Û¯ ‰ÛÏinterlinked,‰Û¯ ‰ÛÏcoupled,‰Û¯ etc. when noting many parts connected in an intricate way, and save the term ‰ÛÏcomplex‰Û¯ for only the discussion related to emergent-behavior or self-organization. This chapter could be the most useful one for non-scientist readers. It furnishes the cross-disciplinary perspective for tying the seemingly disparate chapter topics and concepts into an integrated, comprehensible whole that can be utilized for decision-making.	This comment makes a good point about the vernacular use of “complexity” and “interdependence,” which the authors have discussed. We decided to reserve “interdependence” for specific cases, and use “interacting” and “interaction” for the broader meaning. In my view, complexity remains a central theme to the chapter because the interactions among these systems make their behaviors hard to predict. We agree with the reviewer’s comment about the accessibility of the notion of complex systems science and the way in which this more precise use of the word "complex" might confuse readers. We have moved the discussion of complex systems science to Key Message #1 where it more clearly fits within the flow of the logic of the chapter.
Allissa	Stutte	141850	Text Region	17. Complex Systems		625	625	17	17	I think this chapter needs a summary section to provide the non-scientist readers with an integrated picture of the chapter‰Ûªs contents and how it ties all the other report chapters together. Here is so possible text. BEGINNING OF TEXT: Although it is not yet possible to establish the combined consequences of climate conditions, interdependencies, and human behaviors, or the ultimate outcomes, it is possible to describe the direction of influence among the factors. These interacting influences are important to recognize when considering mitigation or adaptation interventions. Due to the interdependencies, a change in one part of the system will most likely have spillover effects in other parts. Or those other parts can make intervention less likely to have the desired outcome. Figure 17.3 [Figure sent to the ‰ÛÏreview‰Û¯ email address.] depicts some of the key relationships described in this chapter and its references. The figure also visually highlights how each of the topics in the previous chapters experience multiple stresses in a highly-interconnected manner. Figure 17.3 Title: Sectoral interdependencies and multiple stressors in a highly-interconnected system [Figure sent to the ‰ÛÏreview‰Û¯ email address.] (Figure 17.3 is hereby in the public domain, without a requirement for attribution or reference. GB) Caption: This diagram shows several of the relationships noted within the chapter and the literature it references. It uses directed arcs to illustrate the causal interconnections between the topic elements. Elements in red designate climate drivers. Those elements in a green font symbolize chapter topics. Sea-level rise is used to capture the concepts of Chapters 8: Coastal Effects. Seafood and ocean warming are used as proxies for the concerns of Chapter 9: Ocean and Marine Resources. A black font indicates dependencies among the variables. The arrow heads show the direction of causality or influence, from-to. The plus (+) or minus (-) sign shown at the arrow heads signify the relationship. A plus implies a positive or reinforcing relationship, where the more the quantity on the source side changes, the more of the variable at the terminal (arrow) side changes in the same direction. This applies whether it is a more-the-more, or a less-the-less response. An arrow with a minus sign indicates a negative or countering response, where the more the quantity on the source side changes, the more of the variable at the terminal (arrow) side changes in the opposite direction. This applies whether it is a more-the-less, or a less-the-more response. If the directed arcs (paths) can be traced around a set of elements and return to the same place, there is a feedback relationship. If the number of minus signs is an even number (including the case where there are no, i.e., zero, minus signs) the overall feedback is reinforcing, which causes	Thank you for the helpful suggestion. We have revised the introduction to the chapter to make it more effectively give the reader the necessary context to read the remainder of the chapter. We have also included a new conceptual diagram to the chapter that is inspired by the comment.
Erica	Brown	142040	Text Region	17. Complex Systems		614	614	6	10	There should be a reference for this statement about the programs the Mayor initiated after Sandy.	Thank you for your suggestions. A citation has been added.
David	Peterson	142404	Text Region	17. Complex Systems		620		16		Box 17.5. It should be clarified that this discussion about multiple stressors applies only to dry mixed-conifer forests of the western U.S. It is not relevant to other forest ecosystems. It should be emphasized that the additional fuels produced by beetles increased fire hazard for only about 5 years. In addition, the Vaillant (et al.?) (2016) reference is not authoritative or relevant for this topic. There are many others that are far more credible and seminal, including McKenzie, D., D.L. Peterson, and J. Littell. 2009. Global warming and stress complexes in forests of western North America. Pages 317-337 in A. Bytnerowicz, M.J. Arbaugh, A.R. Riebau, and C. Andersen (eds.), Wildland Fires and Air Pollution. Elsevier Publishers, The Hague, Netherlands. Hicke, Jeffrey A; Johnson, Morris C.; Hayes, Jane L.; Preisler, Haiganoush K. 2012. Effects of bark beetle-caused tree mortality on wildfire. Forest Ecology and Management. 271:81‰ÛÒ90. (This is already cited in the References but not in the text.)	Thank you for your comment. We have included a description of the forest type, and added the suggested literature.
Social Science	Coordinating Committee	143298	Text Region	17. Complex Systems		612	612	7	10	Writing style comment: not clear how the point this paragraph is trying to make is different from content of the previous two paragraphs. Is this trying to emphasize management and challenges to humans to understand and oversee the interactions of systems rather than the nature of systems themselves?	The summary has been revised to reflect the changes throughout the document. Note that all the text in the summary comes verbatim from the text of the chapter.
Social Science	Coordinating Committee	143299	Whole Chapter	17. Complex Systems						Recommend incorporating research fields that deal with the complexity of human systems over time here -- such as anthropology and archaeology. There is an extended literature in archaeology about how complex societies (aka, civilization) have developed (suggest starting with author/scholar: Charles Redman), how they interact, and what happens when they encounter environmental stress. These concepts should be included in this chapter.	While we appreciate the suggestion to include more examples of complexity analysis in a range of disciplines, doing so in a more extended way is beyond the scope of this chapter. In the revised draft, the topic of complex systems science is discussed explicitly now in KM#1. In that section, we include a sentence that makes clear that complex systems science has a long history beyond the topics being discussed in this chapter. And in that discussion, we have included now citations to several additional fields, including paleontology and meteorology. We believe that these citations are sufficient to support the point that is being made in that section.
Social Science	Coordinating Committee	143300	Text Region	17. Complex Systems		615	615	1	14	Strongly recommend including an example of social system stress here. For example, community resilience can first take a hit from a disaster, which leads to loss of jobs, which in turn can reduce access to health care, which both together may lead to migration, which in turn leads to loss of social cohesion. Recommend starting with studies of intersecting forces following Hurricane Katrina.	The regional rollup has been substantially revised. It is now constructed to demonstrate that there are examples relevant to the themes in this chapter throughout the regional chapters of the NCA. Every regional chapter is now referenced in this section.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Social Science	Coordinating Committee	143301	Text Region	17. Complex Systems		615	615	23	32	Recommend an archaeological example to build this out -- research in the Southwest has looked at which communities/households responded and how during decades-long droughts. Recommended author with which to start: Scott Ingram	While we appreciate the suggestion to include more examples of complexity analysis in a range of disciplines, doing so in a more extended way is beyond the scope of this chapter. In the revised draft, the topic of complex systems science is discussed explicitly now in KM#1. In that section, we include a sentence that makes clear that complex systems science has a long history beyond the topics being discussed in this chapter. And in that discussion, we have included now citations to several additional fields, including paleontology and meteorology. We believe that these citations are sufficient to support the point that is being made in that section.
Social Science	Coordinating Committee	143302	Text Region	17. Complex Systems		616	616	16	17	Writing style: phrasing of this sentence is awkward, recommend rephrasing.	We have removed this box and placed some of the material in line in KM#1
Social Science	Coordinating Committee	143303	Text Region	17. Complex Systems		616	616	25	26	Can a climate-related example be found? I'll suggest water rights and the recent California drought, although noted that California and water is a frequent example in the balance of this chapter.	We have decided to keep the box because it illustrates the unpredictably of complex systems well, and because it illustrates the importance of interactions with societal decisions. The points made in the chapter are not necessarily specific to climate, and this will be important for readers to understand.
Social Science	Coordinating Committee	143304	Text Region	17. Complex Systems		620	620	3	6	Archaeologists/anthropologists work with interdependencies all the time. Lack of attention to interdependencies is an outcome of emphasis on physical systems/segregation (or, in government terms, separation into 'silos') of physical and natural sciences from social sciences. Recommend that this situation be incorporated here.	The different nature of uncertainties dealt with by different disciplines is indeed relevant to this chapter. We have made this point more explicit, now, through addition of reference to natural and social sciences, along with other modes of analysis.
Social Science	Coordinating Committee	143305	Text Region	17. Complex Systems		621	621	5	7	Recommend noting that agent-based modeling does work with human responses to environmental and other social stresses. Recommend work of Tim Kohler (farming responses to drought in the Southwest) as a starting point.	Thank you for the suggested literature. While interesting, we did not feel this fell within the scope of the case study. Please see our response to the NAS review comments regarding the terms of reference for this chapter.
Social Science	Coordinating Committee	143306	Text Region	17. Complex Systems		621	621	33	34	This is a really key point! Brings out that it's not just lack of awareness of interdependent systems, but how and where control is allocated. Recommend ensuring that this point continues to be made in this chapt.	We have looked for other opportunties in KM#3 to emphasize this point.
Social Science	Coordinating Committee	143307	Text Region	17. Complex Systems		622	622	17	18	Perspective is one thing, but -- as noted near bottom of previous page, organizational and regulatory barriers and the structure of rewards in a system are key factors in determining how and why things are done within a system. Suggest developing a stronger connection between this paragraph and the last paragraph on the previous page.	Sentence was inserted to acknowledge that shifting from recognizing complex, multisector risks to designing policies and practices that deal effectively with those risks is a non-trivial undertaking.
Social Science	Coordinating Committee	143308	Text Region	17. Complex Systems		623	623	22	30	Please see USGCRP Social Science Coordinating Committee social science white papers, particularly Group 2 paper on vulnerability, for integrated social science approaches to vulnerable populations. For example, per the last sentence in this paragraph, it is not just infrastructure failures that affect public health; it is also an outcome of systemic inequality, governance, social networks, political capital.	Yes, social vulnerability certainly affects public health outcomes during extreme events such as this. First paragraph of box text has been updated to acknowledge other determinants of health outcomes such as inequalities of income and education as well as human behavior and choice.
Social Science	Coordinating Committee	143309	Text Region	17. Complex Systems		624	624	15	17	Disagree with this statement: there are modeling efforts that integrate key human systems, specifically- agent-based modeling systems. Archaeologist Tim Kohler has worked with agent-based modeling to look at agricultural responses to drought. Other work with human agents and environmental change has been developed at Argonne National Laboratory for example.	This text has been revised, showing which modeling frameworks deal with individual systems and which incorporate key human systems (without being encyclopedic). The suggested references have been added.
Social Science	Coordinating Committee	143310	Text Region	17. Complex Systems		629	629	24	25	Attention is needed here to the cost implications of building in redundancy and flexibility. Current economic pressures emphasize 'just in time' delivery âD for example, which reduces storage costs but increases sensitivity of transportation systems to disruptive weather events or supply chain issues. Increasing storage capacity in some places might increase robustness, but at what cost? How will costs be justified in an economic system that emphasizes shareholder value and cost reduction?	Additional discussion has been added to KM#3 regarding the potential short-term and long-term costs vs. benefits of expanding flexibility and robustness of systems. Supporting material has also been added to the traceable account for KM#3.
Social Science	Coordinating Committee	143311	Whole Chapter	17. Complex Systems						Which authors have training and background in social sciences? If none, social scientists should be added to the author team.	Thank you for your comment. One author on our team, Ron Sands, is an economist.
Allison	Crimmins	143420	Whole Chapter	17. Complex Systems						Very strongly recommend changing the title of this chapter. It is long, full of buzzwords, and extremely confusing. Most readers of this report will not know what is meant by "sectoral interdependencies" (I don't). It is also rather redundant. Furthermore, and maybe most importantly, it doesn't convey what the content of the chapter is. This chapter title could be changed to something much simpler, and more audience appropriate, like "Complex Interactions" or "Complex climate risks".	The authors engaged in an extensive discussion over the title of the chapter. We have weighted two competing goals: being desriptive of the content of the chapter, on the one hand, and simplicity, on the other. As a basis of this disucssion, the authors have chosen to retain the basic structure of the title, which we believe is an accurate description of the contents of the chapter. We have, however, simplified the first phrase. And, in addition, we have made a wide range of changes throughout the chapter to reduce jargon and make the exposition easier to understand. We believe that these changes are more important for the readability in the chapter.
Allison	Crimmins	143421	Text Region	17. Complex Systems		611	611	3	24	These key messages are very redundant to one another. There are also parts of each message- particularly key message 2- that are not KEY. Strongly suggest revisiting these key messages and consolidating to only three or even two. For example, you make the point about there being uncertainty (which is not a key message) and needing to integrate evidence/models/impacts in the last sentence of KM1, the last sentence of KM2, and the last sentence of KM3. You make the point that one shouldn't use just one analysis in the second sentence of KM2 which repeats what was said in the second sentence of KM1. Key message 2 can be deleted in its entirety without losing any of the points, since they are all already conveyed elsewhere. The example in Key Message 3 (lines 16-18) is not an example of the sentence it follows (lines 15-16). Delete. The reader is left wondering what points the authors were trying to make. All four messages seem to say that we should be considering more than one analysis to better understand complex interactions of impacts and inform responses. So that is one key message. What else do the authors want to say?	We have substantially rewored KM#1, KM#2, and KM#4 to reduce redundancy among them and to make their emphasis clearer.
Allison	Crimmins	143422	Text Region	17. Complex Systems		613	613	11	12	Repetitive- this was also stated on page 615 line 23-24	This sentence has been removed.
Allison	Crimmins	143423	Text Region	17. Complex Systems		613	615	29	24	For nearly two whole pages, there were zero citations. This is a major red flag. What literature did the authors assess to come to these conclusions?	The State of the Sector has been renamed as "introduction". It is not necessary to include citations in the introduction ot the chapter, as its role is to introduce key themes rather than to draw conclusions. These are provided extensively throughout the remainder of the chapter in key messages and in boxes.
Allison	Crimmins	143424	Text Region	17. Complex Systems		615	616	24	20	Again, there is an entire page of text that went by with ZERO citations. What literature did the authors assess to come to these conclusions. Include citations.	Key message #1 now includes more references. However, we would like to pint out that in addition to these references, Key Message #1 refers to many of the examples in the boxes in the chapter, each of which has its own set of references. We therefore believe that Key Message #1 is sufficiently referenced and supported by the literature.
Allison	Crimmins	143425	Text Region	17. Complex Systems		616	616	24	36	There are zero citations in this entire paragraph.	Citations added
Allison	Crimmins	143426	Text Region	17. Complex Systems		618	618	10	22	Again, there are zero citations in this entire paragraph. What literature did the authors assess to come to these conclusions? Include citations.	Thank you for the suggestion. We have decided to update the box to include only the California example, and removed the Arizona example.
Allison	Crimmins	143427	Text Region	17. Complex Systems		613	613	34	34	This box assumes readers know what, when, and where Sandy occurred. This is a rather east-coast bias, as many people from the west would not be able to tell you what year Sandy occurred. Just as many from the east will not "remember" the Yarnell fire.	This box has been updated to include a more recent extreme weather event example. Dates have been included to describe all storms.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	143428	Text Region	17. Complex Systems		614	614	16	21	Drop this entire paragraph except for the last sentence. It is not needed and does not help the chapter.	The regional rollup has been substantially revised. It is now constructed to demonstrate that there are examples relevant to the themes in this chapter throughout the regional chapters of the NCA. Every regional chapter is now referenced in this section.
Allison	Crimmins	143429	Text Region	17. Complex Systems		614	615	24	25	Add the years that these events occurred as they are not necessarily familiar to all readers.	The regional rollup has been substantially revised. It is now constructed to demonstrate that there are examples relevant to the themes in this chapter throughout the regional chapters of the NCA. Every regional chapter is now referenced in this section.
Allison	Crimmins	143430	Text Region	17. Complex Systems		614	614	26	26	Add a reference to the health chapter either to this bullet or in the last bullet on wildfire	The regional rollup has been substantially revised. It is now constructed to demonstrate that there are examples relevant to the themes in this chapter throughout the regional chapters of the NCA. Every regional chapter is now referenced in this section.
Allison	Crimmins	143431	Text Region	17. Complex Systems		615	615	23	25	This repeats information on page 613. Suggest putting in just one place to save on page length.	Agreed. In revising Key Message #1, this sentence no longer appears.
Allison	Crimmins	143432	Text Region	17. Complex Systems		615	615	32	32	Something seems to be missing from the end of this sentence, or perhaps there is just a grammar issue that makes it awkward/ confusing.	The sentence has been fixed.
Allison	Crimmins	143433	Text Region	17. Complex Systems		615	615	34	34	Cite Bell et al 2016 from the 2016 climate and health assessment, which had an entire section on cascading failures.	Thank you for the recommendation. We have included a reference to the Climate and Health Assessment on cascading failures.
Allison	Crimmins	143434	Text Region	17. Complex Systems		616	616	2	2	Please consider dropping the phrase "sectoral interdependencies" and even the word "interdependencies" from this entire chapter, including the title. This is jargon and rather an empty phrase at that. Almost all of these can be replaced with simpler words more appropriate for this audience, such as "connected" or "web".	The authors have discussed the use of the words "interconnected" and "interdependent" extensively. We decided to reserve “interdependence” for specific cases, but to use “interacting” and “interaction” for the broader meanings.
Allison	Crimmins	143435	Text Region	17. Complex Systems		616	616	5	5	Please consider dropping the use of the phrase "system-of-systems". This is a terrible and meaningless phrase, and not appropriate for the NCA audience.	We are no longer using the phraase, "system of systems".
Allison	Crimmins	143436	Text Region	17. Complex Systems		616	616	5	9	Consider dropping this paragraph as it is vague and repetitive	Key Message #1 has been substantially revised, including this paragraph. At the same time, the point of this paragraph is a crucial theme of the chapter, so it has been retained in the chapter in its revised form.
Allison	Crimmins	143437	Text Region	17. Complex Systems		616	616	8	8	The use of the word "now" suggests that this is a new phenomena, when really it has always been like that.	This paragraph has been revised, and the word "now" has been removed.
Allison	Crimmins	143438	Text Region	17. Complex Systems		616	616	10	22	Drop this entire box. This topic is covered in the International chapter and there isn't room for it in this chapter. Plus there are zero citations in it, so it is unclear what literature the authors assessed in writing this.	We have removed this box and placed some of the material in line in KM#1
Allison	Crimmins	143439	Text Region	17. Complex Systems		616	617	24	2	Drop this entire box. The authors admit themselves that this is a non-climate example, so why are they taking up so much room with it in a chapter that is already too long? Again, there are no citations in this box, so it also unclear what literature the authors assessed in writing this. It is a nice story, but completely irrelevant.	We have decided to keep the box because it illustrates the unpredictably of complex systems well, and because it illustrates the importance of interactions with societal decisions. The points made in the chapter are not necessarily specific to climate, and this will be important for readers to understand.
Allison	Crimmins	143440	Text Region	17. Complex Systems		617	619	4	22	This is good information but a really, really long box. I'm not sure something that spans more than two pages is even a box anymore. However, this would be improved by cutting at least in half. For example, completely drop the text on page 618 from line 10-22 (note that this entire paragraph is lacking citations), and move the text on page 619 lines 3-11 to key message 3. Choosing fewer examples will help convey the message of this box better.	Thank you for the suggestion. We agree with the reviewer and have decided to shorten the box by including only the California example, and removing the Arizona example.
Allison	Crimmins	143441	Text Region	17. Complex Systems		617	617	6	9	There is no need to introduce an arbitrary acronym like EWL here. This is not a common acronym and readers won't remember it, nor do they need to. The uses of EWL on line 7 and 9 can just be deleted without losing the meaning of the sentences.	Thank you for the comment. We agree with the reviewer and have removed the use of the EWL acronym for clarity.
Allison	Crimmins	143442	Text Region	17. Complex Systems		617	617	8	8	"severe" is an odd word choice here and seems a bit strong	Thank you for the comment. We agree with the reviewer and have edited the text to replace "severe" with "significant"
Allison	Crimmins	143443	Figure	17. Complex Systems	1	618				It would be better to use a long-term climate indicator here rather than just three years, which is really only showing weather, not climate. These dates will also be 5 years old or more by the time this report is published.	Thank you for the comment. This figure has been removed.
Allison	Crimmins	143444	Text Region	17. Complex Systems		619	619	1	1	What is CAP? Please spell out the acronym.	Thank you for the comment. We have decided to shorten the box by including only the California example. As a results, we no longer include a reference to CAP.
Allison	Crimmins	143445	Text Region	17. Complex Systems		620	620	13	13	Cite the CSSR here.	This reference has been added.
Allison	Crimmins	143446	Text Region	17. Complex Systems		620	620	28	28	Citation needed	Thank you for your comment. We have added a citation for this statement.
Allison	Crimmins	143447	Text Region	17. Complex Systems		620	620	30	30	Citation needed	Thank you for your comment. We have added a citation for this statement.
Allison	Crimmins	143448	Text Region	17. Complex Systems		621	621	5	5	Not sure this is a complete assessment of the literature. The EPA CIRA report looks at wildfire response costs (economic impacts) and the US climate and health assessment certainly looks at health impacts. Both of these resources are technical inputs to this report. After a dearth of citation in this chapter, it is odd that only Valliant is cited twice here.	Thank you for the comment. The text has been updated to include the suggested literature.
Allison	Crimmins	143449	Text Region	17. Complex Systems		621	621	37	37	Cite Ziska 2016. The US climate and health assessment had a text box on this exact example.	Citation added
Allison	Crimmins	143450	Text Region	17. Complex Systems		622	622	11	16	This is some very dry text that sounds like it is out of a propaganda brochure. Can you summarize and use plain language?	Text was edited to make it shorter and to link the DOD example back to other organizations more generally.
Allison	Crimmins	143451	Text Region	17. Complex Systems		622	622	19	19	Citation needed	citations added
Allison	Crimmins	143452	Text Region	17. Complex Systems		622	622	20	20	Citation needed	citation added
Allison	Crimmins	143453	Text Region	17. Complex Systems		622	622	27	36	Suggest the authors review the Built Environment chapter, which has the same sort of information. May be best to use in just one place.	Cross-references have been added to other chapters in the NCA4 that discuss the blackout. Note, however, that this text box contains a more extensive discussion of the blackout than other references in other chapters.
Allison	Crimmins	143454	Text Region	17. Complex Systems		623	623	1	10	This is yet another super long text box. Suggest dropping this entire paragraph.	While the event is familiar, the authors believe that it is important to retain the text describing how a cascade arises within a networked system, because the goal of this chapter is not simply to state that there is the potential for complex, cascading consequences, but also communicate how they arise. No changes have been made to the text.
Allison	Crimmins	143455	Text Region	17. Complex Systems		623	623	20	27	Move these sentences to the beginning of the paragraph so that we know what sort of cascading failures you mean.	The authors have considered this change and determined that the text should flow from the general (interactions between energy and other systems) to the specific (the consequences arising from the 2003 Blackout). No changes have been made to the text.
Allison	Crimmins	143456	Whole Chapter	17. Complex Systems						Besides for Figure 1 (which shows three years of data = weather, not climate), most of the images in this chapter are pictures and not figures. Typically I hate box-and-arrow or spaghetti diagram "conceptual" figures, but this may be one place where that is appropriate. Taking and example and mapping it out to show the connections and how that strengthens or weakens impacts could be helpful to the reader to understand what the point of this chapter is: stuff is connected.	Thank you for the excellent suggestion. We have added a conceptual diagram at the start of the chapter and are adding an additional wiring diagram in the box on energy-water-land systems

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	143457	Text Region	17. Complex Systems		624	624	17	17	The phrase "but these do not effectively integrate key human systems" is false. What about the CSSR and how they used SSPs? What about the CIRA report and their use of population and GDP? and adaptation actions? Both of these were technical inputs to this report and integrated human systems. And beyond those, there are many more, including MIT's EPPA model, which is all about human systems.	The text has been revised to emphasize where modeling frameworks use "societal" information as inputs, as in these and many other examples, and where the frameworks identify feedbacks to those societal processes, which is extremely rare. References are added.
Allison	Crimmins	143458	Text Region	17. Complex Systems		624	624	17	17	Citation needed	Thank you for the suggestion. We have added a citation into the text as recommended.
Allison	Crimmins	143459	Text Region	17. Complex Systems		624	624	21	21	Citation needed	Thank you for the suggestion. We have added a citation into the text as recommended.
Allison	Crimmins	143460	Text Region	17. Complex Systems		624	624	25	25	CIRA citation added here	Thank you for the suggestion. We have added a citation to CIRA as recommended.
Allison	Crimmins	143461	Text Region	17. Complex Systems		625	625	4		Suggest dropping the word "precisely" as measuring this precisely is not exactly the goal	Thank you for the recommendation. We agree with the reviewer and have removed the word "precisely."
Allison	Crimmins	143462	Text Region	17. Complex Systems		625	625	5	5	Both the NCA3 and the USGCRP 2016 health report have lengthy discussions on making decisions under uncertainty that could be cited here.	Agreed, but also see text edits focused on addressing human dimensions in modeling, which is more relevant here.
Allison	Crimmins	143463	Traceable Account	17. Complex Systems		626	626	2	11	Please add text that explains the decisions made regarding the scope of this chapter (what is in, what is out, what is covered elsewhere)	The introduction to the traceable accounts now includes a paragraph discussing the basis for the scope of the chapter.
Allison	Crimmins	143464	Traceable Account	17. Complex Systems		626	626	26	26	What other "recent literature" is there? Please provide citations.	We have modifed the text to make clear that there is a strong evidence base supporting the importance of interactions between systems but that there is only a small set of literature that has begun attempting to systematically quantify the implications of these interactions.
Allison	Crimmins	143465	Traceable Account	17. Complex Systems		626	626	31	33	These citations do not seem to appear in the chapter itself. I believe the guidance for authors says that all citations in the traceable accounts must also be in the chapter, and this chapter would greatly benefit from more citations in the main text.	We have put the appropriate citations in the main text and removed any overlap. Given the role of the point in the narrative of the chapter, a smaller set of citations was sufficient to support the point.
Allison	Crimmins	143466	Traceable Account	17. Complex Systems		627	627	1	6	This is reviewing uncertainty across the whole field or topic, not the author's uncertainty about key message 1. Please remove mention of KM4 and replace general information with uncertainties specific to KM1.	We would respectfully disagree with the reviewers suggestion. The reference to KM#4 in this traceable account is not intended to support the uncertainty assessment of KM#4, but to support the uncertainty assessment of KM#1. It is important to understand that while we have strong evidence regarding the linkages between systems and many historical examples of the importance of these linkages, we do not have to tools today to quantify or predict all the multi-sector dynamics that might emerge in the future.
Allison	Crimmins	143467	Traceable Account	17. Complex Systems		627	627	8	11	Confidence and likelihood rankings are not provided here- please add.	We now have confidence statements for all key messages. We have not included likelihood statements, as we believe they are not appropriate for these messages.
Allison	Crimmins	143468	Traceable Account	17. Complex Systems		627	627	22	24	No need to repeat what is in the chapter- just describe the evidence. Is it old, new, emerging or established, consensus or contentious? Etc.	The authors feel that some overlap is necessary for the traceable account to be comprehensible. Building from this overlap, the traceable account then goes further to underscore the origin of the conclusions in the underlying literature.
Allison	Crimmins	143469	Traceable Account	17. Complex Systems		627	627	33	34	Were these citations in the chapter?	Yes, these citations appear in the text associated with key message 2.
Allison	Crimmins	143470	Traceable Account	17. Complex Systems		628	628	9	11	Confidence and likelihood rankings are not provided here- please add.	Explicit mention of the confidence language associated with the key message has been added.
Allison	Crimmins	143471	Traceable Account	17. Complex Systems		628	628	21	25	Were these citations, and this information, in the chapter text?	No, not all citations in the traceable account appear in the KM. Our understanding is that this is acceptable practice.
Allison	Crimmins	143472	Traceable Account	17. Complex Systems		629	629	7	25	This is a really long section and it seems that these citations were not in the main text.	No, not all citations in the traceable account appear in the KM. Our understanding is that this is acceptable practice.
Michael	MacCracken	144455	Text Region	17. Complex Systems		611	611	23	23	I would think that "predict" needs to be changed to "project". Also on line 35	The summary has been revised to reflect the changes throughout the document. Note that all the text in the summary comes verbatim from the text of the chapter.
Michael	MacCracken	144456	Text Region	17. Complex Systems		611	611	3	24	Overall, a very well-stated and interesting set of key messages.	Thank you. Please note that we have substantially rewored KM#1, KM#2, and KM#4 to reduce redundancy among them and to make their emphasis clearer.
Michael	MacCracken	144457	Text Region	17. Complex Systems		611	611	34	34	I would think here that it should be "feed back" rather than a single word.	The summary has been revised to reflect the changes throughout the document. Note that all the text in the summary comes verbatim from the text of the chapter.
Michael	MacCracken	144458	Text Region	17. Complex Systems		612	612	2	2	It seems to me saying "exactly" sets up an improperly ambitious goal for the effort. We will never be able to predict the future due to aspects that are only partly due to physics--with a lot due to societal choices now and in the future. The issue is whether the uncertainties can be reduced sufficiently for useful insights to be derived from them--and I would venture that for quite a number of aspects of what is being examined and assessed, the uncertainties are smaller than uncertainties due to non-climate related factors, so further refining the analysis would be unlikely to really assist in the assessment. I'd suggest a bit more discussion to provide further context.	The summary has been revised to reflect the changes throughout the document. Note that all the text in the summary comes verbatim from the text of the chapter.
Michael	MacCracken	144459	Text Region	17. Complex Systems		613	613	2	4	I'm surprised that agriculture and the food system is not mentioned. I'd urge adding it. Also, that health is not mentioned seems surprising, and also the economic system.	We have added in agriculture and two examples of social systems (financial services and social networking). Unfortunately, we cannot include all the different systems or sectors that are relevant in this one sentence. The sectors or systems listed here are examples, but not exhaustive.
Michael	MacCracken	144460	Text Region	17. Complex Systems		615	615	9	14	I think it might be useful to indicate here that some of these interactions can have influences that last for generations--such as fire consuming a stressed ecosystem, rains causing mudslides, new vegetation growing up.	The regional rollup has been substantially revised. It is now constructed to demonstrate that there are examples relevant to the themes in this chapter throughout the regional chapters of the NCA. Every regional chapter is now referenced in this section.
Michael	MacCracken	144461	Text Region	17. Complex Systems		617	617	1	1	Need to use lexicon instead of "may"--that word is just far too vague.	Language changed for clarification, although this was not a case of using "may" in the sense of the uncertainty lexicon.
Michael	MacCracken	144462	Text Region	17. Complex Systems		618	618	2	2	This area does not seem to me to be the "Southwest"--it seems to me to be the "western US". Also, line 5.	Thank you for the comment. We have decided to shorten the box by including only the California example. As a results, we no longer include a reference to the Southwest.
Michael	MacCracken	144463	Text Region	17. Complex Systems		623	623	15	15	I would think "predict will increase" should be changed to "suggest has increased" in that we are really already in that situation.	Suggested edit accepted.
Amanda	Babson	140977	Figure	18. Northeast	18.5	656				The inclusion of Gulf of Maine/Georges Bank lobster (bottom figure, upper left panel) which is one that is increasing without any explanation in the above text (p.655) may be confusing. Suggest adding a sentence about declines in Long Island Sound and increases in Gulf of Maine.	This explanation has been expanded in the figure legend and is also discussed in the text.
Amanda	Babson	140978	Text Region	18. Northeast		660	660	4	6	An additional good reference on habitat modifications is http://northatlanticlcc.org/products/synthesis-of-tidal-inlet-and-beach-habitat-inventories	We appreciate the suggestion and have determined that the current references are appropriate and adequate given the chapter's space limitations.
Amanda	Babson	140979	Text Region	18. Northeast		670	670	30	37	If you'd like to add a citation to this section, Beavers et al. 2016	This citation has been added to Box 18.4.
Dave	White	140980	Text Region	18. Northeast		684	684	6	6	check -13 degrees C	The chapter text has been revised to reflect this comment.
Robert	Kopp	141184	Text Region	18. Northeast		654	654	15	16	This statement is a bit too vague to tie to specific tide gauges, and may be true for regions like coastal New Jersey that experience hightened sea-level rise due to the combination of GIA, anthropogenically accelerated sediment compaction, and atmosphere/ocean dynamics. But it seems excessively for many sites that are located on uncompactable bedrock, where the rate of RSL rise over 1950-2009 is likely more than 2x but less than 3x the global average over this time period (1.9 mm/yr from 1951-2010 per Hay et al 2015).	We have revised this statement to be a bit more location specific. It now reads: "North of Cape Hatteras, NC, several decades of tide gauge data through 2009 along the mid-Atlantic Coast have shown sea level rise rates were three to four times higher than the global average rate (Sallenger et al. 2012; Boon et al. 2012; Ezer et al. 2012).

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Robert	Kopp	141185	Text Region	18. Northeast		654	654	32	32	These are flood heights, not storm surges -- the effect found by Reed et al 2015 is driven essentially entirely by sea-level rise; storm surges changed little.	In accordance with Reed et al. (2015), we have revised the text to read: "Storm flood heights driven by hurricanes in New York City increased by more than 3.9 feet (1.2 meters) over the last thousand years (Reed, et al. 2015)."
Robert	Kopp	141186	Text Region	18. Northeast		657	657	10	35	This paragraph is a repeat.	The duplicative text on this page has been removed.
Robert	Kopp	141187	Text Region	18. Northeast		662	662	1	2	There are good reasons to be skeptical that most of this migration flow will be between states as opposed to relocating to different areas of the same region.	This comment does not appear to raise a question or suggest a revision.
Robert	Kopp	141188	Text Region	18. Northeast		667	667	1	4	This sentence is weirdly constructed. Sea-level rise anywhere increases both flood (NB not surge, which is a product of the storm, not the base level) height and the frequency of a flood of a given height.	The text was revised to incorporate this perspective. As supported by the published literature, as sea level rises, the storm surge associated with a given storm will be at a higher level and potentially span further inland. In addition, higher sea level will lead to higher frequencies of coastal flooding.
Robert	Kopp	141189	Text Region	18. Northeast		667		10	10	Throughout the report, the document refers to results from the American Climate Prospectus or the Risky Business Report, cited alternatively as Gordon, 2014; Risky Business, 2014; Houser et al. 2014; and Houser et al. 2015. The American Climate Prospectus is the peer-reviewed technical analysis, whereas the Risky Business Report is a summary for policymakers; I would therefore suggest citing the ACP instead of the Risky Business Report. The final version of the ACP was published in 2015 by Columbia University Press; the 2014 version is a Rhodium Group report. Citations should be to Houser et al. 2015: T. Houser, S. Hsiang, R. Kopp, K. Larsen and others (2015). Economic Risks of Climate Change: An American Prospectus. New York: Columbia University Press, 384 pp.	The text has been revised to incorporate this suggestion.
Robert	Kopp	141190	Text Region	18. Northeast		667	667	8	10	The impact projections from the American Climate Prospectus (Risky Business report) are for RCP 8.5.	The text has been revised to incorporate this suggestion.
Robert	Kopp	141191	Text Region	18. Northeast		667	667	10	10	Given the uncertainty surrounding hurricane projections -- including the potential for track shifts, as discussed in chapter 12 of the CSSR -- I would suggest "could" rather than "would".	The text has been revised to incorporate this suggestion.
Sally	Sims	141579	Whole Page	18. Northeast		642				Comment: Given the predominance of forested lands in the Northeast, the topic deserves its own key message. This topic is covered well in the Midwest section and similar language could be used. [See suggested text in the next paragraph.] Suggested text to add a new Key Message at Ch 18, page 642, line 10: Northeastern forests provide numerous economic and ecological benefits, yet threats from a changing climate are interacting with stressors from invasive species, pests, and pathogens to increase tree mortality and reduce forest productivity. Without adaptive actions, these interactions will result in the loss of economically and culturally important tree species and may lead to the conversion of some forests to other forest types by the end of the century. Land managers are beginning to consider forest adaptation actions from impacts related to droughts, floods, and severe weather (Northern Institute of Applied Climate Science, Climate Change Framework and Forest Adaptation Resources, Climate Change Tools and Resources for Land Managers (2016)). Also, given the Northeastâ€™s important forest and riverine habitats, this region of the United States is an important biodiversity migration pathway for species moving north from the southern United States and those moving from the northern United States into Canada in response to climate change (The Nature Conservancy, Migrations in Motion Map, 2016).	We appreciate this suggestion. The author team has deliberated and agreed that the text on regional forests in Key Message 1 covers the most relevant information. An additional key message on forests has not been added.
Elizabeth	Burakowski	141596	Text Region	18. Northeast		665	665	25	26	Please include Scott et al. 2008 and Dawson and Scott, 2013 in the discussion of economic viability of ski resorts in the Northeastern United States. Both of these studies note that one metric for economic viability is a 100-day ski season length, in addition to being open during the Christmas Holiday break and maintaining winter temperatures cold enough for snowmaking. The Wobus et al. (2017) study's present-day modeled ski season length in the Northeast US is about 40-60 days (including snowmaking, see Figure 2 in Wobus et al. 2017). The typical northeastern US ski season length is closer to 100 days (see Dawson and Scott, 2013; National Ski Areas Association Kottke End of Season Reports - nsaa.org). Thus, the model bias in the Wobus et al. (2017) potentially overestimates impacts to ski season length in the Northeastern US. References: Dawson, J. and D. Scott. 2013. Managing for climate change in the alpine ski sector. Tourism Management, 35: 244-254. doi: 10.1016/j.tourman.2012.07.009. Scott, D et al. 2008. Climate change vulnerability of the US Northeast winter recreation-tourism sector. Mitig. Adapt. Strat. Glob. Change, 13: 577-596. doi: 10.1007/s11027-007-9136-z.	We have added the suggested citations in the chapter assessment.
Elizabeth	Burakowski	141597	Text Region	18. Northeast		666	666	1	3	Please include discussion of Hamilton et al. (2007), who focused on the demand-side of skier visitation. This study importantly identified snowfall in both urban (ie: "backyard effect") and at the mountains as important drivers in skier visitation. An important conclusion of the study is that supply-side economics (ie: snowmaking to increase supply of ski trails) is not adequate to maintain skier visitation. Skiers must also see snow in their own backyards to generate demand for skiing. Reference: Hamilton et al. 2007. Ski areas, weather and climate: a time series model for New England case studies. International Journal of Climatology, 27: 2113-2124. doi: 10.1002/joc.1502.	We have added the suggested citation in the chapter assessment.
Elizabeth	Burakowski	141598	Text Region	18. Northeast		665	665	24	24	Consider removing "cross country skiing" from the list of winter recreation activities that rely on natural snow cover. At the very least, include text that describes how more cross country ski resorts are investing in artificial snow making, including at least a dozen in the northeastern United States as of 2016 (check with the Cross Country Ski Areas Association - Reese Brown for exact numbers and trends).	Due to the size of the topic and the page limit for the chapter, we focused on broad trends rather than providing such a level of specificity and revised the text to remove the list of winter sports in "()" as suggested.
Elizabeth	Burakowski	141599	Text Region	18. Northeast		665	665	20	20	The $7.6 billion figure citation should be corrected. It does not come from Frumhoff et al. (2007) or Wobus et al. (2017). The number was generated in Scott et al. (2008) and comes from several sources summed together. These sources include Southwick Associates (2006), International Snowmobile Manufacturers Association (2006), Reiling (1998), and Snowmobile Association of Massachusetts (2005). Note this figure may include double-counting from economic activity from participants across state-lines. A more recent figure could be derived from Burakowski and Magnusson (2012) by summing state-level economic activity (~$3.6 billion), or from the Outdoor Industries of America (Southwick Associates, 2017) and participation statistics from Snowsports Industries of America (2017). References: Southwick Associates. 2017. The Outdoor Recreation Economy. Outdoor Industry Association. https://outdoorindustry.org/resource/2017-outdoor-recreation-economy-report/ Snowsports Industries of America. 2017. https://www.snowsports.org/sia-announces-release-of-the-2017-sia-participation-study/	The text has been revised to incorporate this suggestion using the sum of state-level estimates for the Northeast from Hagenstad et al. (2018), the recently published update to Burakowski and Magnusson (2012)

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Elizabeth	Burakowski	141600	Text Region	18. Northeast		647	647	35	35	Contosta et al. 2016 should be Contosta et al. 2017. This article was published in the April 2017 Global Change Biology issue. Complete article history: Publication History Issue online: 8 March 2017 Version of record online: 3 November 2016 Manuscript Accepted: 23 August 2016 Manuscript Received: 14 June 2016 from http://onlinelibrary.wiley.com/doi/10.1111/gcb.13517/abstract. GoogleScholar also lists this article as 2017.	The text has been revised as suggested.
Elizabeth	Burakowski	141601	Text Region	18. Northeast		654	654	28	28	The citation should be Tebaldi et al. 2012, not Tebauldi et al. 2012.	This typographical error has been corrected.
David	Wojick	141602	Text Region	18. Northeast		655	655	11	27	Formatting is centered instead of left-aligned.	This comment has been incorporated into the chapter.
Soren	Warland	141629	Whole Chapter	18. Northeast						Another issue to consider in the northeast is migration from other places in the country to this area. As the climate in the southern and western regions of the US becomes hotter and less tolerable to people, some will move to the northeast in order to live in a cooler climate. The northeast, especially northern states such as Maine, can expect to see an influx of people in the coming decades. The chapter mentioned outflows of people from the coast, but did not consider that a warming climate may cause more people to move into the states. Mentioning the contamination of water and soil through increased heavy precipitation events and storm surge is a good point for spurring a local civil government to take action on updating infrastructure to deal with a changing climate. Emphasizing this effect of climate change forces people to see an immediate threat to public health. Focusing on deaths from air pollution is also a useful strategy for urging action, since deaths from particulate matter and other types of air pollution are an immediate and tangible threat of poor environmental quality. Especially in the northeastern states with shorelines, civic leaders will be interested in the effects of climate change on recreational opportunities. Tourism in these states is a crucial industry that provides a source of jobs in rural areas that would otherwise have high unemployment rates, so it is crucial to provide detail about how climate change will affect these natural resources. There was good information about this subject presented in the chapter.	The authors have considered this comment and revised the text where appropriate.
David	Wojick	141705	Text Region	18. Northeast		647	647	26	32	Here is the present text: 26 Key Message 1: The distinct seasonality of the Northeast, which is central to the regionâ€™s sense 27 of place and an important driver of local industry, is at risk from rising temperatures and 28 changing precipitation patterns. Milder winters and earlier spring conditions are already 29 changing habitats, affecting species, and altering environments in ways that adversely 30 impact human health. The region can expect irreversible changes to hydrology, wildlife, and 31 forests that will threaten the regionâ€™s character, seasonal tourism industry, and health of its 32 residents. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	Key Message 1 has been re-written. Further information on the science is provided in the NCA4 Volume 1. Volume I of the Fourth U.S. National Climate Assessment was prepared and Volume 2 is being prepared in compliance with Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (P.L. 106-554) and information quality guidelines issued by the Department of Commerce / National Oceanic and Atmospheric Administration pursuant to Section 515 (http://www.cio.noaa.gov/services_programs/info_quality.html). For purposes of compliance with Section 515, these documents are deemed a "highly influential scientific assessment" (HISA) and contain expert assessments of the relevant scientific literature that are peer-reviewed by the National Academy of Sciences. The report graphics follow the ISO 19115 standard which includes the necessary information to achieve reproducibility.
David	Wojick	141706	Text Region	18. Northeast		661	661	10	17	The present text says this: 10 Key Message 3: Rural communities are an essential part of the Northeast economy and are 11 largely supported by a diverse range of agricultural, tourism, and natural resource12 dependent industries. Coastal communities already impacted by declining fisheries and 13 flooding are threatened by further ocean warming, sea level rise, and coastal storms. Inland, 14 the impacts of extreme heat on health, increased precipitation on farming, and warming 15 winters on recreation, specialty crops, and forestry threaten rural economies and livelihoods. 16 Rural communities face economic uncertainty if they cannot adapt to projected changes in 17 climate. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	NCA4 Vol. 1, which provides the underlying scientific basis for NCA4 Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. It states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." (Chapter 4)
David	Wojick	141707	Text Region	18. Northeast		666	666	7	9	The present text is this: 7 Disruptions to infrastructure and negative 8 impacts on historic sites, health and well-being, and urban economies are already occurring 9 and will become more common with a changing climate. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the current state of the science on this topic.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Andrew	Pershing	141871	Whole Chapter	18. Northeast						This chapter is a challenge. It is not very well organized/edited nor is it written at the appropriate level for the NCA. The challenges begin with the key messages, which do not follow any particular logical structure. Because these set the whole structure of the chapter, it means that the chapter does not follow a logical structure. There are some really interesting stories in the chapter that could make for stronger key messages. For example, there is a powerful section on the increase in Lyme disease and West Nile virus. How is "people value being healthy and climate change is making that challenging in the Northeast" not a key message? Another unique aspect of this region that is completely absent is the story of the Regional Greenhouse Gas Initiative. RGGI spans most of the chapter domain and has reduced CO2 emissions from the energy sector while keeping costs increases below average. This is an incredible success story from this region that is highly relevant to the NCA.	The chapter has been significantly revised to deal with these issues.
Andrew	Pershing	141872	Whole Page	18. Northeast		642				These key messages are a bit of a mess. They feel like they were written by 5 (or more) different people and that there was very little effort to make them work together in any way. First, the chapter talks about seasons, then oceans & coasts, then rural, urban, then a non-key message, then a generic adaptation key message that contradicts a point in the oceans key message. The entire chapter would benefit from restructuring these key messages to really focus on the unique aspects of the region. One potential reorganization: -instead of all seasons, pick one. The Northeast is known for its harsh winters, so why not talk about them? You could then bring in recreation, and maple sugaring. There is solid science, a strong climate connection, ecosystem impacts, and economic impacts. An alternative would be to focus on hydrology and extreme precipitation as a unique driver recognized in this region. -Urban. Since urban is so much about infrastructure, you could bring in carbon reductions through Regional Greenhouse Gas Initiative and also bring in some of the ideas from KM4 (which isn't written as a KM) -Rural -Oceans and coasts. Consider motivating this with coastal communities (both urban and rural) depend on services… -Disease. This is one of the strongest points in the entire chapter. Consider elevating it to a KM	Thank you for your comments. The Key Messages have been substantially revised.
Andrew	Pershing	141873	Text Region	18. Northeast		642	642	3	9	The logic of this KM is unclear to this reviewer. It seems like you want to talk about shifts in the timing of the seasons (earlier spring, later fall transitions), but it is written in an absolute sense (warmer, colder). This makes it seem like a generic climate change catch-all, rather than something really unique.	We appreciate this suggestion. This KM has been rewritten to focus more on seasonality and rural impacts of climate change.
Andrew	Pershing	141874	Text Region	18. Northeast		642	642	10	16	This KM does a nice job following the NCA guidance. It would be better if the last sentence (an impact) would precede the second to last sentence (adaptation). As suggested in my overview comments on the KM, consider building the motivation from coastal communities (both urban and rural) depend on services… The assertion that adaptive capacity is limited is contradicted by other information in this chapter (notably KM 5). There is actually significant adaptation going on in the marine sector (and even more potential) in the Northeast.	We appreciate the reviewer's comment and have revised this Key Message to reflect the content order suggested in the comment. We have also revised the statement regarding adaptive capacity to indicate that it is variable across ecosystems and communities.
Andrew	Pershing	141875	Text Region	18. Northeast		642	642	17	24	Essential in what sense? Culturally, perhaps, but the economic activity in the rural parts of any area, especially the Northeast is going to be dwarfed by the cities, and this region has some huge cities (Boston, New York, Newark, Philadelphia, Baltimore, DC, Pittsburg, etc.). Highlighting fisheries here seems weird since you have a KM on oceans.	The Key Message identified has been revised to address the reviewer's comment. Text refering to rural industries was incorporated into Key Message 1 and the statement referring to "essential" was removed. Text refering to fisheries was incorporated into Key Message 2.
Andrew	Pershing	141876	Text Region	18. Northeast		642	642	25	29	This isn't written in the same format at the other KMs nor in the style used by NCA. It is not very interesting and could possibly be merged with the urban one.	The Key Message referred to in this comment is unclear. However, the Key Messages have been revised.
Andrew	Pershing	141877	Figure	18. Northeast	18.1	644				I think most readers know that the Northeast has some major metropolitan areas. There is no need to waste inches demonstrating something that is obviously true and can be mentioned in a sentence or two.	Thank you for your comment. Figure 18.1 has been provided to orient all readers to the geographic heterogeneity of the Northeast as a region.
Andrew	Pershing	141878	Text Region	18. Northeast		645	645	15	25	The second half of this paragraph restates the points from the first, but with references.	Relevant example references have been incorporated throughout this paragraph. More detailed citations are provided in the body of key message 2.
Andrew	Pershing	141879	Text Region	18. Northeast		645	645	26	26	This statement "intensely rural and intensely urban" is strange. Intensely urban makes sense (NYC is more "intensely urban" than Buffalo), but I can't picture what it means to be intensely rural. Spell it out: there are some major urban areas (the nation's oldest and most densely populated cities) but there are also vast areas of farms, forests, and small towns.	Adjustments to the text were made.
Andrew	Pershing	141880	Text Region	18. Northeast		645	645	26	33	This paragraph needs references.	Key references has been added.
Andrew	Pershing	141881	Text Region	18. Northeast		646	646	11	15	Wow, this is a very cool story. It is unique to this region and seems to be documented. If you could connect it to climate, it could make a very interesting key message or box.	We currently have a statement about human migration in the introduction and in Key Messages 2 and 5. We have also added a statement about this in new Key Message 4. We have added a statement to the introduction where this topic is mentioned, stating that published research in this area is limited.
Andrew	Pershing	141882	Text Region	18. Northeast		646	646	20	21	This is actually the same set with the addition of air quality.	Text has been revised as suggested.
Andrew	Pershing	141883	Text Region	18. Northeast		647	647	9	16	There are a number of precise statements there that need references.	References were added to the text as requested.
Andrew	Pershing	141884	Figure	18. Northeast	18.2	648				It seems weird to have a figure that has so few data points on it. Aren't there stream gauges in NY, PA, MD, VA, DE? This info would be better conveyed as a time series.	The rivers in Dudley et al. (2017) needed to meet criteria of having substantial amounts of snowpack, long-term complete data, and rivers not substantially impacted by reservoir regulation. These criteria were not met by any stations in the southern part of the region. We have updated the figure by removing the southern part of the region from the figure. We think a map is the best way to present this information. A single time series plot would not convey the variability/consistency of results from individual rivers nor the location of the rivers.
Andrew	Pershing	141885	Text Region	18. Northeast		647	651	25	13	The text supporting this KM tacks back and forth between talking about changes in phenology and then changes in absolute values (volume, temperature, etc.). If you stick with the KM as written, remove any sections (for example, 649, L13-29) that don't discuss phenology. NCA can't include everything, so the game is to figure out the most compelling stories and tell them with data and the literature.	The sections identified have been rearranged and revised to incorporate the reviewer's suggestion. The Key Message was revised to focus on the landscape response to changes in seasonality that impact rural communities. This includes changes in phenology, hydrology and habits that support rural industries specifically tourism, forestry, and agriculture.
Andrew	Pershing	141886	Text Region	18. Northeast		650	650	29	40	You are burying the lede here. This section is so much more interesting and powerful for the NCA audience than streamflow and maple trees. The residents of New England are certainly more worried about getting Lyme disease. There is a strong climate link, powerful motivation. This should be a KM.	Health issues have been elevated into a new Key Messsage in the chapter.
Andrew	Pershing	141887	Text Region	18. Northeast		653	653	11	11	The text refers to a trend from 2007-2016, but it is attributed to papers published in the middle of the period. Clearly this is coming from the data. The references basically say this region is warming quickly and the figure shows that the warming has continued rapidly.	We have modified this section in an attempt to clarify that statements extending through 2016 are derived from the data in Figure 18.3.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Andrew	Pershing	141888	Text Region	18. Northeast		652	653	14	21	This box is really interesting. It adds a lot to the key message about unusual marine impacts in this region. It is also very well written and the figure is cool.	We appreciate the reviewer's comment.
Andrew	Pershing	141889	Text Region	18. Northeast		654	654	3	14	One of the unique stories out of this region is the impact of coastal acidification (primarily runoff) on shellfish hatcheries and the development of technology to monitor water chemistry in real-time. Mook B, Salisbury J. 2015. Ocean Acidification: A Global Issue Affecting a Maine Oyster Farm. EarthZine [Internet]. Available from: https://earthzine.org/2015/05/26/ocean- acidification-a-global-issue-affecting-a-maine-oyster-farm/	We appreciate this suggestion and have incorporated it into Key Message 2.
Andrew	Pershing	141890	Text Region	18. Northeast		651	661	14	8	The organization of the supporting text for this KM could use some work. There is a big chunk of repeated text and ocean acidification is stuck in between temperature. The sea level rise discussion is also really long (even considering the repeated text).	The duplicative text on this page has been removed, and the section on sea level rise has been shortened where possible.
Piyush	Garg	141891	Text Region	18. Northeast		655	655	11	17	This paragraph seems to be about fisheries, but there is no mention of fisheries management. The slow response of management was highlighted in the Pershing et al. paper as a contributing factor to the collapse of cod. There is also a new paper by Le Bris et al. (www.pnas.org/cgi/doi/10.1073/pnas.1711122115) that discusses temperature as a driver of the decline of lobster in the south, the rise in the north, and projects future declines in both regions. A major component of this story is the role of management, with protections for large lobsters in Maine conferring climate resilience. It would also be good to get the economic and social impact of fisheries declines in here somewhere. The box describing the 2012 story and its impact on lobster is good. Anything talking about the economic or social challenges due to cod? On the flip side, there are opportunities for management to mitigate the impact of climate on fisheries. The NMFS Climate Science Strategy lays out a high level plan, and I believe there is a Regional Action Plan that the Northeast Fisheries Science Center has put together. The fishery management councils in this region organized a workshop in 2014 to discuss how to handle shifting stocks.	Most of these comments have been incorporated into the chapter in Key Messages 2 and 5. Discussions by fishery management councils of governance and management implications of shifting stocks have not been documented in publications suitable for citing in this document.
Christen	Armstrong	141929	Text Region	18. Northeast		651	651	15	21	cross reference Chapter 9 in Key Msg 2	Report guidance was to not cross-reference to other chapters in the key messages. Cross-references to the ocean and coastal chapters are provided in the underlying text.
David	Wojick	141930	Text Region	18. Northeast		653	653	1	3	cross reference Chapter 9	This cross-reference to Chapter 9 has been added.
Sarah	Davidson	142003	Text Region	18. Northeast		643	643	24	27	This sentence ("Extreme temperatures....") says that impacts of climate change "may lead to" and then combines direct consequences (e.g. "damaged infrastructure") with possible responses (e.g. "support for relocation"). It's important to make clear that the response-type items on the list are different from the direct consequences, in that residents shouldn't assume they will happen, they will only occur with intentional action and investment.	Language was clarified
Sarah	Davidson	142004	Text Region	18. Northeast		645	645	10	14	It would be helpful to also provide regional projections comparing the difference between RCP4.5 and 8.5 through the end of the study period (i.e. 100 years), to explain the difference between these two scenarios. If regional projections are not available, a general explanation of what to expect based on national or global projections would be helpful.	The new health key meesage projects to 2050. The authors have also referenced CSSR.
Sarah	Davidson	142005	Text Region	18. Northeast		646	646	21	24	In this sentence ("These physical changes....") please clarify to identify the list items that will not occur without intentional action and investment. It should be clear that residents can probably assume there will be damaged infrastructure but should not assume that they will receive support if they need to relocate. An alternative could be something like "These physical changes may lead to large numbers of evacuated and displaced populations and damaged infrastructure, and sustaining communities may require significant investment and planning to provide emergency response efforts....".	Chapter text was changed to reflect the proposed suggestion.
Sarah	Davidson	142006	Text Region	18. Northeast		669	669	31	34	In addition to Utica and Boston, Philadelphia has many programs related to green stormawater infrastructure, for example providing free street trees and rain barrels on qualified residential properties, incentives for large new developments, and adding new green stormwater infrastructure as part of completing other maintenance projects. See p. 41 of "Toward a Climate Ready Philadelphia", cited earlier in this chapter, and www.phila.gov/water/wu/stormwater/Pages/Grants.aspx www.phillywatersheds.org/what_were_doing/green_infrastructure www.pwdraincheck.org	Thank you for pointing this out. We have added Philadelphia to this section on green infrastructure and flooding and referenced the "Toward a climate-ready Philadelphia" report.
Tomi	Vest	142061	Whole Page	18. Northeast		643				The summary overview is constructed from five paragraphs taken verbatim from the introduction. The overview text is also qualitative without any quantitative points. This section would be more effective if written as a concise synthesis with specific values on, for example, expected warming (land and ocean), percentage increase in extreme precipitation, change in growing season length, habitat decline, and so on.	Thank you for the comment. The summary overview section is formatted as required by the NCA report guidance.
Felix	Guerrero	142063	Whole Chapter	18. Northeast						The chapter would benefit from a couple figures relating historical (1895-present) monthly mean temperature and precipitation. Temperature could be shown as anomalies for annual and seasonal (or at least the important end members, DJF and JJA). Precipitation annual total would likely suffice. Timeseries 1895-present could also be supplemented with a figure showing the mean temperature annual cycle for different time intervals (e.g., ca. 1900, 2000 and projected 2030, 2070). One benefit of the latter is that it provides a visual of how the seasons are changing with respect to, say, a 32 deg F datum. This or similar figure could be used in conjunction with discussion on the growing season length and also changes in the snow season.	Please refer to the NCA4 Volume 1.
David	Peterson	142405	Text Region	18. Northeast		642		7		The statement about irreversible changes seems extreme. And â€œirreversibleâ€ needs to be defined in this context. For example, distribution and abundance of tree species and animal species may change, but without any loss of functionality.	The sentence was revised and the term "irreversible" removed to incorporate this perspective.
David	Peterson	142406	Text Region	18. Northeast		642		9		Staudinger et al. (2015) is cited several times in the chapter, but it is a gray-literature report, not a peer-reviewed article, and does not seem like an appropriate citation.	The National Climate Assessment draws upon a variety of sources. All sources were assessed to ensure that they comply with Information Quality Act requirements for (1) utility, (2) transparency and traceability, (3) objectivity, and (4) integrity and security. This is a federal agency report that underwent multiple rounds of public, government and peer review.
Amy	Chen	142407	Text Region	18. Northeast		651		9		This is a confusing section. First, it says that low-elevation forests are most vulnerable, then it says that spruce-fir are most vulnerable. Spruce-fir forest is generally considered to be occupied by relict species that survive in cooler refugial landscapes, so it would not take much additional heat to reduce their distribution and abundance. Nonnative insects are also significant stressors. In addition, Staudinger et al. (2015) is not an authoritative reference for this information â€“ better to use the primary literature.	The text has been revised to incorporate this suggestion and a new reference (Ralston et al. 2015) used.
Juanita	Constible	142571	Whole Chapter	18. Northeast						The chapter has several large passages that are repeated verbatim. While repetition of major points is useful, repeating whole sections is redundant and tedious; please use repetition judiciously.	We have reduced repetition of major points for more judicious use of space and less redundancy.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142572	Whole Chapter	18. Northeast						The chapter is a bit uneven in its level of detail for a general audience. It would benefit greatly from a more consistent level of detail throughout. Recommend adding more in-text citations in sections now without any at all and translating some of the technical jargon for the general reader.	We have reviewed the chapter text for the evenness of the overall "voice", added in-text citations, and used non-technical language in place of the technical jargon.
Juanita	Constible	142573	Whole Chapter	18. Northeast						The 5 Key Messages are good descriptions of a variety of major climate impacts in the Northeast, and important to retain in the final draft.	We have retained 5 key messages.
Juanita	Constible	142574	Whole Chapter	18. Northeast						Key Messages 2-5 cross-connect to corresponding chapters (Key Message 2 to Coasts Ch.8 & Oceans Ch.9; Key Message 3 to Rural Ch.10; Key Message 4 to Urban Ch. 11 & Health Ch. 14; Key Message 5 to Adaptation Ch. 28) in the document, which should be noted accordingly within Ch.18 text.	Cross references have been added
Juanita	Constible	142575	Text Region	18. Northeast		643	643	12	12	Provide a brief definition or example of the term, "ecological services," for a broader audience.	We agree that a definition would be helpful, and have made that addition later in the chapter.
Juanita	Constible	142576	Text Region	18. Northeast		643	643	18	18	In order to clarify the text relative to the Figure 18.1, suggest revising to say, "The Northeast includes areas ranging from intensely rural to intensely urban in character."	Figure 18.1 has been revised to highlight the range of population densities, and geographic heterogeneity. The associated figure caption has been revised as well.
Juanita	Constible	142577	Figure	18. Northeast	1	644				Figure 18.1 and its caption appear in two different places in the text, and are redundant as such. Please remove from one of these locations so that it appears only once in chapter. Furthermore, the color scheme and roadways on the map need a map legend.	We have revised Figure 18.1 and its legend to ensure that material appears only once in the document.
Juanita	Constible	142578	Figure	18. Northeast	1	646				Figure 18.1 and its caption appear in two different places in the text, and are redundant as such. Please remove from p.646 location so that it appears only once in chapter.	Thank you for the comment. Figure 18.1 and its caption appear once in the final draft of the chapter.
Juanita	Constible	142579	Text Region	18. Northeast		643	643	23	24	Items listed are exposures, not vulnerabilities. Please correct text, i.e., ".... Face a different set of multifaceted exposures, including heat extremes, episodes of poor air quality, and flooding from excess precipitation." Urban dimensions of vulnerability might instead include characteristics like high population density, high concentrations of young, old, and economically disadvantaged residents, etc.	The text has been substantially revised to incorporate this suggestion.
Juanita	Constible	142580	Text Region	18. Northeast		643	643	30	31	There is an oversight in the list of cities where adaptation responses are emerging, namely Philadelphia (which has been a leader in organizing heat response plans, developing green infrastructure, etc.).	A new Key Message (KM 4) on health has been added and it includes mention of the leading roles played by New York City and Philadelphia in terms of adapting to heat health conditions.
Juanita	Constible	142581	Text Region	18. Northeast		645	645	2	10	These lines are redundant, and repeat verbatim the text on p.643, lines 2-10. Please edit so that text is not exactly duplicative, which is distracting to readers.	Thank you for the comment. The summary overview section is formatted as required by the NCA report guidance.
Juanita	Constible	142582	Whole Chapter	18. Northeast						Throughout the Chapter, in reference to the various RCPs, "scenario" is used. Suggest adding "emissions" before "scenario"; or otherwise describing within the chapter or elsewhere in the document what the RCP scenarios are, for example, "…plausible, alternative future atmospheric greenhouse gas concentrations, consistent with a wide range of possible changes in greenhouse gas emissions."	The language referring to RCP scenario has been provided by the NCA.
Juanita	Constible	142583	Text Region	18. Northeast		645	645	13	13	For accuracy relative to the cited citation, insert "as much as" before "two decades".	The text has been revised to reflect this point.
Juanita	Constible	142584	Text Region	18. Northeast		645	645	15	21	These lines are redundant, and repeat nearly verbatim the text on p.643, lines 11-17. Please edit so that text is not exactly duplicative, which is distracting to readers.	Thank you for the comment. The summary overview section is formatted as required by the NCA report guidance.
Juanita	Constible	142585	Text Region	18. Northeast		645	645	22	22	To support the statement about "… some of the highest rates of…" either here or later in the chapter when this information re-surfaces, please include examples of how much faster, i.e. "rates threefold faster" or "rates 50% greater than".	We have updated the chapter text after the Key Message to incorporate this suggestion.
Juanita	Constible	142586	Text Region	18. Northeast		645	645	26	29	These lines are redundant, and repeat verbatim the text on p.643, lines 18-21. Please edit so that text is not exactly duplicative, which is distracting to readers.	Thank you for the comment. The summary overview section is formatted as required by the NCA report guidance.
Juanita	Constible	142587	Text Region	18. Northeast		646	646	9	10	These lines are redundant, and repeat verbatim the text on p.643, lines 21-22. Please edit so that text is not exactly duplicative, which is distracting to readers.	Thank you for the comment. The summary overview section is formatted as required by the NCA report guidance.
Juanita	Constible	142588	Text Region	18. Northeast		646	646	14	14	The term "agricultural practices" is not sufficiently descriptive. Please consider, if appropriate, "crop yields" or "food security".	The text has been revised to reflect this point.
Juanita	Constible	142589	Text Region	18. Northeast		646	646	15	17	To describe the risks of valley flooding, the experience of many rural communities during Hurricane Irene could be mentioned in his example.	The author team reviewed the current peer-reviewed literature which does not support the implication that examples such as Hurricane/Tropical Storm Irene are indicative that climate change will lead to more catastrophic hurricane related flood events in the Northeast. Thus, we believe that the current chapter text is appropriate.
Juanita	Constible	142590	Text Region	18. Northeast		646	646	20	24	These lines are redundant, and repeat verbatim the text on p.643, lines 23-27. Please edit so that text is not exactly duplicative, which is distracting to readers.	Thank you for the comment. The summary overview section is formatted as required by the NCA report guidance.
Juanita	Constible	142591	Text Region	18. Northeast		647	647	3	3	Suggest substituting "diminished" in place of "the loss of" before "quality of life", since there may not be an absolute disappearance of life's positive quality.	The text has been revised to refer to "lower quality of life" throughout.
Juanita	Constible	142592	Text Region	18. Northeast		647	647	17	24	These lines are redundant, and repeat verbatim the text on p.643, lines 28-35. Please edit so that text is not exactly duplicative, which is distracting to readers.	Thank you for the comment. The summary overview section is formatted as required by the NCA report guidance.
Juanita	Constible	142593	Text Region	18. Northeast		648	648	3	4	Suggest that the figure title and legend be edited to provide more clarity on the figure's contents. For example, there needs to be more clarity that the map does not show future projections and shows observed changes in spring streamflow timing. Suggest title, "Changes in Observed Timing of Spring Snowmelt-Related Maximum Daily Streamflow". Suggest adding, "Topography in" before "Feet Above Sea Level" at the right in map legend.	We agree that the title should be more specific and have changed it to have a similar level of detail to the suggested wording. The addition of "maximum daily" does not reflect the way Dudley et al. (2017) did their study so that language is not used. We have added "Topography in" to the legend as suggested.
Juanita	Constible	142594	Text Region	18. Northeast		648	648	11	13	The language in the caption is not entirely clear about the way that Spring is defined: line 11 says "February through April". Please be explicit in the figure caption. Also in line 11, provide more specificity about the "average February through April temperature" metric. Was that daily temperatures averaged? Lastly, suggest in line 13, adding "maximum spring daily" before "streamflow" for clarity.	To be more explicit would involve adding technical detail that isn't critical to understanding the figure, and would make it more technical and less understandable to many people. We have opted to remove the "February to April" language and replace it with the more generic "winter-spring". We think that is less confusing in this context. We believe it's more appropriate to let the reader look at Dudley et al. (2017) for specific technical details. This journal article is referenced in the figure caption. This response also applies to the question about daily air temperatures. In terms of the final comment about adding "maximum spring daily" before "streamflow", the indicator in Dudley et al. (2017) does not use the timing of the maximum winter-spring streamflow, rather it looks at changes in the timing of the entire volume of winter-spring streamflow which is strongly influenced by high flows related to snowmelt runoff. To try to improve the figure caption, we have have changed the text to "seasonal timing of snowmelt related streamflow".
Juanita	Constible	142595	Text Region	18. Northeast		648	648	19	19	It would be helpful for readers to have a source citation to support this first sentence, which is loaded with statements of climate impacts.	We have added the Rustad et al. (2012) reference, which covers the effects broadly listed in this statement.
Juanita	Constible	142596	Text Region	18. Northeast		649	649	3	7	Unless these findings are so widespread that they pertain to the entire Northeast region, please provide mention of the regions or locations in which these occurred, within the Northeast.	These findings apply to the entire Northeast Shelf region. The location of this statement has been moved into KM2 and some information has been added to describe differences within the region.
Juanita	Constible	142597	Text Region	18. Northeast		649	649	20	22	Please provide brief mention of the time period in which these decreases in lowest streamflows have been observed or for which they are projected.	We have added the time period for the future changes in the lowest streamflows.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142598	Text Region	18. Northeast		649	649	24	26	For improved clarity in this sentence, suggest moving the long clause in lines 24-25 as follows, since the sentence is now confusing: "… in the Northeast, one study using the lower (RCP4.5) and higher (RCP8.5) scenarios projects that habitat suitable for dragonflies and damselflies, which are good indicators of ecosystem health along rivers and streams, would decline 45-99% by 2080…"	The text has been revised as suggested.
Juanita	Constible	142599	Text Region	18. Northeast		649	649	36	36	Please provide a brief example or mention of the "destructive impacts" of shifting seasonality.	The text has been revised to incorporate this suggestion. Examples of the negative impacts of changing seasonality on forests, wildlife and industry were moved to directly follow this statement.
Juanita	Constible	142600	Text Region	18. Northeast		650	650	6	6	To clarify this sentence, please add "to" after "lose their tolerance", and "they" before "may become".	The text has been revised as suggested.
Juanita	Constible	142601	Text Region	18. Northeast		650	650	24	26	It's not specifically the plant allergens that change in study locations north of 44 degrees N latitude, as documented in Ziska et al. (2011). It was ragweed pollen production season length that increased 18 to 25 days at higher latitudes in central North America. Suggest that this sentence be adjusted accordingly.	That specific text has been removed and alternate text has been added.
Juanita	Constible	142602	Text Region	18. Northeast		650	650	33	33	Suggest a slight clarification in the language relative to disease transmission, i.e. "… the period of elevated risk of Lyme disease transmission in…"	Thank you for your comment. The text has been changed for more specificity as suggested by reviewer.
Juanita	Constible	142603	Text Region	18. Northeast		650	650	39	40	Please provide the genus and species names for these two mosquitoes, so that readers can be certain about which the authors are referencing.	The text has been revised as suggested.
Juanita	Constible	142604	Text Region	18. Northeast		651	651	1	1	Please provide information on how far into New England, and by what year(s), the expected shifts are.	This information has been added to the text.
Juanita	Constible	142605	Text Region	18. Northeast		651	651	3	3	In this sentence, the reference to "(as in the higher scenario, RCP8.5)" is a bit confusing where it is currently because it follows a reference to "efforts to mitigate climate change". Suggest moving the clause "(as in the higher scenario, RCP8.5)" to the end of line 3 after "warming winters".	The text has been revised to incorporate this suggestion.
Juanita	Constible	142606	Text Region	18. Northeast		651	651	6	6	Please provide a brief example of the ways in which white-tailed deer and nutria pose "major concern in different parts of the region".	The text has been revised to incorporate this suggestion.
Juanita	Constible	142607	Text Region	18. Northeast		652	652	3	7	In caption to Figure 18.3 please consider including mention of info from text lines 8-13 about the warming rate of ocean and coastal temperatures in the Northeast Shelf being three times faster than the global average over the last 35 years, and nearly four times faster over the last decade.	Comparison of the regional SST warming rate to the global rate has been incorporated into Figure 18.3 and its legend.
Juanita	Constible	142608	Text Region	18. Northeast		652	652	8	11	Please mention the global average rate of ocean sea surface temperature rise, which is referenced in line 9.	This global rate has been incorporated into this paragraph.
Juanita	Constible	142609	Text Region	18. Northeast		653	653	15	15	In the figure caption "1982-2011 climatology" is defined as what? The caption is not clear, and needs to provide some more detail on whether these are local mean sea surface temperatures, whether mean or maximum, and over what time period (June-August?).	The figure legend has been revised to avoid the use of the words "anomaly" and "climatology", as these may be unfamiliar to the readers. General information about the data is in the figure legend, which we believe addresses other concerns posed in the comment. More details about the data and its processing are available in the metadata.
Juanita	Constible	142610	Text Region	18. Northeast		654	654	17	17	"(Figure 18.X)" is referenced in this line, but doesn't appear in the chapter.	Reference to this figure has been removed.
Juanita	Constible	142611	Text Region	18. Northeast		654	654	28	29	The clause, "…which are major drivers of coastal and climate-related change" is unclear as used in this sentence.	The text has been reworded for clarity to the following: Coastal flood risks from storm-driven precipitation and surges are major drivers of coastal and climate-related change (Morton and Sallenger 2003; Leonardi et al. 2015) and are amplified by sea level increases (Tebaldi et al. 2012; Woodruff et al. 2013; Ezer and Atkinson 2014).
Juanita	Constible	142612	Text Region	18. Northeast		655	655	13	27	The alignment in these lines is centered, instead of left-justified.	This comment has been incorporated into the chapter.
Juanita	Constible	142613	Text Region	18. Northeast		656	656	9	9	In the caption to Figure 18.5, and throughout the chapter, the sources of information in figures and their captions should include the year of the source. Here, the year should be added at the end of line 9 to fully describe the "Gulf of Maine Research Institute" source.	We have cited the sources of the data presented in Figure 18.5, including years when those data are taken from publications. The metadata clarifies that this is an original figure made for this report and provides further details regarding source data.
Juanita	Constible	142614	Text Region	18. Northeast		657	657	10	35	These lines are redundant, and repeat verbatim the text on p.654, line 15 to p.655, line 1. Please edit so that text is not exactly duplicative, which is distracting to readers.	The duplicative text on this page has been removed.
Juanita	Constible	142615	Text Region	18. Northeast		657	657	12	12	Figure 18.6 does not seem to illustrate what's described here.	After consideration of this point, we have determined that the existing placement of this figure is appropriate to the text describing coastal landscape diversity.
Juanita	Constible	142616	Text Region	18. Northeast		657	657	10	12	Please mention the global average rate of ocean sea surface temperature rise, which is referenced in line 11, and the Northeast's rate.	The global rate of SST increase has been incorporated into the text.
Juanita	Constible	142617	Figure	18. Northeast	6	658				At the top of the figure, "ecosystems services" is mentioned but has it been previously defined for readers?	We have now included the following definition: "The varied coast in the region provides an array of ecosystem services which benefit people, from provisioning groundwater resources, filtering non-point source pollution and sequestering carbon, mitigating storm impacts and erosion, to sustaining cultural features such as iconic landscapes, recreation, and traditions."
Juanita	Constible	142618	Text Region	18. Northeast		659	659	10	13	This last sentence could use a source citation to support it. One such source is: Maldonado J, Koppel J, Shearer C, Bronen R, Peterson K, Lazarus H. 2013. The impact of climate change on tribal communities in the USL Displacement, relocation, and human rights. Climatic Change 120:601-614, doi:10.1007/s10584-013-0746-z.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Juanita	Constible	142619	Text Region	18. Northeast		660	660	24	40	This paragraph lacks an anchoring timeframe by which these impacts are projected to occur. Please provide that information here, and throughout the chapter. When projected future impacts are mentioned, the timeframe is needed too.	The text was revised to incorporate this perspective and a timeframe of 2100 has been added.
Juanita	Constible	142620	Text Region	18. Northeast		661	661	35	38	If it is possible to provide a total regional cost estimate for property losses and protective investments through 2100 in the Northeast, that would be great.	Costs estimates are provided as examples. See source material for more information.
Juanita	Constible	142621	Figure	18. Northeast	7	663				Figure labeling within two boxes could easily be clarified by the addition of ", top to bottom," after the words "rows in boxes" in the 3rd line of boxed text.	Figure 18.7 has been replaced with a new figure and caption.
Juanita	Constible	142622	Text Region	18. Northeast		663	663	10	10	To clarify that this figure is all about future projections, suggest adding "future" after "projected" in the first line of Figure 18.7 caption.	Figure 18.7 has been replaced with a new figure and caption.
Juanita	Constible	142623	Text Region	18. Northeast		664	664	9	10	The point that increases in moderate heat could be more important than extreme events, because moderate heat occurs more often, leaves the reader wondering if these moderate temperatures are truly health-harming? Don't people quickly become acclimatized to slightly hotter temperatures? Suggest adding a bit more information from the source paper, because if clarified this could become of great interest to readers.	The text has been modified to state "days of moderate heat may in aggregate be associated with a larger number of adverse health events" to clarify this point.
Juanita	Constible	142624	Text Region	18. Northeast		664	664	14	16	It would be helpful to translate those rates per million people per year to an actual number of projected additional heat-related deaths, or to a percentage increase above mortality rates currently seen, across the Northeast region.	This information is not available in the literature cited and calculating additional results is beyond the scope of this report.
Juanita	Constible	142625	Text Region	18. Northeast		664	664	26	30	The fact that population health can be improved by limiting greenhouse gas emissions, to the tune of 1,000 fewer annual ER visits in Rhode Island, seems like a really important point worthy of more amplification. In other words, when the chapter talks about benefits to health, economies, communities, etc. that can be enjoyed by limiting greenhouse gases, that makes the whole topic seem much more actionable.	Thanks for this comment. We have highlighted these results in Box 18.3.
Juanita	Constible	142626	Text Region	18. Northeast		664	664	36	36	What does "BRACE" stand for?	The text has been revised as suggested. The definition of BRACE has been added.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142627	Text Region	18. Northeast		664	664	38	39	(Note that this sentence actually continues onto p.655, line 2) The cumulative effects of climate change, and the fact that we don't have a strong sense of the overall picture of what those cumulative effects could be, seems like a very important point worthy of amplification. The studies cited in the chapter mostly deal with one impact at a time, but what could the interactive, synergistic effects on health of the Northeast be, for example when a storm strikes and knocks out power for extended periods, only to be followed by a heat wave, infectious illness outbreaks, and ecosystem service disruption which limits food supply productivity and access, and compromises drinking water quality and access to healthcare? The U.S. has already experienced some extreme weather events like Hurricane Katrina, Superstorm Sandy, Hurricanes Harvey and Maria, among others, that had these cascading effects and caused multiple systems failures. It seems like estimating and projective cumulative, interactive impacts is important, needed information.	This is an evolving area of research. This knowledge gap is highlighted in the traceable account for KM 4.
Juanita	Constible	142628	Text Region	18. Northeast		665	665	8	9	In line 9, please explain how is "uncomfortably hot weather" defined (if as days over 80 degrees Fahrenheit, please say so). Many people would not find temperatures in the 80s uncomfortable. They might also wonder, don't people quickly become acclimatized to temperatures in that range? Please provide information to address these concerns.	"Uncomfortably" has been changed to "health-threatening" as defined by the increase in risk of ER visits at temperatures >80 deg F. Specific heat metrics are defined in the figure itself.
Juanita	Constible	142629	Text Region	18. Northeast		665	665	14	15	Suggest removing "excess" to clarify "…1,000 fewer annual excess heat-related ER visits", because "fewer" and "excess" seems confusing when stated together.	The text has been modified as suggested
Juanita	Constible	142630	Text Region	18. Northeast		666	666	12	12	Has the "urban heat island effect" been defined for readers elsewhere? If not, please provide a brief definition here, for example, by adding, "which occurs as manmade materials re-radiate absorbed solar heat."	We agree that a definition would be helpful and have added a footnote that cites Appendix 5 for the definition.
Juanita	Constible	142631	Text Region	18. Northeast		666	666	21	24	Please provide a bit more explanation for lay readers in the general public of what's meant by "factors that drive vulnerability," perhaps substituting "… are all socio-economic factors that can increase people's health vulnerability to the harmful effects of heat."	After consideration of this point, we have determined that the existing text is clear and accurate.
Juanita	Constible	142632	Text Region	18. Northeast		667	667	8	10	These estimates seem relatively modest, since hearing that damages in 2017 from extreme weather events exceeded $300 billion (source: NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2018). https://www.ncdc.noaa.gov/billions/). This seeming disparity between the future projected costs, and what society is already having to contend.	The text has been revised to incorporate this suggestion by including the following text, "… projected future costs are estimated to continue along the upward trend of being much greater than what is currently being experienced today. However, there is limited published research that quantifies these costs associated with increased damage across an entire system in response to amplified storm events."
Juanita	Constible	142633	Text Region	18. Northeast		667	667	12	12	Suggest replacing "enhanced" with "increased", since "enhance usually refers to something positive, which social inequality is not.	The text has been revised to incorporate this suggestion.
Juanita	Constible	142634	Text Region	18. Northeast		667	667	25	26	Suggest making "climate impact" plural.	The text has been revised to incorporate this suggestion.
Juanita	Constible	142635	Text Region	18. Northeast		667	667	30	30	Suggest inserting "at elevations" before "within about 16 feet…" to clarify that these are vertical, not horizontal, distances.	The text has been revised to incorporate this suggestion.
Juanita	Constible	142636	Text Region	18. Northeast		667	667	37	37	Suggest substituting "Projected increases" for "Projections of increases" at the beginning of this sentence. It's the actual projected event that's harmful, not the projection.	The text has been revised to incorporate this suggestion.
Juanita	Constible	142637	Text Region	18. Northeast		668	668	7	7	For clarity, suggest inserting "economically" before ""disadvantaged".	After consideration of this point, we have determined that the existing text is clear and accurate. There are additional forms of disadvantaged beyond just economic.
Juanita	Constible	142638	Text Region	18. Northeast		668	668	15	31	This section on climate-health impacts in the Northeast has omitted mention of several important health effects. These include the range of health harms that can result from coastal and riverine flooding; vector borne diseases affected by climate change; displacement resulting from extreme weather events fueled by climate change; and associated mental health impacts. Sources for all these can be found in the 2016 US Global Change Research Program Climate & Health Assessment; or in their 2014 Third US National Climate Assessment, Ch.9 on Human Health.	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information to include and therefore have not revised the chapter. The past Assessment reports are resources available to the public and it is not our intent to repeat this information in this report - rather to build upon or revise as appropriate. Please see Chapter 14 that provides more discussion on human health.
Juanita	Constible	142639	Text Region	18. Northeast		668	668	17	17	Suggest that for completeness, add "and ER visits" after "hospitalizations".	The text has been revised to incorporate this suggestion.
Juanita	Constible	142640	Text Region	18. Northeast		668	668	21	21	Substitute "sewage" for "water", as in "… untreated sewage may be released into local water bodies."	The text has been revised to incorporate this suggestion.
Juanita	Constible	142641	Text Region	18. Northeast		668	668	28	28	Please provide a brief mention of the connection(s) between erosion and human health, which is the theme of this paragraph.	The text has been revised to incorporate this suggestion. The streambed erosion affects human health through bridge collapse and/or damage. This is one example provided, space is limited to provide an exhaustive discussion.
Juanita	Constible	142642	Text Region	18. Northeast		668	668	31	31	Suggest adding "traffic and injury" before "fatalities" for clarity.	The text has been revised to incorporate this suggestion. "Traffic" congestion was not added as that falls within forms of transportation disruptions.
Juanita	Constible	142643	Text Region	18. Northeast		668	668	37	37	Add "Projected" before "flows" to clarify this concerns future projections.	The text has been revised to incorporate this suggestion.
Juanita	Constible	142644	Text Region	18. Northeast		668	668	39	39	Suggest "are lower" rather than "becomes lower" - for clarity.	The text has been revised to incorporate this suggestion.
Juanita	Constible	142645	Text Region	18. Northeast		670	670	5	6	The word order as shown makes this sentence unclear. Suggest reorder text & delete "the" to read, "…most exposed to acute and chronic climate risks".	This rewording has been incorporated into the document.
Juanita	Constible	142646	Text Region	18. Northeast		670	670	19	37	This is a long text box with provocative, important ideas, but providing a source citation would help readers who want to see support for these findings, or read more.	Beavers et al 2016 was added as a reference in the upper portion of the box.
Juanita	Constible	142647	Text Region	18. Northeast		671	671	6	8	Is this sentence aiming to describe the simultaneous conditions "…to achieve restoration, sustainability, and conservation and protection goals"? If so, please add "simultaneously".	These actions may be, but are not necessarily simultaneous.
Juanita	Constible	142648	Text Region	18. Northeast		671	671	2	35	It would be great to hear more about what people in the Chesapeake Bay Watershed are doing to build human community resiliency, too, as part of this section.	Text was revised to incorporate reference to CPM workgroup efforts to engage local communities.
Juanita	Constible	142649	Text Region	18. Northeast		672	672	3	3	Suggest inserting "building" before "codes" for clarity.	The text has been revised as suggested.
Juanita	Constible	142650	Text Region	18. Northeast		673	673	16	29	Some questions and suggestions in this example of the piping plover. One, please explain why it is a "species of concern" - is that because of low population numbers, or because of its ecosystem importance? Two, who uses the "'iPlover' smartphone application" -- only researchers or citizens too? Three, none of the text box examples used to describe Key Message 5 concern human community adaptation explicitly, which is a major concern of most readers of the Northeast chapter. Suggest including one more detailed text box of how human communities and/or neighborhoods are adapting to climate change.	The text was revised to incorporate the additional clarification requested for the plover case study. Examples of such adaptation have already been highlighted in the chapter text. A human community example was added to Box 18.4
Juanita	Constible	142651	Text Region	18. Northeast		675	675	3	4	Please provide information on how many states, counties, or municipalities in the Northeast region have existing adaptation plans, and provide a citation to sources in which readers can find more information.	This is constantly changing and occuring on multiple scales. https://www.epa.gov/cira; http://www.georgetownclimate.org/; https://www.rggi.org/; https://toolkit.climate.gov/regions/northeast
Juanita	Constible	142652	Traceable Account	18. Northeast		676	676	19	19	Please describe whether Non-Governmental organizations (NGOs) were also tapped as potential chapter author team members.	See traceable account on author selection.
Juanita	Constible	142653	Traceable Account	18. Northeast		676	676	23	26	Please describe whether author team members with expertise and/or experience in cultural and social issues in the Northeast region included, since subjects like displacement from extreme weather events, and associated mental health impacts, weigh heavily on the Northeast in the context of climate change.	See traceable account on author selection.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142654	Traceable Account	18. Northeast		678	678	3	13	Please provide in this chapter either a description, or a note on where to find a description, of the distinction between "Likelihood" and "Confidence" as applied in the Traceable Accounts.	This information is provided in the front matter of the NCA
Juanita	Constible	142655	Traceable Account	18. Northeast		678	678	26	26	For clarity, please transpose word order to read, "…to exceed rates expected in other ocean regions".	This suggestion has been incorporated.
Juanita	Constible	142656	Traceable Account	18. Northeast		678	678	36	37	For clarity, please say "subsidence" instead "vertical land movement", which makes readers wonder if this is something about tectonic movement.	After consideration of this point, we have determined that the existing terminology is accurate; vertical land movement includes subsidence from both tectonic and non-tectonic effects, both of which are factors in the NE.
Juanita	Constible	142657	Traceable Account	18. Northeast		679	679	18	18	For clarity, please substitute "result in" rather than "require".	This comment has been incorporated.
Juanita	Constible	142658	Traceable Account	18. Northeast		680	680	21	21	Consider adding "and involved in" after "largely supported by", since rural communities are a part of those systems as well.	The key messages have been revised to provide consistency, more specificity, and reflect the content in the narrative. The traceable accounts have been updated to reflect these changes.
Juanita	Constible	142659	Traceable Account	18. Northeast		680	680	31	31	Please consider adding "tourism" to this list, as that is quite important to rural economies.	The key messages have been revised to provide consistency, more specificity, and reflect the content in the narrative. The traceable accounts have been updated to reflect these changes.
Juanita	Constible	142660	Traceable Account	18. Northeast		681	681	11	11	95 DEGREES Fahrenheit translates to 35 degrees Celsius; please re-check your conversations here and fix.	This sentence has been removed. All conversions have been checked and revised if necessary.
Juanita	Constible	142661	Traceable Account	18. Northeast		683	683	10	10	Please specify what the "recent three-year period" was.	The text has been revised to provide the 3 year period.
Juanita	Constible	142662	Traceable Account	18. Northeast		683	683	14	19	The information in these two sentences would be good to amplify, as they describe the scope of Northeast climate-health impacts. Some more specificity in the geographic range of the cities affected would be helpful.	The cited report by the EPA (CIRA 2.0) provides estimates of excess deaths for the entire region rather than city-specific results. See the report for additional details about how these estimates are generated. The Estrada (2017) paper provides global rather than local or regional estimates. As suggested, the text has been revised to clarify both of these points.
Juanita	Constible	142663	Traceable Account	18. Northeast		684	684	6	6	Please check the conversion between Celsius and Fahrenheit (an increase of 8 deg C is 14 deg F, and an increase of 8 deg F is 4.4 deg C); and delete the negative sign "-" from in front of "13 deg C".	The chapter text has been revised to reflect this comment.
Juanita	Constible	142664	Traceable Account	18. Northeast		684	684	7	7	Remove incorrect punctuation at end of sentence and replace with period.	The chapter text has been revised to reflect this comment.
Juanita	Constible	142665	Traceable Account	18. Northeast		691	691	24	32	In the reference list, should all the US EPA citations be together? Presently, some are under "EPA" and others under "US EPA".	The text has been revised to reflect this comment.
Mikko	McFeely	142866	Text Region	18. Northeast		647	647	30	30	I am concerned about the use of the word irreversible. This can be viewed as a statement that we have passed a tipping point and that emission reductions implemented now or in the future will have no impact. To what extent have models actually been used to evaluate what happens after decades of reduced greenhouse gas emission? I think you need to be careful about the use of irreversible. Also note that on page 677, it says that there is very high confidence in this statement regarding irreversible changes. I believe that there is very high confidence that the changes described will occur. But is there also very high confidence in the irreversibility of these changes?	The sentence was revised and the term "irreversible" removed to incorporate this perspective.
Mikko	McFeely	142867	Figure	18. Northeast	182	648				Regarding Figure 18.2: There are 7 symbols to represent the range, but only 3 of the 7 appear on the figure. Why not narrow the range of the 7? Also, why is there no results for the central and southwest portion of the region?	The symbology used in the legend has been updated and the southern part of the region removed since no data exist in the study from which this figure was derived. This eliminates large geographic areas for which thare are no results.
Mikko	McFeely	142868	Text Region	18. Northeast		649	649	6	6	What is the direction of the shift?	Directionality of shifts are varied for the ecosystem components mentioned in this sentence, and due to space constraints, we have not detailed the directionality of specific timing shifts. For phytoplankton, we have also modified the phrasing to include more than just timing, but also broader characteristics of the bloom.
Mikko	McFeely	142869	Text Region	18. Northeast		649	649	19	21	Replace annual lowest streamflows with annual minimum streamflows, if that is what is meant. Same on line 21. Lowest is not a term used commonly used by hydrologists.	The text has been revised to replace "annual lowest streamflows" with "annual minimum streamflows" as suggested.
Mikko	McFeely	142870	Text Region	18. Northeast		650	650	1	1	Does less predictable mean more variability in the model predictions, or just more uncertainty	The text has been revised to say "increaing variablity".
Mikko	McFeely	142871	Text Region	18. Northeast		661	661	9	9	This section on Key Message 3 seems to be skewed toward coastal communities, with inland communities receiving little attention. There was no mention of the impact of floods on rural inland communities. In recent decades, the most severe climate impacts NYC watershed communities has likely been floods from tropical storms.	While minor/moderate riverine flooding has increased in the Northeast during the last century, there is currently insufficient evidence to conclude that major riverine flooding has increased despite some high profile events such as flooding related to hurricanes. Also, increases in future major flooding across the region are uncertain as they are impacted by not only intense precipitation but also by factors such as snowpack amounts and antecedent soil moisture. Increased coastal flooding is much more certain because sea level rise is driven primarily by temperature increases. We therefore think the current text relavent to this comment is appropriate. We do discuss implications of increased minor/moderate riverine flooding in Key Message 4.
Mikko	McFeely	142991	Whole Page	18. Northeast		642				Key messages 3 and 4 discuss how rural communities and urban centers may be impacted by climate change. The NE has many vulnerable populations (elderly, children, indigenous, poor, etc.) in both large cities (Boston, Philadelphia, Baltimore) and in rural communities. As climate change is superimposed on existing vulnerabilities, we suggest including language that specifically mentions vulnerable populations in these key messages.	Issues that affect vulnerable populations are important, have been infused throughout the chapter and highlighted in the Key Message on urban impacts. A new Key Message on health that assesses the impacts of climate change on rural and urban populations has been added.
Mikko	McFeely	142992	Whole Page	18. Northeast		642				Aside from one sentence in Key Message #1 (The region can expect irreversible changes to hydrology… the key messages do not include reference to freshwater changes (quantity and quality); we suggest that climate change impacts to freshwater should play a larger role in the key messages. We understand that there is entire chapter in the NCA on water, so it may be helpful to more clearly link the Sector impacts/key messages (water, etc.) to the regional impacts/key messages.	We recognize that water is an important topical area. It is a cross-cutting theme that is addressed across all Key Messages in the Northeast chapter, as well as a cross-cutting theme that has been coordinated with the national water chapter of the NCA. We have added references to relevant issues in the Water chapter to our Key Messages 3 and 5.
Mikko	McFeely	142993	Text Region	18. Northeast		643	643	25	27	The list of climate change hazards includes recurrent coastal flooding. Flooding hazards in the NE include riverine flooding as well (i.e. hurricane Irene in New England). We suggest including additional sources of flooding: riverine flooding and heavy and long duration rainfall.	While minor/moderate riverine flooding has increased in the Northeast during the last century, there is currently insufficient evidence to conclude that, even with high profile events such as those following Hurricane/Tropical Storm Irene, that major riverine flooding has increased. Also, increases in future major flooding are uncertain because they depend upon intense precipitation as well as factors such as snowpack amounts and antecedent soil moisture. The incidence of increased coastal flooding is much more certain because sea level rise is driven primarily by temperature increases. Thus, we believe that the current text supporting the original chapter is appropriate. We do discuss implications of increased minor/moderate riverine flooding in Key Message 3 and Key Message 4.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	142994	Whole Page	18. Northeast		643				If not in key messages, language about vulnerable populations should be highlighted in the summary overview. This comment is related to a previous comment: The NE has many vulnerable populations (elderly, children, indigenous, poor, etc.) in both large cities (Boston, Philadelphia, Baltimore) and in rural communities. As climate change is superimposed on existing vulnerabilities, we suggest including language that specifically mentions vulnerable populations in these key messages.	We have added additional language about vulnerable populations in the key messages.
Mikko	McFeely	142995	Text Region	18. Northeast		646	646	20	21	Flooding is not limited to coastal flooding. Flash flooding, riverine flooding and storm surge are other potential threats.	We updated this introductory text to include the potential for increased flooding on urban streams. We believe that the general text on coastal flooding is inclusive of storm surges.
Mikko	McFeely	142996	Text Region	18. Northeast		649	649	27	29	In addition to the vulnerable species listed in this section, we suggest including the fact that there several species that are already endangered and federally protected in NE they will be further threatened by climate change impacts (for example Atlantic sturgeon). http://www.nmfs.noaa.gov/stories/2012/01/31_atlantic_sturgeon.html	This comment has been incorporated into the Key Message 2 using Atlantic sturgeon, Atlantic salmon, and right whales as examples.
Mikko	McFeely	142997	Text Region	18. Northeast		651	660	14	21	Description of Key Message 2 neglects natural water systems which are not directly coastal, are not estuaries but are still influenced by tidal dynamics. Tidal dynamics and the location and movement of the interface between saltwater and freshwater (saltline) can for example impact drinking water intakes which rely on acquifers (groundwater) or/ and tidally influenced rivers (surface water). One example is the Delaware river, which is tidally influenced. The river provides a large portion of drinking water to the city of Philadelphia. During the 100 year drought in the 1960s the saltline came as close as 13 miles to its drinking water intake. Consequently, SLR and frequency of extreme storms in particular have an important impact on upstream of estuary habitats, ecosystem services and livelihoods. The chapter should extend its scope to include these systems.	We appreciate this suggestion, but space and references specific to the region that meet IQA standards are somewhat limited. Where possible, we have included some additional text and statements as to the impact of saltwater intrusion on drinking supplies.
Mikko	McFeely	142998	Text Region	18. Northeast		654	654	15	17	Locally in Philadelphia our data indicates that over the historic record we have seen double the rate of sea level rise as compared to the global average. Three four times the global rate for the entire NE strikes us as high. The last NCA states Coastal flooding has increased due to a rise in sea level of approximately 1 foot since 1900. This rate of sea level rise exceeds the global average of approximately 8 inches. If this high rate (3 to 4 x the global average) has only been seen in the last 50 to 60 years, this should be made clear in this section. First discuss the trend seen over the entire historic record and follow with the more recent trends. Then it will make more sense to explain that this more recent increase in the rate is not confirmed as a long term trend. Additionally, it is our understanding that this high rate of SLR in more recent years is concentrated in the mid Atlantic section of the United States and while it does extend from Cape Hatteras up to Boston, Maine, New Hampshire and parts of Massachuessets are beyond that point. It may be good to include a broader range of observed sea level rise rates that apply to the entire Northeast.	We recognize there may have been some confusion due to the way the text was written. We have revised the text to specify this increase in is associated with rates in the mid-Atlantic region, and make clear the potential contributors to this increase. Although we appreciate the suggestions to cover the historic record, space is limited, and after deliberation with the author team, we have elected not to expand this section further.
Mikko	McFeely	142999	Text Region	18. Northeast		654	654	16	17	The source cited on line 16 to 17 Ezer et al. 2012 is not found in the bibliography. We assume it is referencing Ezer et al. 2013, which is included in the bibliography.	We have added the following reference: Ezer, T., and W. B. Corlett (2012), Is sea level rise accelerating in the Chesapeake Bay? A demonstration of a novel new approach for analyzing sea level data, Geophys. Res. Lett., 39, L19605, doi:10.1029/2012GL053435.
Mikko	McFeely	143000	Text Region	18. Northeast		654	654	20	26	The text in this section about higher rates of sea level rise in the NE is confusing. It disucsses sea level rise rates being 3 to 4 times higher in the NE over a period from 1950 to 2009 but then states that it is uncertain whether the increasing rate indicates a long term trend or shorter term fluctuations. Isn t a 59 year period of rise long enough to account for multi decadal fluctuations?	We recognize there may have been some confusion due to the way the text was written. We have revised the text to provide clarification as potential contributors to the recent trend: ""North of Cape Hatteras, NC, several decades of tide gauge data through 2009 along the mid-Atlantic Coast have shown sea level rise rates were three to four times higher than the global average rate (Sallenger et al. 2012; Boon et al. 2012; Ezer et al. 2012) (Figure 18.6). The region's sea level rise rates are increased by land subsidence (sinking)—largely due to vertical land movement related to the melting of glaciers from the last ice age—which leaves much of the land sinking with respect to current sea level (Sella et al. 2009; Karegar et al. 2016; Love et al. 2016; Sweet et al., 2017). Additionally, shorter-term fluctuations in the variability of ocean dynamics (Kopp 2013; Rahmstorf, et al. 2015), atmospheric shifts (Valle-Levinson et al., 2017), and ice mass loss from Greenland and Antarctica (Davis and Vinogradova, 2017) have been connected to these recent accelerations in the SLR rate in the region. "
Mikko	McFeely	143001	Whole Page	18. Northeast		657				Text on pg. 657 and 654 is repeated verbatim. Generally speaking, the layout of some of these sections is repetitive and a bit confusing.	The duplicative text on this page has been removed.
Mikko	McFeely	143002	Text Region	18. Northeast		660	660	15	16	It would be helpful to reader less familiar with SLR projections to be given a bit more context on the NOAA projections used in the CSSR, especially in regard to what is meant by more probable scenarios and how it's related to intermediate low and intermediate projections.	SLR scenarios are based on Sweet et al 2017 and are explained in more detail therein
Mikko	McFeely	143003	Text Region	18. Northeast		660	660	25	27	This is the only sentence in the entire chapter that mentions saltwater intrusion. More emphasis should be placed on this issue given its implications to water supply. Many communities in the NE are located in densely populated coastal zones that rely on groundwater or tidally influenced source waters for drinking water.	Several sentences now expand upon the risks of salt water intrusion, and several studies on Cape Cod and Assateague Island are now referenced. However, the text has also been adjusted to reflect the considerable research gap that accompanies this topic for the Northeast.
Mikko	McFeely	143004	Text Region	18. Northeast		660	660	36	38	The statement on inland erosion rates of 3.3 feet/year is only linked to one source. Is this a widely accepted rate? We suggest making it clear that one study determined that rate or provide additional sources and/or a range of rates.	The text has been revised to say that one study determined that rate.
Mikko	McFeely	143005	Text Region	18. Northeast		661	661	5	6	This is a great and really important point about the ongoing challenge of determining the value of ecosystem services. We are glad to see it included; this message could be reiterated in other sections.	This comment does not appear to raise a question or suggest a revision.
Mikko	McFeely	143006	Figure	18. Northeast	7	663				Bottom panel in Figure 18.7 seems to be mislabeled (representing 95F days as opposed to 75F nighttime temperatures)	Figure 18.7 has been replaced with a new figure and caption.
Mikko	McFeely	143007	Text Region	18. Northeast		664	664	37	37	Consider changing languge from our knowledge to scientific community's knowledge or something similar	The text has been revised as suggested.
Mikko	McFeely	143008	Text Region	18. Northeast		666	666	31	39	We suggest calling attention to the fact that aging infrastructure and the need to renew or replace provides and opportunity to invest in resilient infrastructure, but acknowledge that this could come with added costs. It could also be explained that much of the water infrastructure that needs renewal or replacement today was initially funded in part by the federal goverment during implementation of the CWA and SDWA. There needs to be acknowledgement of financial burden on municipalities to maintain this costly critical infrastructure.	The text was revised to incorporate this perspective. The following has been incorporated into the body of KM4: "Any redevelopment of aging infrastructure will likely reinforce or further intensify long-standing tensions between federally funded projects requiring locally-funded maintenance, a particular issue for local communities that are resource-limited."
Mikko	McFeely	143009	Text Region	18. Northeast		667	667	15	26	Thank you for including this. We feel that it is essential to highlight the interdependencies of critical infrastructure.	We greatly appreciate the reviewer's comment about the report and hope that the content is useful. Please note that interdepencies is also discussed in other part of the report including Chapters 11 and 17.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	143010	Text Region	18. Northeast		668	668	18	21	This section discusses some of the issues that climate change poses to water systems (supply and wastewater) and the resulting health impacts. In addition to everything mentioned, we highly suggest that this section includes language about the great risk of inundation to wastewater infrastucture given the location of these assets. Water infrastructure including infrastructure like outfalls or wastewater or water treatment plants, is often located in current or future flooplains and may be vulnerable to flooding and damage associated with storm surge. Another potential location to make this point could be on page 667, lines 28 to 30)	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information to include and therefore have not revised the chapter.
Mikko	McFeely	143011	Text Region	18. Northeast		683	683	32	36	Is this sentence implying that planting trees leads to increase in VOCs? This wording is unclear. If trees can be a sources of VOCs, this should be explained further.	The authors considered this comment and agree that this sentence appropriately constructed as written.
Casey	Thornbrugh	143100	Text Region	18. Northeast		659	659	14	14	Re-word the section title from â€œTribal and Indigenous Peoplesâ€ to â€œIndigenous Peoples and Tribal Nations.â€ Reason: When the term â€œTribalâ€ stands alone it can be interpreted to have multiple or even vague meanings. â€œTribal Nations,â€ however is a term used by the National Congress of American Indians (NCAI) and the United South and Eastern Tribes (USET) Inc. to refer to the 573 (as of January 31, 2018) federally recognized sovereign Tribal Nations (variously called tribes, bands, pueblos, communities, and Alaska Native villages) that have a â€œnation-to-nation relationshipâ€ with the U.S. Government. See the NCAI Guide to Tribal Nations and the United States for more information: http://www.ncai.org/resources/ncai_publications/tribal-nations-and-the-united-states-an-introduction	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Casey	Thornbrugh	143101	Text Region	18. Northeast		659	659	15	16	Revise the sentence, â€œIndigenous peoples and tribal communities of the Northeast region have millennia-long relationships with the diverse landscapes and climate zones found throughout the region.â€ To: â€œIndigenous peoples and tribal nations of the Northeast region have millennia-long relationships with the diverse landscapes and climate zones found throughout the region.â€	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Casey	Thornbrugh	143102	Text Region	18. Northeast		659	659	17	17	There are actually â€œ18â€ federally recognized tribes in the Northeast. To verify, see: https://www.bia.gov/sites/bia.gov/libraries/maps/tld_map.html	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Casey	Thornbrugh	143103	Text Region	18. Northeast		669	669	9	11	Add to the sentence, â€œCommunities, towns, cities, counties, and states across the Northeast are already engaged in efforts to build resilience to environmental challenges and adapt to a changing climate, sometimes in partnership with federal agencies (CDC BRACE).â€ To read: â€œCommunities, towns, cities, counties, states, and tribes across the Northeast are already engaged in efforts to build resilience to environmental challenges and adapt to a changing climate, sometimes in partnership with federal agencies (CDC BRACE).â€	The text has been revised to incorporate this suggestion.
Casey	Thornbrugh	143104	Text Region	18. Northeast		674	675	6	3	Revise the sentence, â€œImplementing resiliency planning and climate change adaptation in order to preserve the cultural, economic, and natural heritage of the Northeast would require ongoing collaboration among tribal, rural, and urban communities as well as municipal, state, and federal agencies.â€ To: â€œImplementing resiliency planning and climate change adaptation in order to preserve the cultural, economic, and natural heritage of the Northeast would require ongoing collaboration among tribal, rural, and urban communities as well as municipal, state, tribal, and federal agencies.â€ NOTE: Tribes are communities, but they are also governments with their own agencies (e.g. public safety, health, and natural resources) just like municipal, state, and federal entities.	Text revised to include recommendation.
Ken	Moraff	143173	Text Region	18. Northeast		642	642	6	6	The text was revised to incorporate the additional clarification requested for the plover case study. Examples of such adaptation have already been highlighted in the chapter text (Box 18.4).	The sentence was revised to incorporate this perspective.
Ken	Moraff	143174	Whole Page	18. Northeast		645				It would be helpful to add a list of the states that are in the Region, how many people live in the Region and their age demographics, housing stock information and that the Region has the highest increase in heavy precipitation of all the US Regions.	The revised Figure 18.1 is a locational map of the states in the Northeast region, that includes population densities. Detailed regional geographic informaiton is not within the context of this report. Heavy precipitation is a cross-cutting issue that is covered in several Key Messages.
Ken	Moraff	143175	Text Region	18. Northeast		645	645	29	29	Add the word "agriculture," after rural areas.	This comment has been incorporated into the chapter text.
Ken	Moraff	143176	Text Region	18. Northeast		646	646	24	24	After "urban" add "and rural" poor.	The term "urban" has been removed to highlight the fact that all poor residents are vulnerable.
Ken	Moraff	143177	Text Region	18. Northeast		647	647	1	1	Add "language isolated" after "recent immagrants" as they are another vulnerable population.	Thank you for the comment. This has been addressed in the revision.
Ken	Moraff	143178	Text Region	18. Northeast		654	654	11	12	As there are multiple reasons for the exacerbation at the coastal margin, the following language additions are suggested. "At the coastal margins, acidification is exacerbated due to nutrients from sources including fertilizer runoff, sewage treatment plants, septic systems, stormwater runoff, and atmospheric deposition during heavy rainfall events." Some of the other coastal, nutrient sources are more significant than fertilizer runoff.	We have broadened this statement to indicate a range of nutrient sources, but for space reasons could not list in detail.
Ken	Moraff	143179	Text Region	18. Northeast		662	662	1	1	As a demonstration on the concern of migration inland, the Pioneer Valley Planning Commission in Massachusetts climate adaptation plan includes sea level rise as a concern, not for flooding, but for an influx of migrants from the coastal regions. http://www.pvpc.org/sites/default/files/PVPC%20Climate%20Action%20Clean%... (page 145). This in fact became a reality after Hurricane Maria when refugees from Puerto Rico came to Massachusettts. http://www.masslive.com/news/index.ssf/2017/12/over_2000_students_from_p...	We have added the suggested citation in the chapter assessment under the adaptation Key Message (KM 5).
Ken	Moraff	143180	Text Region	18. Northeast		664	664	25	25	Also this study concluded that there is a 7.5% increase in visits and deaths from all causes increased by 5.5% in Rhode Island, Maine and New Hampshire on days when the heat index reaches 95 degrees. Based on these results, the National Weather Service Northeast Region updated its heat advisory to be issued when the heat index is 95 degrees for any amount of time on two or more days or 100 degrees for any amount of time on a single day as opposed to the old advisory that only went out when the heat index reached 100 degrees for two or more consecutive hours.	Thanks for this suggestion. The change in guideline criteria for heat advisories in the new england is now highlighted in the box.
Ken	Moraff	143181	Text Region	18. Northeast		666	666	15	18	More emphasis should be placed on air quality in this chapter. Specifically, there is high confidence that ozone and particulate matter air quality is worsening as a result of climate change. There is also reason to expect that higher particulate matter levels will result from climate change, resulting in the potential to increase the number of deaths due to air pollution. Because the northeast is a highly populated region, these increasing pollutant levels will impact health in larger numbers of people. Details in the maps presented in Chapter 13 Air Quality indicate these regional impacts potentially affecting the northeast.	We appreciate the comment, but space is limited. Note that the Chapter 13 map is for summertime ozone projections and shows the Northeast split regarding experiencing worsening or improving conditions. As noted in Chapter 13, PM2.5 projections have noted uncertainty about future concentration, with some suggestion of decreases in response to increased controls and some suggestion of increases based on changes in environmental factors that influence PM2.5 concentrations.
Ken	Moraff	143182	Text Region	18. Northeast		678	678	11	11	Add ",impact interactions among species" after "by species'. Delete "but" and begin new sentence, "It is likely..."	This concern has been addressed

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Ken	Moraff	143183	Text Region	18. Northeast		683	683	26	38	Uncertainties discussed regarding air quality in this chapter seem to be contradicted by the discussion in Chapter 13 Air Quality. Several studies to date have examined the expected air quality impacts from climate change in the U.S., with consistent conclusions that increasing temperatures associated with climate change are a driver to increase ozone and PM levels, exposure, and health impacts. The magnitude and regional allocation of these air quality impacts is still uncertain. See Fernando Garcia-Menendez, Rebecca K. Saari, Erwan Monier, and Noelle E. Selin (2015) U.S. Air Quality and Health Benefits from Avoided Climate Change under Greenhouse Gas Mitigation, Environ. Sci. Technol., 49 (13), pp 7580--7588, DOI: 10.1021/acs.est.5b01324	Our expressions of uncertainties are consistent with those in the traceable accounts for Chapter 13.
David	Wojick	143184	Text Region	18. Northeast		684	684	38	38	EPA Region 1 has collected and categorized over 200 New England community adaptation plans in an effort to assist other communities that are starting their resilience planning. www.epa.gov/raine	The author team thanks you for this reference. It is referenced in Key Message 5.
Social Science	Coordinating Committee	143211	Whole Page	18. Northeast		642				This was particularly strong in addressing on going activities communities are taking to reduce risk that demonstrate the value of workable adaptation solutions with early adoption	Authors appreciate the reviewer's comment.
Social Science	Coordinating Committee	143212	Whole Page	18. Northeast		649				Stronger links between ecosystems and human systems e.g. Key Message 1, vulnerable groups of fish are discussed but the linkage between impacts to fisheries and human communities are not clear. What are the economic, social and cultural impacts to changing fish availability? How will these stresses have a cascading impact on social and cultural systems? What will the impact of vector borne disease be for tourism?	This text has been incorporated into KM 2, primarily as an impact of warming temperatures and future projections. Ecological-social linkages associated with changing species are also discussed in KM5.
Social Science	Coordinating Committee	143213	Whole Page	18. Northeast		666				Message 4 is explicit in regards to components of vulnerability and even mentions historic sites---more nuanced understanding/language of the importance of cultural heritage sites for well-being would be a powerful statement.	The text was revised to incorporate this perspective. The text has been updated by identifying the historic sites as "nationally significant."
Social Science	Coordinating Committee	143214	Whole Page	18. Northeast		669				Message 5 focuses on adaptation and decision support, which is positive, but it might be helpful to also explore the institutional barriers or challenges to these activities	Not clear what is intended by institutional barriers. May be outside the scope of this discussion. We added challenges to the key message.
Carole	LeBlanc	143381	Whole Chapter	18. Northeast						Though the positive activities in the Northeast are certainly not in dispute, the tone of this chapter may be overly optimistic. For instance, members of the Environmental Business Council of New England (ebcne.org) have noted the lack of the public's awareness and engagement of many, if not most, climate change activities in their own communities. Mentioning this might serve stakeholders/interested parties well.	Additional text regarding barriers to action have been added.
Diane	Borggaard	143418	Text Region	18. Northeast		655	655	22	22	Hare et al. looked at fish and invertebrates, so "fish" should be added to clarify. If the sentence reads "... protected fish species" this would help clarify. There are ongoing discussions efforts within NMFS to conduct marine mammal and sea turtle vulnerability assessments but results are not yet available. Adding this point of clarification would be helpful.	We have added both "fish and invertebrates" to clarify the focus of the Hare et al. (2016) paper and to distinguish its scope from ongoing assessments of other protected species.
Union of Concerned Scientists	Union of Concerned Scientists	143896	Whole Page	18. Northeast		642				It would likely be useful for decision makers if the authors were able to include key numbers that portray the magnitude of changes observed in and projected for the NE US.	We added additional details where possible (oceans KM, health KM, and in the traceable accounts). The majority of magnitude of these numbers are contained in the CSSR.
Union of Concerned Scientists	Union of Concerned Scientists	143897	Text Region	18. Northeast		645	645	26	26	This line generally repeats what is said in line 4.	After consideration, these two statements are referring to distinct differences in the region.
Union of Concerned Scientists	Union of Concerned Scientists	143898	Whole Page	18. Northeast		657				It appears that much of this page is a duplicate with what appears on page 654.	The duplicative text on this page has been removed.
Union of Concerned Scientists	Union of Concerned Scientists	143899	Whole Page	18. Northeast		642				It would be helpful if the key messages could be a bit more specific - for example, what are the key sectors that are likely to be affected, and how? The key messages are so general right now (e.g. risks to economies… but which ones?), that they might not be helpful for decision-makers looking for information they can base decisions off of.	The key messages have been revised to provide consistency, more specificity, and reflect the content in the narrative. The traceable accounts have been updated to reflect these changes.
Union of Concerned Scientists	Union of Concerned Scientists	143901	Whole Chapter	18. Northeast						This chapter would benefit from additional sub-headers to organize the information. The key messages are quite broad, but then the material can be quite specific - it can be a bit hard to follow the logic and structure of the chapter.	The text has been revised to reflect this comment. Sub-headings have been added throughout the chapter.
Michael	MacCracken	144464	Text Region	18. Northeast		642	642	3	9	It seems to me the first point ultimately covers more than human health aspects--saying that seemed to me to narrow the point in an unexpected way as I was reading along. So, rest of point mentions tourism and would apply to recreation as well, plus more. Perhaps, as is done in the second point, the main theme of the point needs to be included in the first sentence, which is now very generally.	We thank the commenter. The impacts of climate change on the health of residents of the Northeast are now described in a separate key message to address this and other points.
Michael	MacCracken	144465	Text Region	18. Northeast		642	642	10	16	It seems to me it might be worth saying this is one of the oldest regions in the country (or at least to really develop extensively), having installed much of its infrastructure based on the climate largely of the 19th century, so on the one hand is likely to early on experience the adverse impacts of change, but also be in a position to include climate projections in the renewing of the infrastructure that is and will continue to be going on.	We thank the commenter. The text has been revised to reflect this point.
Michael	MacCracken	144466	Text Region	18. Northeast		642	642	20	24	There is also the inland effect on rivers, so greater range in levels. Also, the increased cycling of freeze/thaw cycles is becoming quite problematic due to impacts on river ice (e.g., enhancing ice dam formation) and on roadways (leading to greater road heaving and so expenses for communities).	Unfortunately it's not possible to include all potential climate-related issues in the text of the key messages. We feel that the currently mentioned issues are the most important ones that have published research to support them.
Michael	MacCracken	144467	Text Region	18. Northeast		646	646	11	11	Along with this statement, it would be appropriate to be noting that the Northeast is where many immigrants settle when they come into the country, living a generation and then moving to elsewhere. Thus, I'd imagine the regions has one of the most mixed ethnic distributions in the country, and also great contrasts in wealth.	Thank you for the comment. Vulnerable populations and underrepresented communities have been noted in the chapter.
Michael	MacCracken	144468	Text Region	18. Northeast		646	646	19	19	Need to use the lexicon words instead of "may"--so perhaps say "are likely to have limited ability Ã‰" Also need to make change on line 22; then page 647, lines 1, 9:, and continuing through the chapter. Page 662, line 21 alone has two places needing a change, and line 16 in same paragraph has one. Really need to do a search on this.	The text has been revised as necessary.
Michael	MacCracken	144469	Text Region	18. Northeast		650	650	6	6	Change to "to lose"	The text has been revised as suggested.
Michael	MacCracken	144470	Text Region	18. Northeast		655	655	11	27	Need to fix justification.	This comment has been incorporated into the chapter.
Michael	MacCracken	144471	Text Region	18. Northeast		664	664	21	21	It is not the risk that increased, but the incidence.	This has been clarified in the text.
Michael	MacCracken	144472	Text Region	18. Northeast		664	664	26	27	Is this visits per year or per day or what. And to what can I compare this to know if this is big or miniscule change?	The visits are annual excess-heat-related ER visits.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144473	Text Region	18. Northeast		666	666	12	15	There is no mention here that what is also going up is the wet-bulb temperature. The increase in the absolute humidity will make overall temperatures feel a lot worse--that is, the discomfort index goes up more than the temperature. This increase in absolute humidity will have very important implications for the air conditioning load as it takes of order 20 times as much energy to pull the temperature of moist air down a degree as it takes for dry air. Keeping absolute humidity down in buildings will require tightening up of the buildings, and this itself can have health effects; indeed, frequently going in and out of air-conditioned buildings would seem likely to cause health problems.	The historical trends and future predicted changes in absolute or relative humidity across the northeast are not well documented in the scientific literature. This is now documented in the traceable account for Key Message 4.
Michael	MacCracken	144474	Text Region	18. Northeast		670	670	19	20	The phrasing here makes it seem as if the Indigenous people of the region are not part of its cultural heritage. A bit of rewording would seem worth doing.	The call out box has been re-named to better represent the content and the focus on historical sites and cultural landscapes.
Michael	MacCracken	144475	Whole Chapter	18. Northeast						Overall, the chapter is quite impressive, having a great deal of specific information and discussion about impacts. The one significant thing that did not seem to get mentioned is that many types of needs in this region are met by what is generated in other regions, and I did not see any discussion (I admit reading not totally complete) regarding the vulnerability of this region to what might happen in other regions (and nations around the world). Although the region being pretty wealthy will allow the region to buy its way out of problems, I still think that the issue needs to be mentioned, etc.	Thank you for your comment. The author team agreed that the current text is appropriate as written.
Grant	Millin	140866	Whole Chapter	19. Southeast						Hi NCA Team, As someone who took a physical geography course along with developing a independent degree in Sustainability and Security Studies and who worked in media I wanted to share some feedback on the special report / NCA4 and for NCA5 and other purposes: 1) I see the term "compound extreme events" accompanying "abrupt and/or irreversible changes". I knew the term abrupt climate change but I think more public attention needs to be directed to the system dynamics of Anthropogenic Climate and what may happen over the course of 2020, 2030, 2050, and 3000 with various levels of mitigation and resilience. I heard Radley use the term "Climate Frankensteins" to cover this systemic change â€¯unknown, unknownsâ€™ risk management arena. Personally in 1990 we should have gone full speed into mitigation mode to avoid these high risk possibilities. 2) A public access Anthropogenic Climate Risk Register is needed where the public and decision makers can manipulate various scenarios as to mitigation and resilience per each US judicial district. For example in the Asheville, NC area we are known for having one of the most biodiverse regions in the world. Also our annual snow averages are hitting rock bottom. Despite the National Centers for Environmental Information HQ being in Asheville I have yet to see a comprehensive analysis of Anthropogenic Climate for this region.t I see the NCA4 team and others in climate science work at being careful at not overemphasizing the medium-low probability but very high impact negative potential outcomes of Anthropogenic Climate. With a national and then global risk register the number of the most severe potential impacts per region based on X, Y, and Z (etc.) can be better viewed. The Koshland Science Museum Mitigation Simulator is one example of what's needed, but that project is several years old now. https://www.koshland-science-museum.org/sites/all/exhibits/mitigationsim/index.html We need a Koshland Earth Lab II program to get more folks up to date on the details and options... fast: http://sustainnc.com/nc-public-carbon-mitigation-decision-wall-raleigh/ 3) I see the term "persistence" but I see very little common wisdom shared in the public forum about the atmospheric persistence of CO2 not absorbed naturally. This seems like a key to understanding Anthropogenic	Thank you for your comment. The creation of a public access anthropogenic climate risk register is outside the scope of this report. The National Climate Assessment summarizes the state of the climate and does not make policy prescriptions.
Robert	Kopp	141192	Text Region	19. Southeast		730	730	11	13	The projection from the Risky Business report is for RCP 8.5.	We agree that adding RCP 8.5 would be helpful, and have made the addition.
Robert	Kopp	141193	Text Region	19. Southeast		730	730	13	13	Throughout the report, the document refers to results from the American Climate Prospectus or the Risky Business Report, cited alternatively as Gordon, 2014; Risky Business, 2014; Houser et al. 2014; and Houser et al. 2015. The American Climate Prospectus is the peer-reviewed technical analysis, whereas the Risky Business Report is a summary for policymakers; I would therefore suggest citing the ACP instead of the Risky Business Report. The final version of the ACP was published in 2015 by Columbia University Press; the 2014 version is a Rhodium Group report. Citations should be to Houser et al. 2015: T. Houser, S. Hsiang, R. Kopp, K. Larsen and others (2015). Economic Risks of Climate Change: An American Prospectus. New York: Columbia University Press, 384 pp.	We agree that this is a more appropriate reference and have made this change or added the reference where the information is most clearly presented in the Risky Business report or other related publication.
Robert	Kopp	141195	Figure	19. Southeast	9	732				The value added by using a sea-level rise projection figure that is not based on the scenarios developed for the NCA is unclear.	We appreciate the suggestion and have determined that the current figure illustrates what one Southeast coastal city, Charleston, has done to address sea level rise. Their sea level rise strategy came out before the Sweet et al, 2017 and NCA4 CSSR, thus used previously available federal scenarios (ex. USACE and NOAA - NCA3). We think it important to show existing work on this. The City of Charleston is discussing possibly adjusting their guidance to inlcude the NCA4 scenarios.
Chris	Narducci	141607	Text Region	19. Southeast		721		20		Isle de Jean Charles is not solely a tribal community. Some residents of the island do not identify as Biloxi-Chitimacha-Choctaw, and that is an important fact that has had significant impacts on the implementation of HUD's NDRC grant program. To describe the community as solely "tribal" is inaccurate. Suggest removing this modifier and clarifying the nature of the community and tribal affiliation.	Comment noted. Yes, there may be non-Tribal community members on Isle de Jean Charles, however this case study focuses on the resettlement of a Tribal community through funds allocated by Housing and Urban Development awarded to the State of Louisiana.
Chris	Narducci	141608	Text Region	19. Southeast		721		30		HUD, alone, awarded NDRC funds. The Rockefeller Foundation provided critical technical assistance to communities and states applying for the funding, however, HUD Reform Act and Federal procurement rules explicitly prohibited Rockefeller from being involved in the decision-making process and HUD from participating in individual provision of technical assistance beyond providing basic information about the application requirements. To suggest that the HUD and Rockefeller "awarded" funds in partnership is inaccurate and suggests a serious violation of the law. Suggest accurately characterizing Rockefeller's involvement in providing technical assistance to applicants.	Correct, HUD award was given to the State of Louisiana. The Rockefeller Foundation provided key technical assistance to the applicants.
Chris	Narducci	141609	Text Region	19. Southeast		721		31		There is no "Isle de Jean Charles Tribe". Many residents of Isle de Jean Charles identify with the Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw Tribe, which is the accurate title for the Tribe. Suggest stating full title of tribe and then refer to it as "the Tribe"□ later in the section.	Comment noted and corrected in the text.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Chris	Narducci	141610	Text Region	19. Southeast		721		31		The award was not provided to the Tribe but to the State to implement a voluntary resettlement program of all residents of the island, whether they are affiliated with the Tribe or not. Due to Fair Housing Act, the option to resettle must be provided to any resident, and may not be exclusive to members of the Tribe. Suggest clarifying this fact in the summary.	Correct, the HUD/NDRC Award was given to the State of Louisiana. "State of Louisiana" has been added to the text. The HUD publication, "NDRC Grantee Profiles, State of Louisiana, 2016, page 10" states that one of the projects awarded to the State of Louisiana is for relocation of the Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw tribe.
Chris	Narducci	141611	Text Region	19. Southeast		721		34		The award was not provided to the Tribe but to the State to implement a voluntary resettlement program of all residents of the island, whether they are affiliated with the Tribe or not. Due to Fair Housing Laws, the option to resettle must be provided to any resident, and may not be exclusive to members of the Tribe. Suggest clarifying this fact in the summary.	Correct, the HUD/NDRC Award was given to the State of Louisiana. "State of Louisiana" has been added to the text. The HUD publication, "NDRC Grantee Profiles, State of Louisiana, 2016, page 10" states that one of the projects awarded to the State of Louisiana is for relocation of the Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw tribe.
Chris	Narducci	141612	Text Region	19. Southeast		721		36		Facilities will be developed at the relocation site, not on the island to revitalize the community. Suggest clarifying this in the following way: "The resettlement plan . . . will include several community facilities at the relocation site, including a tribal center and health facility"	"… in the new location" was added to this sentence.
Chris	Narducci	141613	Text Region	19. Southeast		721		37		There is no "Isle de Jean Charles Tribe". Many residents of Isle de Jean Charles identify with the Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw Tribe, which is the accurate title for the Tribe. Suggest stating full title of tribe and then refer to it as "the Tribe" later in the section.	The full name of the Tribe has been included.
Christen	Armstrong	141614	Text Region	19. Southeast		722	722	1	3	With regard to federal agencies, they are continuously working to accommodate the needs of vulnerable communities in the context of adaptation, so this statement would be better received if it provided more illustration of how Federal government could address the unique challenges of whole-community relocation. Suggest referring to MOU on establishing Interagency Working Group on community-led and managed retreat for an excellent discussion of the need and how federal government can potentially respond. With regard to Fair Housing Act, the sentiment, as written, seems to suggest that the law - a 50-year-old hallmark of the civil rights movement- should allow communities to exclude assistance to certain race/ethnic groups. This is concerning and unsubstantiated without further discussion of the unique scenario of IdIC. The comment would benefit by, first, distinguishing this from separate comment on Federal agencies, and also further clarifying how the Fair Housing Act impacted the planning process for the resettlement and what solutions were developed to address the challenges, and what other solutions could aid in addressing those challenges in the future.	Comment noted regarding the importance of federal agencies, in particular the Fair Housing Act. This sentence does not imply exclusion to anyone. Only that climate migration/resettlement at a community level will take some flexibility.
Holly	Mallinson	141632	Text Region	19. Southeast		721	722	19	10	The case study on the Isle de Jean Charles Tribe (page 721 lines 19-39 and page 722 lines 1-10) was fascinating and devastating- an excellent example to drive home the point that climate change is happening now and that people are already being affected. It could be worth investigating if this is happening elsewhere, even if not as drastic or where loss like this could be expected in the next several decades to show that this type of event is not a one-off and will continue to happen.	A sentence has been added to communicate that Isle de Jean Charles is not the only community experiencing affects from sea level rise. ADDED: Coastal communities in the Southeast are already experiencing impacts from higher temperatures and sea level rise (USGCRP 2014, Hauer et al, Nature Climate Change 2016)).
Holly	Mallinson	141633	Text Region	19. Southeast		734	734	1	12	Under the Extreme Rainfall Events Are Contributing to Increased Inland and Coastal Flooding section (page 733 line 6) the flooding in south Louisiana in August 2016 is highlighted (page 734 lines 1-12. This event was preceded by flooding in north Louisiana in March 8-11, 2016 where some areas received upwards of 20 inches of rain in about a two-day span. This event was also catastrophically damaging to the region and could be mentioned to further illustrate that extreme events are becoming more commonplace.	The text was revised to incorporate this perspective.
David	Wojick	141708	Text Region	19. Southeast		722	722	12	15	The present text says this: 12 Key Message 1: Many Southeastern cities are particularly vulnerable to climate change 13 compared to cities in other regions, with expected impacts to infrastructure and human 14 health. Increasing heat, flooding, and vector-borne disease could affect the vibrancy and 15 viability of metropolitan areas. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	This comment is inconsistent with the current state of the science. Strong evidence exists, as outlined here, in other sections of this document, and in the peer-reviewed literature. For example, human health impacts of climate change, both current and projected, are outlined in USGCRP, 2016: *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* . Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312 pp. http://dx.doi.org/10.7930/J0R49NQX
David	Wojick	141709	Text Region	19. Southeast		727	727	28	32	The present text is this: 28. The combined effects of 29 changing extreme rainfall events and sea level rise are increasing flood frequencies, making 30 these places highly vulnerable to climate change impacts. Without significant adaptation 31 measures many coastal cities will experience daily high tide flooding by the end of the 32 century. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	After consideration of this point, we have determined that the existing text is clear and accurate. The KM states that sea levels are rising and flood frequencies are increasing currently. Even if this trend only continues in a linear fashion, it is likley high tide flooding wll become a daily event. If future sea levels follow current published projections such as Sweet, et al, 2017, this likelihood only increases.
David	Wojick	141710	Text Region	19. Southeast		736	736	21	28	Here is the present text: 21 Key Message 3: The Southeastâ€™s diverse natural systems, which provide many benefits to society 22 and span the transition zone between tropical and temperate climates, will be transformed by 23 climate change. Changing winter temperature extremes, wildfire patterns, sea levels, 24 hurricanes, floods, droughts, and warming ocean temperatures are expected to redistribute 25 species and greatly modify ecosystems. As a result, the ecological resources that people 26 depend on for livelihood, protection, and well-being are increasingly at risk, and future 27 generations may experience and interact with natural systems that are much different than 28 those we see today. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the current state of the science on this topic.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
David	Wojick	141711	Text Region	19. Southeast		746	746	3	7	The present text says this: 3 Increasingly frequent 4 extreme heat episodes and changing seasonal climates will increase exposure-linked health 5 impacts and economic vulnerabilities in the agricultural, timber, and manufacturing sectors. 6 By the end of the century, over one-half billion labor hours could be lost from extreme heat 7 related impacts. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. That these health claims are highly questionable has already been pointed out to the USGCRP. See for example: "Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment" by Patrick J. Michaels and Paul C. "Chip" Knappenberger, Cato Institute, June 2015. https://www.cato.org/publications/public-comments/draft-impacts-climate-change-human-health-united-states-scientific Apparently the USGCRP has chosen to ignore this information.	Thank you for your comment. This statement is inconsistent with the state of the science, and references a non-peer-reviewed source. Please see the health chapter of this report, or USGCRP, 2016: *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* . Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312 pp. http://dx.doi.org/10.7930/J0R49NQX
David	Wojick	141932	Text Region	19. Southeast		745	745	12	39	cross reference to Chapter 9	Chapter 9 has been cross referenced.
Christen	Armstrong	141935	Text Region	19. Southeast		745	745	30	32	add reference: Yates, K. K., Zawada, D. G., Smiley, N. A., and Tiling-Range, G.: Divergence of seafloor elevation and sea level rise in coral reef ecosystems, Biogeosciences, 14, 1739-1772, https://doi.org/10.5194/bg-14-1739-2017, 2017.	We added that reference to the following statement: "Coral elevation and volume in the Florida Keys have been declining in recent decades (Yates et al. 2017)"
Christen	Armstrong	141936	Text Region	19. Southeast		745		31		"coral cover and heightâ€¦ have been declining"	We modified that statement as follows: "Coral elevation and volume in the Florida Keys have been declining in recent decades (Yates et al. 2017)"
Christen	Armstrong	141937	Text Region	19. Southeast		746	746	16	17	cross reference to Chapter 9	thank you. The revision has been made.
David	Peterson	142409	Text Region	19. Southeast		744		35		Several of these references are general in nature and not relevant to Southeastern forests.	It is true that several of these references are general in that they examine the effects of drought on forests; however, several of the references incorporate effects on southeastern forests.
David	Peterson	142410	Text Region	19. Southeast		745		5		What is a "critical foundation plant species"?	Foundation species are defined earlier in the chapter: "Foundation species are species that create habitat and support entire ecological communities (Dayton 1972; Ellison et al. 2005)."
David	Peterson	142411	Text Region	19. Southeast		748		12		Because most of the forest land is privately owned, forest managers have several options for adapting actively and quickly to altered conditions. Thinning and prescribed burning are already standard practice, and short rotations allow for periodic modification of management practices. This suggests that actively managed forests may not be as vulnerable as suggested in the first sentence of the paragraph.	The comment correctly points to adaptation strategies that would increase resilience, but current trends in forest management are correctly reflected in the chapter's statement of about wildfire risk. Where coordinated action is needed to address a risk, such as fire or insect outbreaks, the challenge of coordinating numerous private holders can result in slower and less effective responses.
David	Peterson	142412	Whole Chapter	19. Southeast						The chapter implies that Southeastern forests are vulnerable to climate change, but many of the actual effects are rather vague, as are the mechanisms. A more compelling discussion with supporting literature (including in the Traceable Accounts) would be more convincing. No need to state severe effects of climate change if they are not likely.	This comment misses at least 5 mechanisms of vulnerability of forests documented in this chapter that relate to climate change: 1) the affects of altered prescribed fire activities from changing prescription windows (KM3), 2) drought-induced pine beetle outbreaks in Piedmont ecosystems (KM3), 3) exotic species invasions in the region (KM3), 4) change in plant hardiness zones particularly minimum nighttime termperatures (KM3), and 5) the diversity of private ownerships that challenge adaptation responses to expected forest changes (KM4). Specifically regarding mechanism 5, where coordinated action is needed to address a risk, such as fire or insect outbreaks, the challenge of coordinating numerous private holders can result in slower and less effective responses. While space is limited to account for a detail treatment of each of these forest change drivers, chapter authors have reviewed the text to ensure those mechanisms are clearly documented and supported by current litereature, and feel that we have addressed this issue. We also added cross linked to the Forests Chapter of the broader NCA4 document that include additional details about these mechanisms and literature behind forest vulnerabilities in the SE and other regions.
Kathy	Lynn	142439	Whole Chapter	19. Southeast						Suggest including adaptation case studies from recent State of Adaptation in Water Resources Management: Southeastern United States and U.S. Caribbean to give some concrete examples of how climate adaptation is currently occurring in the region	Thank you for your comment. We have added this document in the "traceable accounts" for key message number one, as it contains several examples of how cities across the southeast are planning for and adapting to climate change. There are also many other adaptation examples highlighted throughout the chapter.
Juanita	Constible	142666	Whole Chapter	19. Southeast						There's limited exploration of the impacts across regions. Will climate change increase potential migration to the SE? Will the region need to increase agricultural productivity to make up for impacts in other regions?	We thank the reviewer for this comment, while a detailed accounting of such cross regional impacts is beyond the scope of this chapter there are two such impacts mentioned: regional infrastructure impacts can have a larger impact and coastal populations could begin moving away from the coasts.
Juanita	Constible	142667	Whole Chapter	19. Southeast						There's also limited coverage on the likelihood of increases in wildfires in the region. It is very forested and wildfires occur quite often. The increase in temperatures and drying overall many lead to severe wildfire impacts.	Wildfire projections in the SE are more complex than other regions of the country. The chapter treats the complexity of wildfire risk in the context of prescribed fire, which dominates acreage burned in the region. The Gatlinberg Fires (Chimney Tops 2) and recent fires in the Southern Appalachians are being highlighted in the Forests chapter, but have been coordinated with this region's treament of wildfire risk.
Juanita	Constible	142668	Whole Chapter	19. Southeast						Similar to wildfires, the flooding issues experienced across the SE were given limited coverage.	We feel the SE chapter covers flooding issues adequately, both in the coastal plain areas as well as inland areas. Several examples and case studies were given. After consideration of this point, we have determined that the existing coverage of flooding is adequate.
Kathy	Mills	143105	Text Region	19. Southeast		721	721	19	19	Recommend to address the tribe by their full name in the title,"Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw Tribe" as shown on the Tribe's website: http://www.isledejeancharles.com/	The full Tribal name has been added.
Social Science	Coordinating Committee	143256	Whole Chapter	19. Southeast						This chapter discusses key categories of impacts of climate change in the region. It appropriately identifies the key areas of concerns. One overall comment, however, is that the discussion and treatment of coastal cities seem a little unbalanced. Key Message 1 addresses key impacts of concerns for the urban areas in the region which include the coastal cities; Key Message 2 addresses key impacts of coastal areas, with more focus on the natural resources and environmental amenities. Somewhere in the Key Messages, it should be pointed out that coastal cities face multiple impacts (from heat, to flooding to storm surge) which can have potential significant cascading impacts to the economy and livelihoods and making coastal cities vulnerable because of the population density. Meanwhile, however, the coastal cities are also actively addressing the challenges and enhancing their adaptive capacity through active policy development, collaboration, and investments. The chapter needs to improve the discussion on impacts on coastal cities, their vulnerabilities, and resilience responses.	We added coastal cities in to KM2 to address this comment. KM2 body mentions impacts, vulnerability, and adaptation example to coastal cities. A case study is provided in Charleston, SC for example. In addition, a sentence was added to KM1 to highlight the critical impacts and opportunities for coastal cities in the Southeast. The "traceable accounts" section also emphasizes that the Southeast has multiple large coastal cities.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Social Science	Coordinating Committee	143257	Whole Page	19. Southeast		713				It's great that the report will reflect on the recent extreme events that affected the region. For this special topic, there is an opportunity to also reflect on the social vulnerability and what may have driven climate impacts, and how vulnerability and resilience outcomes may vary across community and population groups, and why. One point that should be made is how adaptive capacity varies across community and population groups, which may have determined the outcome. Taking the case of Hurricanes Harvey and Irma, with similar hazard levels, the outcomes were very different - cities in FL, for example, had learned from past experience and implemented policies (such as building code, land use planning) to enhance resilience of infrastructure and the cities, whereas in regions affected by Hurricane Harvey in Texas, land use planning did not take into consideration the future risks of extreme weather events and the area displayed significant vulnerabilities and resulting damages from the hurricane event.	Houston, Texas is not in our region so cannot be used as an example nor comparison here. However, other locations are highlighted throughout the chapter as to their sustainability or climate adaptation efforts.
Social Science	Coordinating Committee	143258	Text Region	19. Southeast		723	723	1	4	In this discussion on opportunities to respond to climate vulnerabilities, adaptation and mitigation should be given equal attention. The discussion acknowledges 'co-benefits' of GHG reductions from adaptation and planning, but it should be recognized that urbanization is also a driver of greenhouse gas emissions increases and also has opportunities to be part of the solutions, as actions in many cities exemplify.	While Mitigation and Adaptation are not given equal attention in this document - it is focused on impacts and possible adaptation actions, the text was revised by adding "mitigation" to acknowledge that aspect as well.
Social Science	Coordinating Committee	143259	Text Region	19. Southeast		714	714	6	8	As discussed in comment above, the key message should acknowledge opportunities and needs for integrated response that includes adaptation AND mitigation in the rapidly growing urban areas in the region. Urbanization is also a driver of greenhouse gas emissions increases and also has opportunities to be part of the solutions, as actions in many cities exemplify. Could consider to reword to 'Many of these urban areas are rapidly growing and offer opportunities to mitigation greenhouse gas emissions and adopt effective adaptation efforts to prevent future negative impacts of climate change.'	KM has been changed as suggested
Social Science	Coordinating Committee	143260	Text Region	19. Southeast		722	722	15	17	Could consider to reword to 'Many of these urban areas are rapidly growing and offer opportunities to mitigation greenhouse gas emissions and adopt effective adaptation efforts to prevent future negative impacts of climate change.'	The text in this section was revised to incorporate the opportunity to mitigate greenhouse gas emissions in growing urban areas. Specifically, "mitigation" was added in the first paragraph. Mitigation activities are also discussed in the infrastructure section. However, because there is not a strong focus on greenhouse gas mitigation strategies in the Southeast chapter, this text was not included in the key message itself.
Social Science	Coordinating Committee	143261	Text Region	19. Southeast		727	727	6	20	The discussion of response actions in the region should also mention Southeast Florida Climate Compact (http://www.southeastfloridaclimatecompact.org/) coordinated by multiple counties in the region to communicate about climate change impacts and develop coordinated mitigation and adaptation responses.	Thank you for the suggestion. The Southeast Florida Regional Climate Change Compact was highlighted in the previous National Climate Assessment. There are many examples of jurisdictions undertaking adpatation strategies, and the authors have chosen to highlight just a few because of space limitations. We have referenced this example in the "traceable accounts" section.
Social Science	Coordinating Committee	143262	Figure	19. Southeast	14	750				In addition to showing losses in labor hours under RCP8.5, should also show changes in larbor hours under RCP4.5 to also illustrate the benefits of mitigating climate change impacts.	thank you for the suggestion. this sentence has been added,"Under RCP 4.5, these projected losses are halved (EPA 2017)."
Social Science	Coordinating Committee	143281	Text Region	19. Southeast		713	713	1	3	Atlantic hurricane activity impacts are important enough that they should be included in multiple locations. A box should certainly be included in the Southeast chapter.	A specific write-up on Irma has been developed and added to this chapter
Social Science	Coordinating Committee	143282	Text Region	19. Southeast		722	722	2	2	Check list of federal agencies here. The Fair Housing Act is not a federal agency.	Correct, the Fair Housing Act is not a federal agency. It is separated by a comma and "and" from the list of federal agencies.
Social Science	Coordinating Committee	143283	Text Region	19. Southeast		727	727	3	5	Quantify the Charleston's response here. Case study on p. 730 notes $235 million.	The $235 million mentioned in the case study is specifically for drainage improvement projects. The text here is referencing larger efforts, including a disaster response plan. The sentence is meant as a brief example, and readers can consult the case study and references for more information such as costs.
Social Science	Coordinating Committee	143284	Text Region	19. Southeast		729	729	2	3	Specify scenario used for 30 days of high tide flooding.	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information to include and therefore have not revised this sentence. Sweet and Park, 2014 suggest 30 days /year is a tipping point for coastal inundation. The majority of Southeast cities will surpass this tipping point over the next several decades regardless of specific climate scenario (RCP).
Social Science	Coordinating Committee	143285	Whole Chapter	19. Southeast						Include commentary on the effects of human groundwater management on saltwater intrusion. For example, long term pumping from the Upper Floridian Aquifer plays a key role for saltwater intrusion along the coast of Georgia and South Carolina.	We appreciate this suggestion, but space is limited. We mention saltwater intrusion as an impact of sea level rise but did not have space to provide specific details and/or case studies. We refer those interested in a deeper treatment of salt water intrusion to the provided citations and to the NCA3 where a Florida community seawater impact to groundwater was highlighted.
Social Science	Coordinating Committee	143289	Text Region	19. Southeast		714	714	3	8	Given the vulnerability of the southeast to hurricanes and growing challenge of emergency response planning in urban areas like Houston, this should be included in Key Message 1.	Houston, Texas is not included in the Southeast region of the National Climate Assessment. Key message 1 does include the impact of flooding and extreme events on infrstructure. Key message 2 includes more information on the impacts of hurricanes on coastal areas in the Southeast, including coastal cities. Key message 3 also discusses the impacts of hurricanes. In addition, the authors have added a case study on Hurricane Irma.
Social Science	Coordinating Committee	143290	Whole Page	19. Southeast		717				Could use some further interpretation of data showing fewer hot days yet increasing warm nights, otherwise the data give the impression that warming is not a problem in the region.	to clarify the points we have added to the caption: Sixty-one percent of major Southeast cities are exhibiting some aspects of worsening heat waves, which is a higher percentage than any other region of the country (Habeeb et al. 2015).Hot days and warm nights are a combination that requires increased cooling efforts and impacts human comfort and health. There are also impacts on agriculture from lack of night time cooling.
Social Science	Coordinating Committee	143291	Whole Page	19. Southeast		721				The case study doesn't currently fit well where it is placed in the chapter. It comes after the section on historical and future climates, which focuses on temperature and precipitation, yet the case study is about resettlement in response to sea level rise. Perhaps the case study could be framed as how vulnerable communities are dealing with a changing climate.	The case study was moved to the bottom of KM2, which deals with coastal issues.
Social Science	Coordinating Committee	143292	Text Region	19. Southeast		728	728	27	27	Virginia Key is not a city, it's an island within the City of Miami where a tide gauge is located.	The text was revised to incorporate this change.
Social Science	Coordinating Committee	143293	Text Region	19. Southeast		732	732	16	18	This paragraph doesn't state the implications of the loss of flow in storm water drainage, e.g. disruprtion and damage, nor the opportunity this represents. Cities that are improving storm water infrastructure have the opportunity to redesign streets to include more green infrastructure and better pedestrian and bike facilities that contribute to quality of life and economic resilience	The text was revised to incorporate this perspective.
Social Science	Coordinating Committee	143294	Whole Chapter	19. Southeast						The information on flooding is somewhat disjointedly distributed throughout the chapter. For example p. 733 line 1-5 states that "Sea level rise is already causing an increase in high tide flood events…." although high tide flooding was already discussed on p. 727. The paragraph starting on p. 734 line 23 discusses adaptive activities for flood management, although these activities are also in response to high tide flooding, not just extreme rainfall associated flooding.	After consideration, the author team determined that the narrative flows best as written; the chapter has not been restructured in the proposed way.
Social Science	Coordinating Committee	143295	Text Region	19. Southeast		749	749	4	6	The end-result for the Cherokkee should be clearly stated, which is that the plant will disappear from their ancestral lands. The paragraph ends with a statement about "existing stressors" on the plant although it does not mention any existing stressors.	This case study is intended to illustrate that plants of cultural significance are threatened by climate change and deserve further inquiry. Existing stressors are mentioned earlier in the paragraph which include: over harvesting pressure, warming and already in southernmost range. This case study indicates that further study of ramps is needed.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Social Science	Coordinating Committee	143296	Text Region	19. Southeast		749	749	26	26	A fire case study is mentioned, yet there is no fire case study. The paragraph should also mention the health risks from inhaling wildfire smoke. https://www3.epa.gov/airnow/wildfire_may2016.pdf	The fire case study referenced is embedded in KM3. The text has been adjusted to clarify this.
Social Science	Coordinating Committee	143297	Text Region	19. Southeast		750	752	14	15	This is a nice section on social vulnerability. It would also be nice to highlight solutions particularly since this is the end of the chapter. The chapter mentions that rural culture is an important part of the history of the region, yet does not mention culture or social connections as a factor in resilience https://repository.upenn.edu/hp_theses/624/	Thank you for the suggestion. Additional information on how reducing compounding stresses can increase resilience has been added. The references include discussion of resilience factors including multiple measures of community cohesion and agency.
Andrea	Galinski	143949	Text Region	19. Southeast		714	714	2	15	It seems like there is quite a bit of overlap between Key Message 1 and 2. Does it make sense to clarify Key Message 2 further to make these two more distinct?	We have changed KM2 to be more specific about what is covered in this section and believe this addresses the possible overlap.
Andrea	Galinski	143950	Figure	19. Southeast	19.9	732				Really like the chart on page 21 that shows how the sea level rise estimate was established and compares to various other curves (Charleston, SC).	We greatly appreciate the reviewer's comment.
Andrea	Galinski	143951	Table	19. Southeast	19.1	733				Add Hurricane Harvey to table.	The point the commenter raises is beyond the scope of this chapter/report and we have not revised the text. Hurricane Harvey should be covered in the SW chapter as there were much greater impacts in that region.
Andrea	Galinski	143953	Text Region	19. Southeast		734	734	14	16	To emphasize both environmental/human causes, consider changing phrase to: "Existing flood map boundaries do not account for future flood risk due to the increasing frequency of more intense precipitation events, as well as new development that may reduce the floodplain's ability to manage stormwater. As building and rebuilding in flood-prone areas continues, the risks of the kinds of major losses seen in this event will continue to grow."	The text was revised to incorporate this perspective.
Andrea	Galinski	143954	Text Region	19. Southeast		740	740	1	2	Perhaps also summarize wetland's ecosystem service value in total as well, (e.g. Mississippi River Delta is valued at $1.3 trillion dollars), in order to give readers a sense of the magnitude of value (vs. per acre). For example, a report published by Earth Economics (2010), states that the Mississippi River Delta provides at least $12-$47 billion in benefits to people each year. If this natural capital were treated like an economic asset, its value would be $330 billion to $1.3 trillion per year. Over a 100-year period, the value of the coast's ecological services alone would be between $237 billion and $4.7 trillion. (Batker, D., Torre, I., Costanza, R., Swedeen, P., Day, J., Boumans, R., Bagstad, K. (2010). Gaining Ground. Wetlands, Hurricanes and the Economy: The Value of Restoring the Mississippi River Delta. Earth Economics. Tacoma, WA.)	This text was revised as follows: "The societal benefits provided by coastal wetlands are numerous (Costanza et al. 2014). Hence, where coastal wetlands are abundant (for example, the Mississippi River Delta), their cumulative value can be worth billions of dollars each year and trillions of dollars over a 100-year period (Batker et al. 2010).
Andrea	Galinski	143955	Text Region	19. Southeast		744	744	20	23	Update text to be "However, between 1932-2016, Louisiana has lost 2,006 square miles of land area (Couvillion et al. 2017…)". From https://www.usgs.gov/news/usgs-louisiana-s-rate-coastal-wetland-loss-continues-slow	This text was updated as follows: "However, between 1932–20106, Louisiana lost 2,006 square miles of land area (Couvillion et al. 2017), due in part to high rates of relative sea level rise (Blum and Roberts 2009; Day et al. 2007; Jankowski et al. 2017; Twilley et al. 2016). The rate of wetland loss during this period would equate to Louisiana losing an area the size of one football field every 34-100 minutes (Couvillion et al. 2017)."
Andrea	Galinski	143956	Text Region	19. Southeast		744	744	27	27	Add "iteratively" to text "…(CPRA) has worked with local, state, and federal partners to iteratively develop a 2017 Coastal Master Plan that identifies investments that can provide direct…"	The text has been adjusted to reflect this comment.
Andrea	Galinski	143958	Text Region	19. Southeast		754	754	3	6	Add "New Orleans 2015" to the list of plans to deal with climate change (plan name: Resilient New Orleans). Also, it could be more valuable/powerful to provide a summary statistic of the number of cities, counties, and states that have climate adaptation plans vs. only giving a few examples. The Adaptation Clearinghouse by the Georgetown Climate Center might be a useful resource for this data. (http://www.adaptationclearinghouse.org/).	Thank you for this comment - we have added New Orleans to the traceable accounts list in section 1 as requested where this contains a number of examples of how cities are adapting. Providing a comprehensive list is beyond the scope of this chapter.
Michael	MacCracken	144476	Text Region	19. Southeast		714	714	35	36	Just a note that it is not just the temperature that goes up, but also the absolute humidity, so the discomfort index goes up more than the temperature. This also has significant effects on electricity demands for air conditioning as it takes something like 20 times as much energy to cool moist air a degree as to cool dry air.	In response to the suggestion, we have modified the statement to include "and often humid" in the sentence - so it now reads: … to dangeorous high and often humid temperatures
Michael	MacCracken	144477	Text Region	19. Southeast		718	718	29	34	Was the groundcover different in the 1920s and 30s, perhaps less forest cover? In that it was generally drier, it would be interesting to know what was happening to the wet bulb temperature and so then to the discomfort index--if fact, it would be fascinating to have a similar diagram of the changes in wet bulb temperatures over the various decades.	This is a hot region and this was a period of drought. The drought is clearly stated in the section describing the historical temperatures. We have been unable to find any such wet-bulb data
Michael	MacCracken	144478	Text Region	19. Southeast		719	719	1	3	So, pretty clearly, when there is little moisture providing evaporative cooling, the temperature ends up being higher. Again, it would be really interesting to have a time history of wet-bulb temperatures at some common time of day, to see how that has been changing.	We have been unable to locate any such wet-bulb data and such details are beyond the scope of this chapter.
Michael	MacCracken	144479	Text Region	19. Southeast		728	728	12	12	Capitalize "Earth" when referring to the planet (and save "earth" when talking about dirt and soils). While some style guides disagree, it makes no sense in a text talking about our planet and geophysics, etc. The Moon, being a specific celestial body also deserves capitalization (even if not called by its supposed proper name--Luna).	We agree and have capitalized "earth". Moon does not need to be capitalized. (except at the beginning of a sentence)
Michael	MacCracken	144480	Text Region	19. Southeast		728	728	22	36	Just as for the bell-shaped distribution of historic temperature anomalies, when it is moved to the right (so warmer conditions) and there is a disproportionate shift in the incidence of conditions above, say, the original two-sigma marker, the same disproportionate increase will occur for the likelihood of inundations as the distribution of daily sea level rise is shifted upward by global sea level rise. So, that the rate of increase is seeming quite large is really just what should be expected (e.g., the occurrence of very warm summer conditions that Hansen et al. reported on, so conditions that for 1951-80 occurred 0.1% of the time are now reported to be occurring over 10% of the time--a factor of 100 increase in incidence for only about a 0.5 C increase in average temperature). So, the situation is going to get worse quickly.	We agree and greatly appreciate the reviewer's observation and comment.
Michael	MacCracken	144481	Text Region	19. Southeast		728	728	37	37	I'd suggest making clear that these increase are what is projected. Also, a reference period needs to be given--if against preindustrial, then it should be said that sea level has already risen by about 8 inches or so (so ~0.7 ft).	After consideration of this point, we have determined that the existing text is clear and accurate. The beginning of this section discusses past sea level change and references a reference period. This paragraph is discussing future global sea level as of this NCA.
Michael	MacCracken	144482	Text Region	19. Southeast		729	729	2	3	Need to change "will experience" to "are projected to experience"	After consideration of this point, we have determined that the existing text is clear and accurate. This statement matches the KM2 text. Regardless of the climate scenario, the tipping point (30 times a year) will happen by 2050. A couple southeastern cities have already surpased the tipping point.
Michael	MacCracken	144483	Text Region	19. Southeast		729	729	6	6	Not clear what "This" is referring to.	We agree that defining "this" would be helpful, and have made the addition.
Michael	MacCracken	144484	Text Region	19. Southeast		735	735	18	19	In making these calculations, it would be helpful to indicate what baseline period was used to determine the standard deviation to use in the calculation. So, what was the baseline period?	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter. Return periods are calculated based on the period of record for each gauge site, in this case rainfall gauges. The return period is extrapolated based on a best fit curve through the observations. The number of observations and years vary for each gauge. The return period is specific for each gauge location and should not be compared with each other.
Michael	MacCracken	144485	Text Region	19. Southeast		736	736	23	23	Correct spelling to "patterns"	The text has been adjusted accordingly.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144486	Text Region	19. Southeast		727	727	26	32	While the start of the message makes clear that the key message applies for both coastal and low-lying areas, that the coastal zone and rivers crossing the coastal plain are very flat I think needs more emphasis, for this allows the coastal impacts to be carried well inland, affecting a much larger area.	We agree and have added coastal "plain" and "inland" to the first part of the KM
Michael	MacCracken	144487	Text Region	19. Southeast		746	746	12	12	Needs to be "climate change" or "changes in climate"	Text was adjusted and now reads "climate change."
Michael	MacCracken	144488	Text Region	19. Southeast		746	746	13	13	The use of the word "may" is not good practice in assessments as it can mean virtually anything. It needs to be replaced by a word or phrase consistent with the likelihood lexicon. The chapter should be searched for such occurrences and have the words "may" and "could" generally removed (p 752, line 9; etc.)	Thank you for the suggestion. The text has been revised.
Michael	MacCracken	144489	Whole Chapter	19. Southeast						Overall, a very well done and informative chapter.	Thank you for your encouragement and positive feedback.
Julie	Maldonado	144750	Text Region	19. Southeast		721	721	28	29	Maldonado et al. forthcoming could be changed to Maldonado et al. 2018.	Confirmed publication date of March 2018
Julie	Maldonado	144752	Text Region	19. Southeast		721	721	34	34	At the end of the sentence, relationship with the tribe, could add -- and other scientists, researchers, and planners.	The text was changed according to this suggestion.
Kristin	Strydhorst	144754	Text Region	19. Southeast		721	721	38	39	The Isle de Jean Charles Tribe's relocation process is on-going; it is yet to be seen if it is a successful relocation. While the idea of this sentence speaks truth, and it's broader than this case, it would be inaccurate to give the perception that the Tribe's relocation is complete and a success; this is yet to be seen.	The resettlement plan is expected to be implemented by 2022. There is no statement that relocation has been completed.
Rebecca	Laurent	144757	Text Region	19. Southeast		721	721	28	28	Could add livelihoods to this sentence.	The text was adjusted according to this comment and "livelihoods" was added.
Julie	Maldonado	144758	Text Region	19. Southeast		721	721	29	29	In this sentence, suggest after the words after nearly 20 years and two previous efforts, adding the words by the Tribe. That way it doesn't sound like it was HUD making these previous efforts.	ADDED: "Tribal persistence"
David	Wojick	141712	Text Region	20. US Caribbean		795	795	6	12	Here is the present text: 6 Key Message 1: Freshwater is critical to life throughout the Caribbean. Increasing global 7 carbon emissions could lead to a steep reduction in rainfall by the end of the century, 8 constraining freshwater availability. Reservoirs could experience a permanent supply deficit 9 by 2025. Saltwater intrusion associated with sea level rise will reduce the quantity and 10 quality of freshwater in coastal aquifers. Increasing variability in rainfall events and 11 increasing temperatures will likely exacerbate existing problems in water management, 12 planning, and infrastructure capacity. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	The message does not state speculative projections of impacts as established physical facts. Projections by definition are predictions based on scientifically accepted models. The comment states that the computer models are "questionable". All models produce results with inherent uncertainty, nevertheless, the models have been rigorously evaluated as part of the peer review process. The comment states "That climate change will have negative impacts has yet to be determined and appears increasingly unlikely." This comment is not consistent with conensus of the scientific community.
David	Wojick	141714	Text Region	20. US Caribbean		798	798	23	30	The present text says this: 23 Key Message 2: Marine ecological systems provide key ecosystem services such as commercial 24 and recreational fisheries and coastal protection. These systems are threatened by changes 25 in ocean surface temperature and acidity, sea level rise, and changes in the frequency and 26 intensity of storm events. Degradation of coral and other marine habitats will result in 27 changes in the distribution of mobile species that use these habitats, including those targeted 28 in fisheries, and loss of cover of live corals, sponges, and other key species. These changes 29 will disrupt valuable ecosystem services, producing subsequent effects on Caribbean island 30 economies. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	The message does not state speculative projections of impacts as established physical facts. Projections by definition are predictions based on scientifically accepted models. The comment states that the computer models are "questionable". All models produce results with inherent uncertainty, nevertheless, the models have been rigorously evaluated as part of the peer review process. The comment states "That climate change will have negative impacts has yet to be determined and appears increasingly unlikely." This comment is not consistent with conensus of the scientific community.
David	Wojick	141715	Text Region	20. US Caribbean		802	802	15	23	Here is the present text: 15 Key Message 3: Island economies, critical infrastructure, property, cultural heritage, and 16 natural ecological systems are all threatened by sea level rise, coastal erosion, and extreme 17 weather. Stronger wave action and higher storm surges will worsen coastal flooding and 18 increase coastal erosion, leading to diminished beach area, loss of coastal protection, 19 decreased tourism revenue, impairment of public services, and negative effects on 20 communitiesâ€™ livelihoods and well-being. The U.S. Caribbean could experience a near 3-foot 21 rise in sea level by 2050 and about 10 feet by 2100. Puerto Rico and the U.S. Virgin Islands 22 could lose up to 3.6% and 4.6% of total coastal land area respectively under a 6.5 feet sea 23 level rise scenario. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	The message does not state speculative projections of impacts as established physical facts. Projections by definition are predictions based on scientifically accepted models. The comment states that the computer models are "questionable". All models produce results with inherent uncertainty, nevertheless, the models have been rigorously evaluated as part of the peer review process. The comment states "That climate change will have negative impacts has yet to be determined and appears increasingly unlikely." This comment is not consistent with conensus of the scientific community.
David	Wojick	141716	Text Region	20. US Caribbean		805	805	23	29	The present text is: 23 Key Message 4: Social well-being, terrestrial ecosystems, agricultural services and socio 24ecological and technological systems are threatened by rising temperatures. Increased 25 temperatures are likely to lead to decreases in agricultural productivity, changes in habitat 26 functionality and wildlife distributions, and increased risk to human health in vulnerable 27 populations. As maximum and minimum temperatures increase, there are likely to be fewer 28 cool nights and more frequent hot days that will affect the quality of life in the U.S. 29 Caribbean. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	The message does not state speculative projections of impacts as established physical facts. Projections by definition are predictions based on scientifically accepted models. The comment states that the computer models are "questionable". All models produce results with inherent uncertainty, nevertheless, the models have been rigorously evaluated as part of the peer review process. The comment states "That climate change will have negative impacts has yet to be determined and appears increasingly unlikely." This comment is not consistent with conensus of the scientific community.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
David	Wojick	141717	Text Region	20. US Caribbean		808	808	23	29	The present text says this: 24 Key Message 5: Increasing frequency of extreme events threatens life, property, and economy in 25 the Caribbean. The frequency and intensity of extreme events such as hurricanes, tropical 26 storms, flooding, heat waves, and droughts are expected to increase, affecting human health 27 and well-being, economic development, conservation, and agriculture. Resiliency will 28 depend on collaboration and integrated planning, preparation, and responses across the 29 region. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. The fact that the CMIP5 models run hot is well known. See just as an example "Lukewarming: The New Climate Science that Changes Everything," Patrick J. Michaels and Paul C. Knappenberger, Cato Institute, 2016. https://store.cato.org/book/lukewarming The USGCRP was informed of these deficiencies after NCA3. Apparently they have now chosen to ignore this information. See for example https://www.cato.org/publications/the-missing-science-from-the-draft-national-assessment, April 2013.	The message does not state speculative projections of impacts as established physical facts. Projections by definition are predictions based on scientifically accepted models. The comment states that the computer models are "questionable". All models produce results with inherent uncertainty, nevertheless, the models have been rigorously evaluated as part of the peer review process. The comment states "That climate change will have negative impacts has yet to be determined and appears increasingly unlikely." This comment is not consistent with conensus of the scientific community.
Jun	Zhang	141914	Text Region	20. US Caribbean		805	805	2	7	Re: Chpt. 20 p.805 lines 2-7 (From sentence beginning with "When considering"): Please note that this statement appears to stand as the only reference to Indigenous and traditional communities for this region and that these populations may be underrepresented for this assessment, given that they have not yet been included in previous assessments to-date. Given the emphasis for inclusion of local, traditional and Indigenous forms of knowledge in the most recent IPCC working group [1] and recognition of the need for further inclusion of Indigenous peoples for NCA4 [2], chapter authors for this regional chapter could benefit from including additional data regarding unique impacts, considerations, and sources of knowledge for these communities. Are there any current or past case studies for this region addressing these concerns that the authors could consider including? Authors may also want to consider shifting to Key Message 6: Adaptive Capacity and Building Resilience, especially in regard to "Shared knowledge, collaborative research and monitoring". References: [1] Field CB, Barros VR, Dokken DJ et al. (2014) Technical summary. In: Climate change 2014: impacts, adaptation, and vulnerability. Part A: global and sectoral aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change Field, CB, et al (Eds), Cambridge, United Kingdom and New York, NY: Cambridge University Press, pp. 35-94 [2] Maldonado J, Bull Bennett TM, Chief K, Cochran P, Cozzetto K, Gough B, Hiza Redsteer M, Lynn K, Maynard N, Voggesser G (2015) Engagement with indigenous peoples and honoring traditional knowledge systems. Clim Chang. doi: 10.1007/s10584-015-1535-7	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include.
Christen	Armstrong	141938	Figure	20. US Caribbean		793				for the figure, it would be good to indicate where these measurements are being taken exactly	I added the information requested. I rewrote caption to go with suggested revisions.
Christen	Armstrong	141939	Text Region	20. US Caribbean		793	793	8	23	a description of OA already exists in Chapter 9, p 334. doesn't make sense to repeat it again here.	Agreed. The paragraph was deleted from this section since a description of OA is in Chapter 9, p 334 and to go with suggested revisions.
Juanita	Constible	142669	Text Region	20. US Caribbean		785	785	2	6	Resiliency doesn't just reduce the need for disaster relief, but also improves the speed with which a place can rebound from a disaster. Places like Puerto Rico, with very poor resiliency will be impacted for much longer, with significant impacts to the economy.	The text has been revised to incorporate this comment.
Juanita	Constible	142670	Whole Page	20. US Caribbean		812				It is unclear if this is considering the impacts of the outmigration from U.S. Caribbean islands to the mainland.	Thank you for your comment, the box has been removed as more recent information regarding economic losses has been incorporated throughout the chapter.
Juanita	Constible	142671	Text Region	20. US Caribbean		822	822	25	30	Key message 4 in page 822 is missing some text.	The text has been revised to incorporate this comment. The missing text was added.
Anne	Marsh	143399	Text Region	20. US Caribbean		809	809	4	5	Please provide an update, to the extent possible.	Thank you for this important comment. We have developed an extensive cal-out box on the 2017 Hurricane season to address this.
Aranzazu	Lascurain	143922	Text Region	20. US Caribbean		805	805	2	7	Please add a citation to sentences referring to traditional knowledge being an important source of information for climate resilience that should be respected and incorporated. Please seek out additional references which exist in the peer-reviewed literature (additionally through Smithsonian, Museum of the American Indian) A statement should also be included regarding rural communities as integral to the Caribbean cultural heritage and to the vibrant agricultural and forest products industries across the islands.	Thank you for you comment. The text has been revised and has been added the citation to traditional knowledge. David-Chavez, D.M.(2018). Indigenous agricultural knowledge, climate resilience and food security in the Caribbean. (unpublished draft in-prep for https://globalchange.ncsu.edu/research-spotlight/)
Michael	MacCracken	144490	Text Region	20. US Caribbean		784	784	4	4	In that global rainfall will be increasing, I'd recommend changing "in rainfall" to "in rainfall in this region" or "in this region's rainfall" in order to make clear this comment is about this region. In that the report also talks about hurricane rainfall going up, might it be helpful to the reader to say "non-hurricane rainfall"?	Thank you for your comment. The chapter text has been revised to incorporate your suggestion. "in rainfall" is replaced with "in rainfall in this region". We also made the distiction between the projected declines in rainfall in the region and increases in the extreme rainfall events: "while extreme rainfall events are expected to increase in intensity (such as rainfall associated within hurricanes), which can increase freshwater flooding impacts."
Michael	MacCracken	144491	Text Region	20. US Caribbean		784	784	12	12	I'd suggest changing "acidity" to "acidification" as the pH will still be above 7	Changed to "acidification" as suggested.
Michael	MacCracken	144492	Text Region	20. US Caribbean		784	784	13	15	"mobile species" seems like too much jargon--if it is only or mainly fish, then perhaps just say fish and then in the text better clarify what the term means there as the sentence does not now read very clearly. And I don't think "loss of cover" is a very clear term either--with coral listed as a key marine habitat at the start of the sentence, how can it lose cover?	We removed the word mobile and left it as species only as it would not be fish only. Also reworded the live cover part to read "loss of live coral cover" although original text was also correct way to refer to this.
Michael	MacCracken	144493	Text Region	20. US Caribbean		784	784	22	22	Regarding "decreased tourism revenue"--I'd think it would be hard to get at the revenue aspect given there are many considerations. How about saying "decreased tourism appeal" or something to indicate what the cause of the change is that is the main driver.	Thank you for your comment. The Key Message text has been revised to incorporate your suggestion, "decreased tourism appeal".

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144494	Text Region	20. US Caribbean		784	784	23	24	It seems to me that putting in the worst sea level rise scenario here will make it seem very alarmist. Yes, this "could" happen--basically anything "could" happen. Using the words "could" and "may" are really poor practice in assessments because they give no sense of likelihood. The sentence needs to be redone using the lexicon for likelihood. What also bothers me here is the focus on dates as if they really matter--what really perhaps matters is the commitment to future increase in sea level and not so much the exact decade it occurs, so the type of sentence that I would suggest is something like: "Unless the rise in the CO2 concentration is soon stopped, sea level rise over the 21st and 22nd centuries is likely to rise by of order 5 to 10 feet or more, causing significant inundation of many Caribbean Islands. For example, Puerto Rico …" I just think tying the indicated amounts of rise to the specific dates will be criticized as alarmist, whereas it seems to me much harder to challenge the revision. We have more confidence in is how much rise could occur than in exactly when the rise will occur, so alter the sentence so one can use the "likely" from the lexicon and just be looser on the dates. Indeed, does it really matter if my son or my grandson or his son will experience the rise (and note I am using "will" here as a rise of meters is virtually inevitable given the situation that we are in).	Thank you for your comment. The Key Message text has been restructured and no longer contains this scenario information.
Michael	MacCracken	144495	Text Region	20. US Caribbean		784	784	27	33	With less precipitation, will this mean a lower humidity and what might that mean? If the boundary layer stays humid, then the absolute humidity is also rising, thus raising the discomfort index even more than the temperature. Given that Key Message 5 focuses on extremes, I wonder if it would help in Key Message 4 to mention that this point is about the average change--as my first reaction was to wonder in this message where mention of extremes was. Indeed, maybe put Key Message 5 as number 4 and then have this message as number 5 and say something like "Even in the absence of extreme storms, just the increase in the average temperature will adversely impact social well-being, …"	Thank you for your comment. We reworded to reflect that this key message is about rising mean temperatures beyond historical ranges, and the risks include decreasing services from those systems adapted to historical ranges. Added a connection to hydrological cycles.
Michael	MacCracken	144496	Text Region	20. US Caribbean		784	784	37	38	I'd urge starting the sentence by saying "Increasing resiliency…" --is total resiliency really possible?	Thank you for your comment. The Key message has been updated to incorporate your suggestion. "Resiliency" has been replaced with " increased resilience".
Michael	MacCracken	144497	Text Region	20. US Caribbean		785	785	3	3	I'd suggest somehow revising the phrase "reduce the need for disaster relief" when it is pretty clear that the levels now being provided have been so inadequate, especially as the likelihood of very severe storms is increasing.--so severe that the storms will just tear apart the natural vegetation even if the buildings were made much stronger. I'd suggest it might be better to say: "have the potential to reduce the loss of life and speed recovery"--but I'd note that having more knowledge, doing research and monitoring and having better institutional adaptive capacity really does not say anything about helping have stronger homes and buildings and only potentially imply that the electric, water, and transportation systems will be more resistant. It seems to me that a terrible situation as has existed the past 6 months could be made somewhat less bad, but I don't see how one can say that this would reduce the need for normal disaster relief, so I'd urge caution in the statement here. If Maria were to return, what would be needed is more aid that has yet been provided, even were island systems made more resilient. If one looks at Texas, which presumably was somewhat more resilient, the aid provided and time needed for recovery are very high and are overwhelming the present legal limits of responding--so I'd urge avoiding a statement suggesting that these actions would reduce the need for aid. Our whole country needs to know that lots more than present commitments are going to be needed to deal with the impacts of climate change induced extremes.	Thank you for the comment, the text has been revised to incorporate your suggestion. The statements now reads: "Shared knowledge, collaborative research and monitoring, and building institutional adaptive capacity could help support and speed up disaster recovery, reduce the loss of life, enhance food security, and improve economic opportunity in the U.S. Caribbean. International cooperation and strengthening partnerships in the Caribbean has the potential to strengthen the region's collective ability to achieve effective actions that build climate change resilience, reduce vulnerability to extreme events and assist in recovery efforts."
Michael	MacCracken	144498	Text Region	20. US Caribbean		785	785	4	6	I would suggest changing "reduces vulnerability and can reduce risks" to something like "has the potential to strengthen the region's collective ability to prepare for extreme storms and assist in recovery efforts." I don't understand how this otherwise reduces vulnerability or reduces risks associated with climate change uncertainty--yes, this might help spread knowledge about how to better prepare, but that is not really action. The helpful actions, it seems to me, would involve preparation and recovery.	Thank you for the comment, the text has been revised to incorporate this suggestion.
Michael	MacCracken	144499	Text Region	20. US Caribbean		785	785	11	11	It might be fine to say that 'climate scenarios project that future conditions will be increasingly variable' but we have these scenarios now, so they are not future scenarios, but scenarios of the future.	Thank you for your comment. The chapter text has been revised to remove confusion regarding the use of "future climate scenarios".
Michael	MacCracken	144500	Text Region	20. US Caribbean		785	785	12	13	Are not the US Caribbean islands relatively more mountainous than the average island in the Caribbean--and even more mountainous than the average coastal county in the US? A key problem for the islands of the region is that they will tend to feel the full force of the storms in that they are relatively small so that the hurricanes can continue to draw energy from the open ocean waters. I do agree that a greater fraction of the region's economy and so population is right on the coasts as that is a key appeal of the islands.	We eliminated "low-lying" as the statement is true regardless of topography
Michael	MacCracken	144501	Text Region	20. US Caribbean		785	785	16	18	I'd even say that a good part of the islands' appeal is that they have reduced resilience, being simpler places that have not had to build to withstand winter conditions, etc. and so are quite open to Nature's influences (this is also a problem for locations in Florida and around the coast of the Gulf of Mexico. That is part of the region's charm.	We concur on the charm of the places mentioned. It's relationship to resilience and adaptive capacity is complex and difficult to take up in a concrete manner with the amount of space available. All environments have their challenges and we would not characterize the tropics as "more simple" than temperate places.
Michael	MacCracken	144502	Text Region	20. US Caribbean		785	785	22	22	Indeed, in that the economy of the region is not based on building things (non-breakable windows, emergency response vehicles, electric transformers, etc.--indeed, their location far from where such resources are widely available), but appeal of its weather to fickle interests of tourists, the region is particularly vulnerable	The premise of the comment is that tourism dominates the economy at the expense of adaptive capacity. Addressing this issue in full would require more discussion than space permits.
Michael	MacCracken	144503	Text Region	20. US Caribbean		785	785	27	27	Not only is present infrastructure vulnerable, but it is pretty hard to envision how any cost efficient infrastructure could be made fully resistant to the very extreme storms the region is and will experience.	Thank you for your comment. However, this comment does not seem to raise any question or suggest any revision.
Michael	MacCracken	144504	Text Region	20. US Caribbean		785	785	29	29	Here and elsewhere, the word "may" needs to be replaced by a term from the lexicon--to here, perhaps "is likely to". Similarly on line 31	Thank you for your comment. The chapter text has been revised to incorporate your suggestion. Those mentions of "may" are replaced with "is likely to" or "is projected to".
Michael	MacCracken	144505	Figure	20. US Caribbean	5	787				I think having 3-figure precision on the rise projected for 2100 is way overdone--I'd urge some rounding, transforming the challenges to be adapting to 1-2 feet, adapting to 3-5 feet, and adapting to 6-12 feet--and then perhaps, looking two centuries ahead. And then associate a likely time range for each level, so 1-2 feet might be 2035 to 2080, 3-5 feet might be 2080 to 2160, etc. So, provide a band of rise and then a range of times, and evaluate the potential impacts and adaptive capacity for those kinds of changes. Having such single lines and precise numbers I think is neither justified nor really all that helpful.	PR-USVI sea level rise projections similar, yet, different. For planning purposes rounding to the nearest 0.5 ft increment is desirable. Change will be produced.
Michael	MacCracken	144506	Text Region	20. US Caribbean		787	787	5	6	The caption says there are four cases, yet the figure only shows three.	Thank you for your comment. The caption has been revised and changed to three.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144507	Figure	20. US Caribbean	10	788				Is there not also a Smithsonian or other lab in Panama considering the regional impacts? And I would think that there are institutions in Cuba working on the issue. At an event I participated in that was in the Dominican Republic ten years ago, they had Cuban representatives back then working on the issue. I think it would be good to see if such organizations could be mentioned in this report. Also, of course, there are ones in the Dominican Republic and likely Haiti. If you want a contact for getting names of these, I'd suggest starting by contacting Natasha Despotovic of the Global Foundation for Democracy and Development, an entity established by the Dominican Republic that cooperates with other nations. Natasha is mostly based in the US with offices in NYC and DC (see http://www.globalfoundationdd.org/staff.asp)	Thank you for your comment. The figure has been updated to include organizations whose mission explicitly includes climate research and/or climate risk management in Cuba, Dominican Republic and Haiti. Caption has been modified to indicate that not all organizations are represented (Some of the organizations…vs Organizations…)
Michael	MacCracken	144508	Text Region	20. US Caribbean		789	789	9	9	Do these factors not just pose risks? Are they not already having an effect?	Yes, these factors are already having an effect but the risks will continue to grow. We have changed the sentence to reflect the ongoing changes: "Changing climate and weather patterns, interacting with human activities are affecting land-use, air quality and resource management, posinge growing risks to food security, the economy, culture, and ecosystems services."
Michael	MacCracken	144509	Text Region	20. US Caribbean		789	789	20	20	Saying "regularly occurring" sounds a bit as if they are on a schedule. How about saying something like "not infrequent"--even though it is a double negative.	Thank you for your comment. The chapter text has been revised to incoporate your suggestion.
Michael	MacCracken	144510	Text Region	20. US Caribbean		789	789	22	22	I'd suggest changing "under future climate scenarios" to "as climate change continues" or something like that. Again, scenarios are about the future, so no need for "future"--and what matters is what actually happens, not what happens in the scenarios. The sentence already indicates that what is mentioned is a projection.	Thank you for your comment. The chapter text has been revised to eliminate confusion related to "future climate scenarios".
Michael	MacCracken	144511	Text Region	20. US Caribbean		789	789	23	23	I'd suggest changing "patterns" to "conditions" as the events cause the problems, not the patterns, which strictly speaking is our human construct for describing the statistics of what is occurring. And I don't understand what "geographic space" is--fine to say that since they have been so predominant for so long, there is little experience to build on to assess the capability of the region to adjust to altered conditions.	Thank you for the comment. We have revised the text as suggested to change the language from "patterns" to conditions. We have also changed the language referring to "geographic space" to clarify that we are referring to the fact that these are small islands isolated from the mainland.
Michael	MacCracken	144512	Text Region	20. US Caribbean		790	790	1	1	Need to replace "may" by choice from the lexicon	We have replaced "may" with "are likely to be" based on uncertainty guidance.
Michael	MacCracken	144513	Text Region	20. US Caribbean		790	790	8	9	I'm curious, what is the percentage for Puerto Rico and is it really high compared to the whole area of the island--or maybe, the question is what does "low-lying" mean? I would think an island like Grand Cayman or Cozumel or atoll islands would be considered low-lying rather than Puerto Rico. Now, for reasons of tourism and access to ocean resources, most of its activities and population are along the coast, so the conclusion of the sentence seems clearly justified--just the start seems a bit questionable.	Thank you for the suggestion. We have removed "low-lying" because the word is not clearly defined and creates confusion.
Michael	MacCracken	144514	Text Region	20. US Caribbean		790	790	18	18	It seems to me that it might be useful to have the start of the sentence say: "To support their main industry of tourism, the U.S. Caribbean islands have become heavily dependent on…" Were it not for all the tourism, I'd imagine the dependence would be significantly reduced.	While large proportions of economic activity in the US Caribbean is derived from tourism, the premise of the comment is that this alone drives the reliance on food imports. This is not likely the case. Even in the case of the USVI, tourism only accounts for roughly 25% of GDP, so it cannot be the main cause of food imports. In the case of PR the contribution of tourism is less than 10 % of GDP.
Michael	MacCracken	144515	Text Region	20. US Caribbean		790	790	37	38	Is this mainly because land temperatures generally increase faster than the global average, which is dominated by the oceans, or is there a reason that the land temperatures here would increase at a rate larger than is typical for land temperatures generally, such as the land temperature increases over the US, which are also larger than the global average?	We have deleted this sentence since the balance of evidence indicates that projected temperature increases in the US Caribbean are in fact similar to (or even lower) than that projected for all land surfaces.
Michael	MacCracken	144516	Text Region	20. US Caribbean		791	791	4	4	I'd suggest inserting a sentence or two here indicating that the absolute humidity will also be going up (I presume) and this will make the discomfort index go up more than the temperature. This aspect of climate change really deserves more attention.	Due to the large scope of the topic, and the page limit for the chapter, we focused on temperature and precipitation projections rather than delving into a level of specificity of other variables. In addition, as of now, claims related to future discomfort levels are still more speculative in nature, without strong backing in the literature.
Michael	MacCracken	144517	Text Region	20. US Caribbean		791	791	12	21	I think it might be useful to say that average rainfall goes down, but hurricane rainfall amounts can go up. The sentence on lines 19-21 sort of says this, but being a bit clearer about hurricanes I think would help as when they are talked about, greater rainfall is often mentioned, creating a seeming conflict about increases and decreases.	The paragraph was adjusted so that now last sentence now reads: These same models indicate that even with this drying, the region is likely to experience more frequent extreme rainfall events, such as those with more than 3 inches of rain in a day as well as more intense rainfall associated with tropical cyclones (Hayhoe 2013, Kossin et al. 2017).
Michael	MacCracken	144518	Text Region	20. US Caribbean		792	792	9	9	Correct spelling of "Source"	The spelling has been corrected.
Michael	MacCracken	144519	Text Region	20. US Caribbean		793	793	5	5	Saying "more acidic" makes it seem as if the present waters are acidic, which is not the case. It might help to clarify.	The paragraph was deleted from this section since a description of OA is in Chapter 9, p 334 and to go with suggested revisions.
Michael	MacCracken	144520	Text Region	20. US Caribbean		793	793	18	18	"predicted" should be "projected"	The text has been adjusted to address this comment.
Michael	MacCracken	144521	Text Region	20. US Caribbean		794	794	4	4	"downstream"--what does this mean?	Thank you for your comment. The chapter text has been revised and no longer includes this term.
Michael	MacCracken	144522	Text Region	20. US Caribbean		795	795	7	8	Be good to replace "could" by words from the likelihood lexicon--"could" really does not provide a useful indication of likelihood. And also replace "may" on lines 17, 18 and then on later in the chapter.	Using the likelihood lexicon recommended by the U.S. National Assessment (NAST), we have replaced "could" with "will likely" and clarified that this result is only for a subset of climate models. Per the NAST, the term likely is indicative of approximately 75% probability. The word "may" is a synonum of "possibly", which, per the NAST likelihood lexicon, suggest approximately 50% probability.
Michael	MacCracken	144523	Text Region	20. US Caribbean		799	799	13	25	There is no real definition here of what "mobile species" means--so does it really need to be stated in the Key Message?	We removed the word mobile and left it as species only.
Michael	MacCracken	144524	Text Region	20. US Caribbean		803	803	14	16	I don't understand the reasons for the differences in numbers here, especially for cruise ship passengers--the two set of numbers look to be in conflict.	Thank you for your comment. We have revised the text to make this statistic clearer. These numbers reflect that 2.1 million people arrive to the US Virgin Islands each year as cruise ship passengers and 570,000 tourists arrive each year by other means.
Michael	MacCracken	144525	Text Region	20. US Caribbean		803	803	24	25	I'd suggest a rewording to something like: "As an example, were sea level rise to reach 6.5 feet (2 meters), which is considered a reasonable possibility during the 22nd century, Puerto Rico and the U.S. Virgin Islands are projected to lose…"	Thank you for your comment. We have revised the text to incorporate your suggestion with some edits: "As an example, were sea level to rise 6.5 feet (2 meters), which could occur during this century under an extreme global emissions scenario, Puerto Rico and the U.S. Virgin Islands are projected to lose 3.6% and 4.6% of total coastal land area, respectively."
Michael	MacCracken	144526	Text Region	20. US Caribbean		803	803	26	27	Then, to get rid of "could" in this sentence, assuming the change to the preceding sentence, say something like: "Were such a rise to take place, relocation of much of Puerto Rico's critical coastal infrastructure , including Ã‰ stations, would be required."	The text has been revised to incorporate this suggestion with some edits: "Were such a rise to take place, this would negatively impact Puerto Rico's critical infrastructure near the coast, including drinking water pipelines and pump stations, sanitary pipelines and pump stations, one wastewater treatment plant, as well as six power plants and associated substations."
Michael	MacCracken	144527	Text Region	20. US Caribbean		803	803	30	30	Should it not be "Operations of Puerto Rican ports" instead of "Ports operations"?	The text has been revised to incorporate this suggestion with some edits: "Operations of Puerto Rico's ports".
Michael	MacCracken	144528	Text Region	20. US Caribbean		809	809	4	5	I assume the chapter will be updated given the occurrence of Maria, etc.	Thank you for this comment. We have developed an extensive cal-out box on the 2017 Hurricane season to address this.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144529	Text Region	20. US Caribbean		809	809	23	25	It would help to give an indication of how long it takes for the area to get into drought--is this something that happens in a few months or a year or more or what? And it would help to know if a hurricane alleviates a drought, or does it take ongoing periods of rain--that is, does the drought occur due to a shortage of groundwater that has to be recharged or due to a persistent loss of soil moisture?	Drought is an ambiguous phenomenon and the onset and end of a drought is hard to define in time and space (Larsen 2000). In the case of the meteorological droughts from 2000 to 2015, abnormally dry conditions before declaring a drought ranged from 3 weeks to 31 weeks as reported by the US Drought Monitor. In the US Caribbean, a period of heavy rainfalls can alleviate a drought by refilling reservoir levels diminished during the period of rainfall deficits and replenish the soils. This was the case for the 2014-2016 drought. There are different variables taken into consideration to declare a drought – while shortage of groundwater and soil moisture are two of the variables considered, our text mostly refers to meteorological drought. We have added the following sentence: While the onset and end of a drought is hard to determine, records of the US Drought Monitor suggest that it takes only weeks of abnormally dry conditions before the declaration of a meteorological drought in Puerto Rico.
Michael	MacCracken	144530	Text Region	20. US Caribbean		810	810	8	8	Change predict to project.	We changed "predict" to "project".
Michael	MacCracken	144531	Text Region	20. US Caribbean		812	812	2	4	I think it might be useful to also indicate that the region is largely coral based, or very dependent on it, and so overall especially vulnerable to ocean acidification--although a bit later than the high-latitude regions, but they are not so much based on coral, etc. So, a special vulnerability.	Thank you for your comment. we addressed with the following addition: Coral reefs play an important role in natural and social systems throughout the Caribbean and are particularly sensitive to ocean warming and acidification.
Kristin	Strydhorst	144763	Text Region	20. US Caribbean		805	805	2	7	This comment is an intended to recognize the indigenous peoples of the Caribbean that are still present in traditions, language, knowledge, and practices among many representation of Traditional Ecological Knowledge (TEK). TaÃ-nos were the first civilization encountered by European explorers upon their arrival in the Americas (Keegan & Maclachlan, 1989) and the last Amerindian manifestation in the Caribbean that goes back 300B.C. (RodrÃ-guez-Ramos, 2008). Indigenous families have residing in the same exact location or area for centuries being enriched with knowledge about places that is transferred from generations through are found in the north Caribbean. Countries such as Cuba, Dominican Republic and Puerto Rico are places in where the descendants from that first encounter are still residing and using TEK from pre-Colombian ancestors. Even if the language is not fluently speak anymore, words are still present in the vocabulary of Spanish and non-Spanish speakers. Many words and conceptual natural phenomena that explain landscapes, islands, and agricultural practices are still embedded in culturally knowledge. Such information and philosophy can be potentially used as reinforcement for instruction and developing of culturally relevant science material. The better organization and development of such material can be acquired through applied ethnographic work and historic literature. Many contemporary work in linguistic, traditions, and ethnosciences (including ethnogeology and ethnobotany) is dedicated to share along the Caribbean such knowledge and practices. Since pre-colonial times both islands, Hispaniola and Puerto Rico, have shared many ecological, geological and anthropological events. Both island share a close ethnohistoric evolution (Bukhari, Luis, Alfonso-Sanchez, Garcia-Bertrand, & Herrera, n.d., Stevens-Arroyo, 1993) as well as cultural norms and both have similar surface topography and geology, specially karst terrain. Karst is one of the geological features that have been an important piece in the development of cultural norms and well as for resources (Day, 2010) in many parts of the Caribbean. The existing interaction between karst and the people among people within the two countries is in the knowledge that comes from the indigenous TaÃ-no culture, a civilization dating from pre-Columbian times that had a close relationship with the karst terrain. Part of this relationship includes karst features that are embedded in creation stories, ceremonial locations and practices, artistic expressions, family stories, as well as place-names among other issues (Alvarez Nazario, 1972; Dominguez-Cristobal, 1989, 1992, 2007; PanÃ©, 1999). Northeastern Caribbean indigenous knowledge about karst processes and features is often found in the form of oral tradition as well other traditional practices (e.g., agricultural practices, ceremonies, etc.) among	Thank you for your comment, however due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity.
Jeremy	Martinich	141053	Text Region	21. Midwest		868	868	1	2	Per the estimates reported in EPA 2017, the values of this sentence should be revised to â€œ350 emergency room visits for asthma by 2050, with an estimated increase in cost of care by about $170,000â€.	The numbers originally reported, 260 emergency room visits and $120,000 in cost of care, are the estimates listed in Tables 5 and 6 of the CIRA II tehcnical report for the Midwest. The values 350 emergency room visits, and $170,000 in cost of care are the upper bounds of those estimates. We have decided to report the projected numbers - rather than upper or lower bounds - listed in CIRA II.
Jeremy	Martinich	141054	Text Region	21. Midwest		868	868	35	36	The finding from the CIRA2.0 report for labor solely represents lost work hours. So this sentence should be revised to: â€œBy 2050, increased temperatures under a higher scenario will cost around $9.8 billion due to lost work hours (EPA 2017).â€ If you want to present the value of additional premature Midwestern deaths per year due to extreme temperatures (RCP8.5), that estimate from the CIRA2.0 report is $10 billion in 2050 and $31 billion in 2090.	Thank you for this clarification. We have updated the text to reflect the latter comment, which is the cost of premature Midwestern deaths/year due to extreme heat (RCP8.5) estimated to be $10billion.
Christen	Armstrong	141055	Text Region	21. Midwest		872	872	20	23	It would be appropriate to clarify that these values reflect estimates for 2090 (â€œend of centuryâ€ would also work).	The words "by 2090" have been added to the sentence in question.
Sally	Sims	141580	Whole Page	21. Midwest		843				Comment: Ch 21, page 843, line 17: Delete wild, replace with native. Line 21, after invasive species, add text to highlight Great Lakes: A major freshwater resource, the Great Lakes are at risk from rising temperatures, changes in seasonal stratification of lake temperatures, and increased summer evaporation rates, combined with stresses from pollution, sediment and nutrient inputs, and invasive species.	We removed "wild" from the key message. We did not insert "native," in part because the idea of "native" is a bit more in flux given the potential for species from areas farther south (but from the central US) to move in to our region can be considered an invasion of "native" or "non-native" species, depending on your perspective. The concept of invasive species is addressed as a stressor, so we felt that not using "native" in the key message was appropriate. We agree that the Great Lakes are a very important ecological resource, and they should be mentioned in this key message. Since there were overlapping components of the suggested edit and the existing text, and because the key message was already pretty long, we added the Great Lakes in without quite as much detail.
Louis	Iverson	141582	Text Region	21. Midwest		844		38		"additional 380 premature deaths per year" I assume this is for Midwest only?	Yes, the additional 380 premature deaths per year is for the Midwest only. The first phrase in the sentence identifies the Midwest. However, we added the phrase "in the region" in the second phrase of the sentence to make that clear.
Louis	Iverson	141583	Text Region	21. Midwest		845		2		"more common by late century in both scenarios" cite figure here as I didn't know which scenarios until reading further.	Thank you for catching that. The text has been changed to identify the two scenarios - "in both the lower (RCP4.5) and higher (RCP8.5) scenarios".
Louis	Iverson	141588	Text Region	21. Midwest		844		26		cite the figure on ice and lake temps	It is the style of the Executive Summary to not include specific references and figures are meant to stand one their own.
Louis	Iverson	141589	Text Region	21. Midwest		848		13		"Wet conditions at the end of the growing season can create elevated levels 14 of mold, fungus, and toxins (Hurburgh 2016)." Doesn't seem to follow thread of wetter springs. Maybe put 'In addition' at beginning of sentence or somehow lead with point of occasional more moisture also at end of growing season.	Good suggestion: "In addition, wet conditions at the end of the growing season…"
Louis	Iverson	141590	Text Region	21. Midwest		849		6		Does the Hatfield reference address the role of moisture concomitant with high temperatures? It seems that physiological drought, or compensating role of adequate moisture, should also be mentioned.	Studies (typically greenhouse) on temperature effects on plants are conducted in such a way that water and nutrients are not limiting so that the independent impact of temperature is revealed.

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Louis	Iverson	141591	Text Region	21. Midwest		850		20		I think 'interspersed droughts' should be added to this sentence, as it is not only excessive rain but also the longer intervals between rains on occasion that are detrimental to crops.	Agreed. Change to: "While the general impacts of climate change on specialty crops are similar to commodity crops, the more intense heat waves, excessive rain interspersed with drought, and higher humidity of a future climate…"
Louis	Iverson	141592	Text Region	21. Midwest		850		32		add 'followed by cold pulses later on' or something to show that the bud break is not a problem unless there is also a hard frost later.	Agreed. Change to: "…untimely bud-break due to earlier and longer occurrences of warm conditions followed by cold pulses in late winter."
Louis	Iverson	141593	Text Region	21. Midwest		852		7		This $2.5 billion figure is cited from a 1999 paper. Is it adjusted to current? Any newer data?	To the best of the authors' knowledge, no newer data has been published. The lead author of the cited study was contacted and has not further updated those estimates. The citation was corrected to reflect that this report was published in 2005, not 1999. This correction was also made in the References sections of the chapter. The original value was provided in 1996 dollars, but has been revised to reflect 2015 dollars.
Louis	Iverson	141594	Text Region	21. Midwest		854		10		"The region now has fewer forest types across the landscape" I don't believe the Goring paper is really stating this. Yes, there are 'lost' forests compared to FIA data but there is no evidence of particular species being lost, just mixes changing. Diversity may not be less with trees, but certainly structural and density changes.	The text was altered to highlight the key point that greater homogeneity in tree species composition was observed across existing forest types.
Elizabeth	Burakowski	141595	Text Region	21. Midwest		866		9		"These account for more than half of the total 10 projected deaths due to the climate-related increase in ground-level ozone nationwide and are 11 estimated to cost to $4.7 billion (EPA 2017)." Not quite correct. by 2050 and RCP 8.5, 380 deaths out of 790 total - not quite half. If you went to 2090, however, it would be over half (910 out of 1700). Also 'cost to $4.7' perhaps would be better 'an estimated $4.7 billion'. It is a range of $0.42 to 13 billion.	We thank you for the clarification. We have refined the text to reflect the nuances in the estimates for the projected number of deaths and the estimated costs.
David	Wojick	141718	Text Region	21. Midwest		848	848	1	4	Here is the present text: 2 Projected increases in moisture, coupled with rising 3 mid-summer temperatures, will be detrimental to crop and livestock production, putting 4 future gains in commodity grain production at risk by mid-century. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	The Climate Science Special Report (NCA4 Volume 1, Chapter 4) addressed the confidence of use of climate model projections. They state, "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproducing their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g. Flato et al. 2013)."
David	Wojick	141719	Text Region	21. Midwest		851	851	15	20	The present text says this: 15 Key Message 2: Midwest forests provide numerous economic and ecological benefits, yet threats 16 from a changing climate are interacting with stressors from invasive species, pests, and 17 pathogens to increase tree mortality and reduce forest productivity. Without adaptive 18 actions, these interactions will result in the loss of economically and culturally important 19 tree species and may lead to the conversion of some forests to other forest types or non 20 forested ecosystems by the end of the century. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	The Climate Science Special Report (NCA4 Volume 1, Chapter 4) addressed the confidence of use of climate model projections. They state, "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproducing their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g. Flato et al. 2013)."
David	Wojick	141720	Text Region	21. Midwest		865	865	10	17	Here is the present text: 10 Key Message 4: Climate change will worsen existing health conditions and introduce new health 11 threats by increasing the frequency and intensity of poor air quality days, extreme high 12 temperature events, and heavy rainfalls; extending pollen seasons, and modifying the 13 distribution of disease-carrying pests and insects. By mid-century, the region is projected to 14 experience substantial, yet avoidable, loss of life, worsened health conditions, and economic 15 impacts estimated in the billions as a result of these changes. Improved basic health services 16 and increased public health measuresâ€"including surveillance and monitoringâ€"can prevent 17 or reduce these impacts. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. That these health claims are highly questionable has already been pointed out to the USGCRP. See for example: "Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment" by Patrick J. Michaels and Paul C. "Chip" Knappenberger, Cato Institute, June 2015. https://www.cato.org/publications/public-comments/draft-impacts-climate-change-human-health-united-states-scientific Apparently the USGCRP has chosen to ignore this information.	The Climate Science Special Report (NCA4 Volume 1, Chapter 4) addressed the confidence of use of climate model projections. They state, "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproducing their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g. Flato et al. 2013)."
David	Wojick	141721	Text Region	21. Midwest		874	874	9	15	The text says this: 9 Key Message 6: At-risk communities in the Midwest are becoming more vulnerable to climate 10 change impacts such as flooding, drought, and increases in urban heat islands. Tribal 11 Nations are especially vulnerable because of their reliance on threatened natural resources 12 for their cultural, subsistence, and economic needs. Integrating climate adaptation into 13 planning processes offers an opportunity to better manage climate risks. Developing 14 knowledge for decision making in cooperation with vulnerable communities and Tribal 15 Nations will help to build adaptive capacity and increase resilience. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	The Climate Science Special Report (NCA4 Volume 1, Chapter 4) addressed the confidence of use of climate model projections. They state, "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproducing their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g. Flato et al. 2013)."

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
David	Peterson	142413	Whole Chapter	21. Midwest						The forests component of this chapter (Key Message 2) projects dire consequences for hardwood forests, based primarily on statistical modeling, which has low credibility because it does not consider realistic processes and competition, and is almost guaranteed to show big changes. There is not much information about causation or mechanisms. Including the results of relevant process models would provide a broader scientific perspective and provide more mechanistic insight on the potential effects of climate change. Most Midwest forests have high species diversity, which suggests that there should be options for persistence of hardwood forests and maintenance of functionality, even though species distribution and abundance may change.	We encourage the reviewer to read the cited literature to gain an accurate understanding of the kinds of models used in the forestry Key Message. In particular, discussion in the forestry Key Message drew heavily from four process models and one species distribution model used in the following publications: Brandt et al. 2014, 2017; Handler et al. 2014a, b; Iverson et al. 2016; Janowiak 2014b; Swanston et al. 2017. The Brandt, Handler, Iverson, and Janowiak publications provide detailed discussion of the relative structure and assumptions of the species distribution and process models; the combined results of these models were used in considered assessments of species and ecosystem vulnerability. As an example, the LINKAGES and LANDIS PRO process models work together using inputs such as growing degree days, photosynthetically active radiation, and precipitation and temperature values (and many others) to simulate climate interactions with establishment, growth, mortality, competition, and succession. We appreciate the suggestion to include more discussion of ecological mechanisms and relative model structure in the forestry Key Message, but space is limited. We refer those interested in a deeper treatment of statistical or simulated modeling of ecosystem function to the provided citations. The authors emphasize that the cultural and economic interactions of people with Midwestern forests extends beyond viewing them simply as "hardwoods"; in fact, there are numerous forest types and communities that people value highly with the current species abundance and structure, and would consider it a loss if the identities of those forest communities were to change. We encourage the reviewer to explore how many Midwesterners consider forest vulnerability and adaptation in the following citations, also provided in the Key Message: Brandt et al. 2017, Janowiak et al. 2014 and Ontl et al. 2017.
Juanita	Constible	142672	Whole Chapter	21. Midwest						There's a surprising lack of emphasis on harmful algal blooms in this chapter, given their importance to fisheries, recreation, and health. E.g., Please see these citations: https://www.ncbi.nlm.nih.gov/pubmed/28073476; http://pubs.acs.org/doi/abs/10.1021/acs.est.7b01498	This topic was discussed on page 863, lines 7 through 11. I'm not sure if more references are need. Kim? Kim reply - I agree these risks should come in again - I added a few lines (as suggested in a previous comment) to the beginning of the biodiversity section to highlight the Great Lakes as an ecosystem, and added a sentence on cyanoHABs in the Great Lakes box.
Juanita	Constible	142673	Whole Chapter	21. Midwest						For any reference to the RCPs, please consider adding "emissions" to "lower scenario" and "higher scenario," to clarify the meaning for lay audiences.	The term "emissions" was not used because these are scenarios based on radiative forcing instead of emission levels. The number associated with the RCP is the amount of forcing in Watts per square meter.
Juanita	Constible	142674	Text Region	21. Midwest		843	843	24	31	This is a strong Key Message and should be retained in the final report.	We greatly appreciate the reviewer's comment.
Juanita	Constible	142675	Text Region	21. Midwest		844	844	16	23	Please provide citations for this paragraph.	It is the style of the Executive Summary to not include specific references and figures are meant to stand one their own.
Juanita	Constible	142676	Text Region	21. Midwest		845	845	1	2	Please provide a citation for the last sentence and/or a reference to Figure 21.7.	It is the style of the Executive Summary to not include references and the figures are meant to stand on their own.
Juanita	Constible	142677	Text Region	21. Midwest		845	845	3	8	Please provide citations for this paragraph.	It is the style of the Executive Summary to not include references and the figures are meant to stand on their own.
Juanita	Constible	142678	Figure	21. Midwest	4	846				Why does Figure 21.4 appear after Figure 21.7?	Pages 843-846 were the "Executive Summary" of the chapter which includes two graphics selected from the full chapter text, not necessarily in the same order.
Juanita	Constible	142679	Text Region	21. Midwest		868	868	26	29	It would be useful to include a short explanation for why the Midwest will see the largest increase in heat-related deaths. This is particularly true given the media splash made by Hsiang et al. 2017 (http://science.sciencemag.org/content/356/6345/1362), which found greater impacts in the Southeast.	Thank you for this comment. The estimates used in the EPA report are specific to heat-related illness, where the Hsiang et al 2017 paper appears to consider only all-cause mortality. We have clariified the text to refer to the EPA estimates, but have also including the Hsiang et al 2017 citation in the Traceable Accounts to acknolwedge a possible different pattern of mortality under the higher scenario.
Juanita	Constible	142680	Text Region	21. Midwest		868	868	38	39	Please consider citing recent EIA data about energy insecurity: https://www.eia.gov/consumption/residential/reports/2015/energybills/	Thank you for this suggestion. We have added some text that refers to energy insecurity in the Midwest, as well as the citation provided.
Juanita	Constible	142681	Text Region	21. Midwest		870	870	7	12	Please consider including the full scientific name of Culex and Ixodes, along with common names typically used in the Midwest.	We have clarified the scientific names of the two Culex species found in the Midwest, as well as Ixodes. We have also included the common name for Ixodes.
Juanita	Constible	142682	Text Region	21. Midwest		870	870	13	17	Please consider fleshing out this paragraph with examples of the specific health harms of HABs.	The USGCRP 2016 Climate and Health Assessment elaborates the detailed health impacts of consuming contaminated HAB drinking water. We have added some language listing the primary outcomes of drinking contaminated water, as well as citations.
Juanita	Constible	142683	Text Region	21. Midwest		870	870	30	38	Given the continued importance of coal-fired generation in the Midwest, please consider adding a reference to power plant emissions in this opportunities paragraph.	Thank you for this comment. We have added some language and a citation (Abel et al. 2018) that addresses the potential cobenefits of air pollution reduction by replacing electricity generation with solar photovoltaics.
Social Science	Coordinating Committee	143217	Text Region	21. Midwest		874	875	8	26	I appreciate the focus of this key message on at-risk communities. The most useful analysis in this section is the part that focuses on Midwest specific issues such as adaptation planning in specific cities or expected damages to infrastructure. You might be able to save some space by referring general issues of social vulnerability/ impacts to other chapters, and so expand on Midwest-specific details. I don't get a sense reading this section about what 'at risk communities' means for the Midwest region.	We thank the reviewer for this comment. We have provided several Midwest-specific examples based on the available peer-reviewed literature (including several specific commuities), but have revised the text to add 'in the Midwest' in cases where it was not already clear the example was specific to the region. Some statements are not Midwest-specific, due to a lack of region-specific literature to reference.
Social Science	Coordinating Committee	143218	Text Region	21. Midwest		864	864	16	35	I like the case study of the GLCAN as it analyzes what works in climate adaptation efforts.	We greatly appreciate the reviewer's comment and are glad the GLCAN study is useful.
Social Science	Coordinating Committee	143219	Text Region	21. Midwest		876	877	13	14	The section on tribal adaptation is useful as it includes climate change issues and traditional ecological knowledge specific to tribal nations in the Midwest. If data exists on particular social vulnerabilities of indigenous people in the Region, including both those living on tribal lands as well as people living in urban areas, this would be useful to include.	We thank the reviewer for this comment, and agree that data pointing to social vulnerability in the region would be useful to include. Unfortunately, we are aware of little published information. Many tribes and urban tribal communities often carry out their own assessments, and since most of this information is consolidated through epidemiologists, we are not aware of published studies with these results to include in this chapter.
Ben	Johnson	143585	Whole Page	21. Midwest		873				The section gives an estimate of the monetary cost of climate change on infrastructure. The section also gives examples of how installing green infrastructure would reduce these costs. I think it would be interesting if the section also gave an estimate of how much money these green infrastructure examples saved with their installation.	We agree that an estimate of monetary savings would be valuable. Unfortunately, cost savings are rarely publicly available. This would be a useful topic for future research.
Michael	MacCracken	144532	Text Region	21. Midwest		843	843	36	37	Is this a cumulative cost or a per year cost. If the former, it sounds small; if the latter, large (though not clear if this is inflation adjusted--so is this present dollars)? A bit more specific indication is needed.	The message is correct in stating that this is an annual cost. See page 239, Table 30.6, in the CIRA report (EPA, 2017). Text has been added to the key message to indicate that the estimate refers to undiscounted 2015 dollars.
Michael	MacCracken	144533	Text Region	21. Midwest		845	845	19	19	I'd suggest changing "using" to "based on the results of" as being more explanatory.	Thank you for the suggestion. The wording was changed to "based on 32 model simulations" to reflect the phrasing used to describe the LOCA database https://scenarios.globalchange.gov/
Michael	MacCracken	144534	Text Region	21. Midwest		846	846	9	9	I don't understand what "central" applies to--is this just the center of Lake Michigan, or also Ontario? And is it just the centers of these lakes that, at present as opposed to in the past, rarely have ice cover? This is just not very clear.	Thank you for requesting clarification. Yes, this applies to Lake Ontario also. The wording has been changed to "the deeper central parts of Lake Michigan and Ontario" to make this more clear.
Michael	MacCracken	144535	Text Region	21. Midwest		847	847	4	4	Change "agriculture" to "agricultural"	The text has been revised as suggested
Michael	MacCracken	144536	Text Region	21. Midwest		847	847	2	2	Given uncertainties in counts and what is being counted (just US citizens, visiting students, etc.), how about saying "home to over 60 million" and not try to be more precise.	Thank you for the suggestion. Wording changed to "home to over 60 million".

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144537	Text Region	21. Midwest		847	847	13	13	Quite amazing that mining/refining (of coal, iron, etc.) is not mentioned given it would have been huge back a few decades. Does it not merit mention now?	We thank the reviewer for the comment. While these industries are still important in the Midwest, the direct climate change impacts on them are not as significant as the ones already identified here. They would likely be affected by policy decisions but discussion of policy is beyond the defined scope of the National Climate Assessment.
Michael	MacCracken	144538	Text Region	21. Midwest		850	850	6	6	Really best to stick to the likelihood lexicon and expunge text of meaningless words like "may" (and "could") that give no sense at all of likelihood. Overall chapter seems to be doing well on avoiding use of these words--should do a scrub to get rid of them all.	Agreed. Change to: "However, future projections show that Midwest surface soil moisture likely will transition from excessive levels in spring due to increased precipitation to insufficient levels.."
Michael	MacCracken	144539	Text Region	21. Midwest		851	851	19	19	Oops, another "may" to expunge--so also back on page 847, line 13	Replaced "may" with "is expected to", linking the loss of tree species to forest type conversion. Additonally, the text describing forest ecosystem loss in the region was changed by adding "while other forests are at risk of conversion to non-forested ecosystems by the end of the century", as uncertainty of forest loss in the region cannot be determined probablistically from observations or modelled results. These changes were made on both pages 847 and 852.
Michael	MacCracken	144540	Text Region	21. Midwest		852	852	20	26	Three more uses of "may" that need to be replaced by choice from the lexicon. Please do a search through the chapter (and I'll stop identifying specific places) as it really is more informative if words like "may" can be avoided, even if one has to say "it is possible". It also generally helps to add some qualifying phrase so have sentence of form "Unless this …, then it is likely that …"--or similar.	All instances where "may" could be replaced with the recommended liklihood language have been addresses in KM2.
Michael	MacCracken	144541	Text Region	21. Midwest		854	854	26	26	I think it better to discuss in terms of shifts in range rather than to say "unable to migrate" which implies specific trees actually change location. So, perhaps say "raises the possibility that the ranges of particular tree species will not be able to successfully shift to future suitable habitats within the Midwest". Also, note that because the word "possibility"--a mid-likelihood wording from the lexicon--is used, then "may" becomes "will" or "will not"	The text was altered as suggested by the reviewer.
Michael	MacCracken	144542	Text Region	21. Midwest		862	862	9	9	From the time of the first assessment, I thought the model results projected that is was very likely that climate change would reduce lake levels (the increase in evaporative loss due to higher temperatures and reduction in ice extent) being larger than the effect of any additional precipitation of the watershed, which is not much larger than the lakes themselves. That level of confidence was questioned in government review process (under Bush 2) and I had to explain that something like 11 of 12 modeling results showed this. Is this indication of sign now in doubt (indicated by using "may") and if so how is early reasoning wrong?	"May" is now changed to "will more likely than not" and citation of Lofgren and Rouhana (2016) is added at this point. Lofgren and Rouhana (2016) bludgeoned the method that had nearly universally been used to project Great Lakes levels under climate change between 1989 and 2010, with the formulation of the land in the basin, not the lakes themselves, being the main source of the problem. The most extreme result found by Lofgren and Rouhana was that, using one particular GCM's results as input to the original Croley method, the potential evapotranspiration in the Lake Superior basin's land increased by an amount equivalent to having 565 suns in the sky. Problematic assumptions in the original Croley method include: 1. The assumption that increased air temperature causes increased evapotranspiration was taken far too literally, excluding even the effect of day length that is included in other simplified calculations of potential evapotranspiration. 2. Evapotranspiration extracted directly from GCM output is to be categorically ignored, even for the sake of comparison, despite significant advances in that aspect of GCMs between 1989 and 2010, and even before. 3. Extreme and convoluted calibration that minimizes error in runoff during the historical period of calibration will lead to a model that can be extended to other climatic regimes. 4. A simple energy constraint based on annually averaged incoming solar radiation applied only during the calibration process will ensure energy conservation in whatever time and climate regime the model is applied, so an explicit conservation of energy constraint is not required. The 565 suns problem strongly suggests that this last one is wrong, and GCMs since the 1960s have had schemes that explicitly conserve energy at the surface. To illuminate problems with temperature-based calculation of potential ET, see also Milly and Dunne(2016, Nature) and others by that research group and beyond, although none of their results show problems as extreme as those in the Croley method. Here's what happened with the 11 out of 12 cases: Each of those cases used data from a different GCM realization, but each of those datasets was funneled through the same off-line hydrologic models used in the Croley method, which was where the problem lay. Contrary to the way this was often described at that time, the GCMs themselves never projected lake levels, but required the intermediary of the Croley method. During the Bush 2 era was when this increasingly became an internal NOAA struggle between Dr. Croley (more senior scientist) and Dr. Lofgren (junior scientist). It didn't hit the literature until Lofgren et al. (2011, J. Great Lakes Res.), but was still taken lightly enough in such secondary literature as NCA3 that the more thorough treatment of Lofgren and Rouhana (2016) was deemed necessary. It is nearly impossible to overstate the problems with the Croley method, and it is a
Michael	MacCracken	144543	Text Region	21. Midwest		862	862	13	15	So, why did lake levels rise so much? The rest of the paragraph also needs explanation--levels of some lakes can be controlled, but is there enough water for the whole system to be so little changed? If so, how come? And will not withdrawals from the lakes be going up as warming occurs?	There is no literature source that gives a good explanation of why water rose during 2013-present. Gronewold (personal communcation) likes to say that the cold period in early 2014 popularly called "the polar vortex" caused it or, more carefully phrased, "coincided". There has been no real test of this, and the very rapid rise in lake level began before that time. As for the much smaller drop in lake levels than previous projections, see Lofgren and Rouhana (2016) and the response to the previous comment. In short, saying that increased air temperature causes increased evapotranspiration is a vast oversimplification that in this case, led quite a few scientists seriously astray. Water withdrawal may go up somewhat, but results from Lofgren, Milly, and others show that this effect has been overrated; also this effect was not calculated and does not enter into the cited papers.
Michael	MacCracken	144544	Text Region	21. Midwest		863	863	26	30	Rather a complicated sentence.	This is split into two sentences, with some re-wording of the second.
Michael	MacCracken	144545	Text Region	21. Midwest		864	864	33	33	I think spelling is "publicly"	The text has been revised as suggested.
Michael	MacCracken	144546	Text Region	21. Midwest		866	866	5	11	Does it need to be said that air quality will be a problem unless there is a conversion to vehicles that are not emitting VOCs, NOx, etc.; or is it that even with just natural emissions from the vegetation there would be a problem. Thus, is reducing use of fossil fuels a win for both climate and air quality, or not? If it really would be a win-win strategy, likely worth more clearly mentioning specifically.	The cobenefits of reducing use of fossil fuels for vehicles is addressed in the last paragraph - challenges and opportunities - of the health section. We have added a citation that highlights the potential air quality benefits of moving to solar-generated electricity (Abel, et al 2018).
Michael	MacCracken	144547	Whole Chapter	21. Midwest						Overall, a very well done and well illustrated chapter. Nice job	We greatly appreciate the reviewer's comment.
Perry	Miller	141552	Figure	22. Northern Great Plains	22.1	923				Number of days over what time period? Year? Summer? Month? decade? And is it truly change or the new prediction of the number of days that will be in this category? I'm seeing things like 60+ days for >90 in Montana at the lower RCP 4.5 context and given the short summer, that seems incredulous to me if that really is meant to represent the 'change'	The data in the figure are correct, but the legend was incorrect. This is being corrected.
Perry	Miller	141553	Table	22. Northern Great Plains	22.2	926				Pulse crops beyond 'dry edible beans' (i.e. dry pea, lentil, chickpea) should be included here since the northern Plains is such a dominant source for their production in the USA. Acreage in Montana alone was 1.5 million in 2017 of these high value, plant-protein crops. Pulse crops demonstrate the capacity of agriculture to shift. in 1997 the acreage of these crops was near zero.	The text has been adjusted accordingly. Data on pulses are now included.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Perry	Miller	141554	Text Region	22. Northern Great Plains		927	927	10	23	How is CRP accounted in this grassland conversion? CRP acreage has diminished to less than 50% of peak acreage in most (all?) northern Plains states starting in about 2009. It's an issue worth raising since it connects with so many segments of society. If CRP was originally cropland and has been converted back during a period of unprecedented crop prices is it really 'grassland conversion'?	We thank the reviewer for the comment. The chapter text has been revised to include mention of CRP expansion.
Louis	Iverson	141555	Text Region	22. Northern Great Plains		924	925	10	32	A powerful example of land use change affecting climate is related to summerfallow, once a practice common to the entire northern Great Plains but now common only to the driest parts. Dr. Paul Stoy and colleagues are documenting the cooling and wetting associated with the conversion of summerfallow to annual cropping in eastern Montana and the western Dakotas, similar to what has been published in the Canadian prairies by Gameda and colleagues. Summerfallow area in the greater northern Plains (including AB and SK) peaked at 17 million ha in 1971 according to Tanaka et al. 2010, and is now well under 4 million ha in the same region, but with some areas such as MLRA 52 in Montana, virtually unchanged. I think it's important to include these examples that show how climate can be affected through changes in agricultural systems.	We greatly appreciate the reviewer's comment, but it doesn't appear that the relevant work by Stoy has been published yet. We do now cite the work by Alter et al. (2018) that's investigated the impacts of land use change on climate in the great plains.
David	Wojick	141722	Text Region	22. Northern Great Plains		922	922	4	9	Here is the present text: 4 Key Message 1: Effective water management is critical to ensuring the region has enough water 5 to meet the demands of its people, its crops and livestock, and its energy industry. Even small 6 changes in precipitation can have large effects downstream, which, when coupled with the 7 variability from extreme events, makes managing these resources a challenge. Future 8 changes in precipitation patterns and the potential for more extreme rainfall events will only 9 serve to exacerbate these challenges. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	We thank the reviewer for the comment. The chapter text has been revised to make it clear that forecasts are uncertain.
David	Wojick	141723	Text Region	22. Northern Great Plains		934	934	10	15	The present text says this: 9 Key Message 4: Energy 10 Key Message 4: Fossil fuel and renewable energy production and distribution infrastructure is 11 expanding within the Northern Great Plains. Climate change and extreme weather events put 12 this infrastructure at risk, as well as the supply of energy it contributes to support 13 individuals, communities, and the U.S. economy as a whole. The energy sector is also a 14 significant source of greenhouse gases and volatile organic compounds that contribute to 15 climate change and ground-level ozone pollution. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	After consideration of this point, we have determined that the existing text is clear and accurate.
David	Wojick	141724	Text Region	22. Northern Great Plains		937	937	14	17	Here is the text: 14 Key Message 5: Indigenous peoples of the Northern Great Plains are at high risk from a variety 15 of climate change impacts, especially those resulting from hydrological changes, including 16 changes in snowpack, glacier melt, seasonality and timing of precipitation events, extreme 17 flooding and droughts, and reduction in streamflows. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	After consideration of this point, we have determined that the existing text is clear and accurate.
Juanita	Constible	142684	Text Region	22. Northern Great Plains		916	916	9	15	The summary of Key Message 2 differs from the narrative in the Key Message 2 section itself (pages 925-928). The summary portrays the impact of climate change on agriculture as primarily positive, with extreme weather events offsetting some of the benefits. The language in the section portrays the impact of climate change as primarily negative, with added productivity offsetting some of the damages (page 927, lines 10-33). The summary would benefit from better alignment with the full section. The main point of the section is that climate change will have both positive and negative impacts on agriculture, which will increase variability and uncertainty and require adaptive management strategies. Moreover, if taken out of context, the conclusions of Key Message 2 could be misrepresented to mean that climate change will benefit agriculture in the region. It should be made clear that both the positive and negative impacts will vary across the region and that the increase in uncertainty and variability will require costly changes to agricultural management.	We thank the reviewer for the comment. The chapter text has been revised to incorporate these suggestions. We qualify the limits of the positive benefits and more clearly emphasize the negative impacts.
Juanita	Constible	142685	Text Region	22. Northern Great Plains		928	928	1	1	This sentence simplifies the impact of climate change on soil water availability, which will likely vary geographically. For example, Wienhold et al. 2017 predict that soil moisture will increase in the northern portions of the region but decrease in the southern portions.	The text has been adjusted accordingly. This bulleted list has been revised extensively to clarify key points.
Juanita	Constible	142686	Text Region	22. Northern Great Plains		928	928	1	17	This section would benefit from an additional bullet point summarizing the impact of climate change on agricultural pests. Weinhold et al. 2017 and others predict increases in the range and fecundity of pests in the Northern Great Plains.	The text has been adjusted accordingly. This bulleted list has been revised extensively to clarify key points.
Juanita	Constible	142687	Text Region	22. Northern Great Plains		928	928	2	7	This bullet point states that climate change is expected to increase crop yields, citing Ko et al. 2012. However, Ko et al. 2012 argues that the negative impacts of higher temperatures will outweigh the positive impacts of CO2 fertilization on dryland crop yield. From Ko et al. 2012: "The results of this investigation indicated that in the event of a climate change projected to year 2100 (the scenario adopted for analysis), the negative effects of enhanced temperatures would dominate over the positive impacts of atmospheric CO2 increases on crops in the dryland cropping systems. Consequently, wheat yields were projected to decrease to some extent in all of the cropping systems analyzed (WF, WCF and WCM)." The impacts of climate change on crop yields will vary geographically and temporally because of differences in temperature and precipitation changes. This section would benefit from discussion of the different factors influencing yield and the variability/uncertainty that these factors create.	The text has been adjusted accordingly. This bulleted list has been revised extensively to clarify key points.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142688	Text Region	22. Northern Great Plains		930	930	10	20	This section presents three pathways through which climate change will impact recreation, including direct impacts to ecosystems, changes in environmental conditions that affect recreationists, and effects of environmental policies on recreationists. The section cites Hunt et al. 2016 as evidence for these pathways. However, the cited paper notes that the third pathway is theoretical, not established. From Hunt et al. 2016: "We are unaware of any studies that have explicitly investigated this pathway. Given the lack of information about this pathway on recreational fishers, we speculate about two potential cases whereby environmental policies may impact inland recreational fishers and fisheries." This section would benefit from recognition of the limited evidence for the third (and, to a lesser extent, the second) pathway for impacts on recreationists. It would also benefit from additional emphasis that the first pathway is not only the most widely studied but also likely the most significant. This change is especially important because the current language implies that the negative impact of adaptation policies on recreation is comparable to the negative impact of the climate change itself, which is not true and could be misconstrued.	The text has been adjusted accordingly. We now clarify that this third pathway is speculative.
Juanita	Constible	142689	Text Region	22. Northern Great Plains		949	949	16	22	The section assigns a "high confidence" level to the statement "The energy sector is also a significant source of greenhouse gases." There is strong evidence and high consensus that the energy sector is a significant source of greenhouse gases, which should put it at the "very high" confidence level.	The text has been adjusted accordingly.
Juanita	Constible	142690	Text Region	22. Northern Great Plains		949	949	16	22	The section assigns a "high confidence" level to the statement that greenhouse gases and volatile organic compounds contribute to climate change and ground-level ozone pollution. There is strong evidence and high consensus that climate change and ozone pollution are linked to greenhouse gases and volatile organic compounds, which should put this statement at the "very high" confidence level.	The text has been adjusted accordingly.
Juanita	Constible	142691	Whole Chapter	22. Northern Great Plains						The chapter does a good job demonstrating what's at stake for agriculture under climate change. The agriculture section includes a lengthy description of the role of agriculture in the economy, breaking up the various components of Northern Plains agriculture and their role in the national food economy. The chapter also includes a reasonable description of the magnitude of the issues that Indigenous peoples in the region face. The chapter does not do as well demonstrating what's at stake for water resources, recreation, and energy. The chapter would benefit from a more in-depth description of the role of water resources, recreation, and energy in the economy of the region and the nation as a whole.	We thank the reviewer for the positive response to the agricutlural section of our chapter. We have not substantially revised the language related to water resources to explicitly asess the economic value of water. Rather, we have tried to make it clear that water resources are fundamental - important for all of the other sections of the report. We now link to these. We have added info to the rec/tourism section on the magnitude of impacts (including $ values). We have revised the language in the energy section to make the improtance of the impactds more clear.
Ben	Feikema	143869	Text Region	22. Northern Great Plains		946	946	2	3	This doesn't read very well, and may have a grammatical issue.	The sentence has been rephrased to clarify.
Ben	Feikema	143874	Text Region	22. Northern Great Plains		946	946	8	13	Objectors will want to know how far back the data on rainfall goes with the intent of pointing to normal climatic cycles and variation as an argument against human-caused climate change.	The text has been adjusted accordingly. The text now states the observation period.
Ben	Feikema	143879	Text Region	22. Northern Great Plains		946	946	18	26	How do you suggest convincing "ag managers" of different, more environmentally friendly farming practices if current farming methods will only grow more and more productive as the climate changes?	The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text.
Michael	MacCracken	144549	Text Region	22. Northern Great Plains		916	916	13	13	Best practice is to avoid words like "may" and "could" that provide no real indication and are not drawn from the likelihood lexicon. I'd urge a scrub of the chapter to replace such word. For example, it is hard to see how this could not be the case, so "may" needs to be changed to "is very likely to" or "is likely to"--and I am surprised why it is only "some" as it is not always easy to justify adapting to the full range of extremes (though insurance might be a workable option)	We thank the reviewer for the comment. Several revisions have been made to the chapter text to more clearly express risks.
Michael	MacCracken	144550	Text Region	22. Northern Great Plains		917	917	7	7	Another "may" that needs to be replaced by an estimate from the likelihood lexicon. Please do scrub the chapter, and I'll not note all cases.	We thank the reviewer for the comment. Several revisions have been made to the chapter text to more clearly express risks.
Michael	MacCracken	144551	Text Region	22. Northern Great Plains		924	924	19	19	Best to replace "Climate models" with "Climate model projections"	The text has been adjusted accordingly.
Michael	MacCracken	144552	Text Region	22. Northern Great Plains		925	925	35	35	This is an awfully precise number for a general key message. I'd suggest saying "over $50 billion per year" (and maybe even give a percentage of the economy for context).	The text has been adjusted accordingly.
Michael	MacCracken	144553	Text Region	22. Northern Great Plains		926	926	9	12	I can't help but recall the comment at an early workshop during the first national assessment by George Seielstad of UND about the importance of the region's agricultural production to national well being when he said that the region produces over 80% (I think it was, or maybe 90%) of the nation's hops. He was roundly cheered and the region was thereafter truly well-respected, with George participating in the New York Metro workshop with the recognition that the Metro region took in resources and exported information and the Northern Great Plains was the exact opposite--so they were very closely inter-dependent. In George's honor, I'd urge also mentioning hops.	We greatly appreciate the reviewer's comment, but it seems that almost all US hop production is in WA, OR, and ID.
Michael	MacCracken	144554	Text Region	22. Northern Great Plains		928	928	31	31	I do hope that the "longer term" for at least some of those reading this report, and for the country, will go beyond the end of the century. It might be noted that the problem will persist well after the ending of release of CO_2.	This comment does not appear to raise a question or suggest a revision.
Michael	MacCracken	144555	Figure	22. Northern Great Plains	4	937				Given refineries in NJ, PA, DE, I'm rather surprised that there is not a shading for that area of the country, yet there is in all sorts of rather remote regions.	This comment does not appear to raise a question or suggest a revision. This figure was taken directly from an EPA report
Michael	MacCracken	144556	Text Region	22. Northern Great Plains		938	938	33	33	Correct spelling of "Because"	The text has been adjusted accordingly.
Michael	MacCracken	144557	Text Region	22. Northern Great Plains		937	941	13	13	I'm a bit surprised that there seems to be no mention here of the opportunity ironically provided to tribal groups when the reservations were located in such a wind-rich region. Especially given the efforts of Bob Gough and Pat Spears to promote the region as an energy-rich wind region that, were there an adequate grid connection (and there are some efforts pushing in this direction), the wind of the region would provide a very well-deserved but only partial, financial recompense given the windy locations that have had to be endured. I would urge mention of this.	We greatly appreciate the reviewer's comment. The issue came up in stakeholder discussions, but was minor in comparison with the other issues discussed in the chapter.
Michael	MacCracken	144560	Text Region	22. Northern Great Plains		917	917	2	3	Somewhere in the description of the meteorology of the region I think it needs to be said that the reduced southward push of cold Canadian air in the cold season of the year has been allowing the northward push of warm, moist Gulf of Mexico air to reach into the northern Great Plains, and when this happens, quite large snowfalls and even rain events can occur. And this is now happening onto a hydrographic regime that is just not well-carved for heavy precipitation because, before global warming, warm, moist air rarely made it to the region in winter, not being able to get in over the Rockies, etc. So, while a couple of inches of precipitation in the southeast is not much because it has been happening for millennia and more and so has carved the landscape, this is a new situation for the northern Great Plains and has been proving quite problematic when it occurs--creating a build up of snow that then under some situations, including rain, can melt rapidly and overwhelm the available drainage capacity of the region's rivers, etc. So, quite a challenge.	We thank the reviewer for the comment. The author team is not aware of published literature that supports this forecast. After consideration of this point, we have determined that the existing text is clear and accurate.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Alexey	Shiklomanov	141725	Text Region	23. Southern Great Plains		972	972	33	37	Here is the present text: 33 Key Message 1: The regionâ€™s growing population, the migration of individuals from rural to 34 urban locations, and climate change will increase and redistribute demand and result in 35 resource contention at the intersection of food consumption, energy production, and water 36 resources. This â€œnexusâ€ is inextricably linked to quality of life, particularly in rural areas as 37 well as across both national and transnational borders. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the author team's thorough assessment of the science relevant to this Key Message. As noted in the findings presented in the USGCRP Climate Science Special Report, and using a significant body of peer-reviewed climate science literature, the authors have determined that the current research associated with this Key Message is valid. High quality observations of climate indicators over the past century clearly demonstrate how climate is changing. For global temperatures, multiple data set versions (e.g. NOAA, NASA, Hadley Center, Berkley) of globally averaged surface temperature all show warming of approximately 1oC over the past 100+ years. Other indicators expected to increase, such as sea level, atmospheric humidity, heavy precipitation events and deep ocean heat content are all increasing, and indicators expected to decrease, such as Arctic sea-ice, alpine glaciers, and continental ice sheet mass, are decreasing.
David	Wojick	141731	Text Region	23. Southern Great Plains		977	977	23	27	Here is the text: 23 Key Message 2: Higher temperatures, extreme precipitation, and rising sea levels associated 24 with climate change make the built environment in the Southern Plains increasingly 25 vulnerable to disruption, particularly as infrastructure ages and populations shift to urban 26 centers. Coastal infrastructure remains particularly at risk as most climate projections 27 suggest sea level rise of up to four feet if emissions are not reduced. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the author team's thorough assessment of the science relevant to this Key Message. As noted in the findings presented in the USGCRP Climate Science Special Report, and using a significant body of peer-reviewed climate science literature, the authors have determined that the current research associated with this Key Message is valid. High quality observations of climate indicators over the past century clearly demonstrate how climate is changing. For global temperatures, multiple data set versions (e.g. NOAA, NASA, Hadley Center, Berkley) of globally averaged surface temperature all show warming of approximately 1oC over the past 100+ years. Other indicators expected to increase, such as sea level, atmospheric humidity, heavy precipitation events and deep ocean heat content are all increasing, and indicators expected to decrease, such as Arctic sea-ice, alpine glaciers, and continental ice sheet mass, are decreasing.
David	Wojick	141732	Text Region	23. Southern Great Plains		981	981	22	25	The present text says this: 22 Key Message 3: Climate change affects terrestrial and aquatic ecosystems, influencing extreme 23 droughts, unprecedented floods, and wildfires that directly and indirectly alter ecosystems 24 and impact species. Some species adapt to changing climates, while others cannot, resulting 25 in significant impacts to both services and people living in these ecosystems. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the author team's thorough assessment of the science relevant to this Key Message. As noted in the findings presented in the USGCRP Climate Science Special Report, and using a significant body of peer-reviewed climate science literature, the authors have determined that the current research associated with this Key Message is valid. High quality observations of climate indicators over the past century clearly demonstrate how climate is changing. For global temperatures, multiple data set versions (e.g. NOAA, NASA, Hadley Center, Berkley) of globally averaged surface temperature all show warming of approximately 1oC over the past 100+ years. Other indicators expected to increase, such as sea level, atmospheric humidity, heavy precipitation events and deep ocean heat content are all increasing, and indicators expected to decrease, such as Arctic sea-ice, alpine glaciers, and continental ice sheet mass, are decreasing.
David	Wojick	141733	Text Region	23. Southern Great Plains		986	986	23	27	Present text: 23 Key Message 4: Climate change will increase exposure to certain health threats, including 24 extreme heat and diseases transmitted through food, water, and insects. These health threats 25 may occur over longer periods of time, or at times of the year where these threats are not 26 normally experienced. Given the widespread changes expected in the Southern Great Plains, 27 health threats will be both varied and widespread. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the author team's thorough assessment of the science relevant to this Key Message. As noted in the findings presented in the USGCRP Climate Science Special Report, and using a significant body of peer-reviewed climate science literature, the authors have determined that the current research associated with this Key Message is valid. High quality observations of climate indicators over the past century clearly demonstrate how climate is changing. For global temperatures, multiple data set versions (e.g. NOAA, NASA, Hadley Center, Berkley) of globally averaged surface temperature all show warming of approximately 1oC over the past 100+ years. Other indicators expected to increase, such as sea level, atmospheric humidity, heavy precipitation events and deep ocean heat content are all increasing, and indicators expected to decrease, such as Arctic sea-ice, alpine glaciers, and continental ice sheet mass, are decreasing.
David	Wojick	141734	Text Region	23. Southern Great Plains		988	988	19	21	Present text: 19 Key Message 5: Tribal nations and indigenous communities in the Southern Great Plains are 20 particularly vulnerable to the effects of climate change, including water resource impacts, 21 extreme weather events, higher temperatures, and other public health issues. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the author team's thorough assessment of the science relevant to this Key Message. As noted in the findings presented in the USGCRP Climate Science Special Report, and using a significant body of peer-reviewed climate science literature, the authors have determined that the current research associated with this Key Message is valid. High quality observations of climate indicators over the past century clearly demonstrate how climate is changing. For global temperatures, multiple data set versions (e.g. NOAA, NASA, Hadley Center, Berkley) of globally averaged surface temperature all show warming of approximately 1oC over the past 100+ years. Other indicators expected to increase, such as sea level, atmospheric humidity, heavy precipitation events and deep ocean heat content are all increasing, and indicators expected to decrease, such as Arctic sea-ice, alpine glaciers, and continental ice sheet mass, are decreasing.
Allison	Crimmins	142066	Whole Chapter	23. Southern Great Plains						I was directly affected by Hurricane Harvey. The sea level rise and extreme weather event associated with this Hurricane makes the human effects on climate change front and center for Texas Gulf Coast residents. This report needs to be publicized in a manner that all citizens will understand the findings and implications for their future.	This concern is shared by the authors and is noted. This is why we included a box dedicated to Hurricane Harvey.
Mikko	McFeely	143082	Text Region	23. Southern Great Plains		967	967	16	18	Suggest adding research indicates that as much as 75 to 80 percent of fishery species in the Gulf of Mexico are dependent upon estuaries for some portion of their life cycle. (Matagorda Bay Freshwater Inflow Needs Study. Lower Colorado River Authority, Texas Commission for Environmental Quality, Texas Parks and Wildlife and Texas Water Development Board. August, 2006)	Powell et all 2002 reference was added to the Key Message 3 text, rather than alter the executive summary.
Mikko	McFeely	143083	Text Region	23. Southern Great Plains		969	969	26	28	Suggest adding research indicates that as much as 75 to 80 percent of fishery species in the Gulf of Mexico are dependent upon estuaries for some portion of their life cycle. (Matagorda Bay Freshwater Inflow Needs Study. Lower Colorado River Authority, Texas Commission for Environmental Quality, Texas Parks and Wildlife and Texas Water Development Board. August, 2006)	This identical comment was made twice, referring to different locations in the document.
Mikko	McFeely	143084	Text Region	23. Southern Great Plains		972	972	19	19	Perhaps worth mentioning that variations in coastal morphology such as sea-level rise could magnify the effects of hurricanes, especially in highly urbanized area.	We agree and have modified the text accordingly.
Mikko	McFeely	143085	Text Region	23. Southern Great Plains		974	974	3	4	Missing word. The neighboring Southwest region is especially vulnerable to climate change due to its rapidly increasing population, changing land use and land cover, limited water supplies, and 5 long term drought (Garfin et al 2013).	This has been fixed.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	143086	Text Region	23. Southern Great Plains		973	973	21	38	Rice farmers were definitely affected by the drought, but the impacts of the drought extended well beyond the rice farmers. For example Austin went to one day per week watering restrictions and other strong drought measures for all but 6 weeks of a 4 and three quarters year period from September 2011 to May 2016. The City's drought response was essential in contributing to the lakes staying above the direst emergency levels. Also, the finances of Austin's water utility, Austin Water, were severely affected by the drought. Austin Water worked diligently with the Austin City Council and community to implement significant business model adaptations to provide increased financial stability for the water utility as the drought progressed. Additionally, water oriented businesses upstream of Austin were damaged by the drought. And, the drought brought increased risk of wildfires. In fact there were two severe fires in areas near Austin in 2011, if not caused by the drought, then either aggravated or heightened by the drought. Also note that water supply rationing did not actually occur. Through drought contingency plan implementation and dramatic cutback efforts by the City of Austin, including the response by Austin's citizenry, and others and action of other entities including the curtailment of interruptible water customers including rice farming operations, through the river authority's water management plan for the basin, while close, the basin was able to stave off reaching emergency rationing levels.	The text was revised to take into account this perspective.
Mikko	McFeely	143087	Text Region	23. Southern Great Plains		973	973	30	32	This statement is problematic. The source that is cited for the information in lines 30 to 33 is not scientific or factual data, but drawn from an interview with an individual from the Chamber of Commerce and refers to one community. Recommend deleting.	The data used in the Baddour 2014 reference are from the USDA National Agricultural Statistics Service. The reference for the statistics on rice crops has been changed to reflect the source of the data.
Mikko	McFeely	143088	Text Region	23. Southern Great Plains		973	973	30	30	Reference is misspelled. Should be Baddour	This has been fixed.
Mikko	McFeely	143089	Text Region	23. Southern Great Plains		976	976	11	16	The Edwards is a limestone aquifer, but the karst nature of it is what makes it vulnerable. It could be construed by these lines that Austin relies on the Edwards Aquifer for drinking water, but this is not the case. In line 16, it fills and drains quickly seems to be oversimplifying the recharge and discharge nature of the aquifer. Suggest: Karst features allow for rapid infiltration of the aquifer during wet periods, and discharge rates are likewise seasonally variable, making it more vulnerable to droughts and floods.	The text in this box has been modified to clarify the concerns of the reviewer.
Mikko	McFeely	143090	Whole Page	23. Southern Great Plains		996				These references are not alphabatized and are incomplete.	I was told that TSU would complete the alphabatizing of references.
Mikko	McFeely	143091	Text Region	23. Southern Great Plains		1008	1008	11	14	Incomplete references	References were checked and completed.
Mikko	McFeely	143092	Text Region	23. Southern Great Plains		973	973	34	36	Chaudhuri et al. paper refers to overpumpage in the Ogallala Aquifer which is not hydrologically connected to the Gulf Coast region.	The reviewer is correct that the wrong reference was used. The reference has been corrected.
Michael	MacCracken	144558	Text Region	23. Southern Great Plains		966	966	11	12	It needs to be said what the timing of the sea level rise is being mentioned here--presumably 2100--but also to rephrase to indicate that sea level rise will continue for millennia unless very rapid and aggressive action is taken. Indeed, I've been suggesting that the way we ought to be talking about sea level rise is not to give a range in a particular year but to give an increase in sea level (1 m, 2 m, etc.) and give a range in time when this level is projected to occur. So, with regard to the statement here, it is really not whether sea level will reach 4 feet or not but when this might occur as we do seem to be really committed to at least this much, and does it really matter much if this is in 2100 or 2140, etc.--in either case, the issue will be retreat from the coastline, etc. So, here, I'd suggest making the point something like this (more briefly here, expanded in text) "as mid-range projections of sea level rise suggest a rise of up to a few feet by the end of the century and at least an equivalent amount of rise during the next century, occurring potentially earlier if emissions are not reduced and up to a few centuries later if emissions are reduced."	The Key Message was modified to include the timeframe of 2100. We did not address continuation beyond 2100 because 2100 appears to be the outer levels of confidence (CCSR does not project beyond 2100). We also did not address "unless very rapid and aggressive action is taken" because this is a policy decision beyond the scope of this document.
Michael	MacCracken	144559	Text Region	23. Southern Great Plains		966	966	19	19	The word "may" needs to be scrubbed throughout the chapter and report as it (and "could") rally provide no useful information about likelihood. The likelihood lexicon really needs to be used in place of these words. This sometimes requires rephrasing to say something like "If … this is not done, then „this is likely" and similar forms. But "may" is really a useless word (e.g., telling one's daughter she may go out is not really very useful guidance to be providing--the lexicon is intended to indicate some boundaries).	This perspective has been incorporated by the authors and modifications were made throughout the chapter.
Michael	MacCracken	144561	Text Region	23. Southern Great Plains		967	967	13	14	It is not only hurricanes that carry warm, moist Gulf of Mexico air up into the central Great Plains where its collision with cold air from the north can lead to very large convective storms and tornado outbreaks. I'd urge mentioning that the Gulf of Mexico's moister and warming air can thus be a threat during much more of the year than just during the hurricane season.	This comment was directed at the executive summary. The authors have chosen to incorporate this addition into the the text of the report, rather than in the executive summary.
Michael	MacCracken	144562	Text Region	23. Southern Great Plains		967	967	14	14	Is this a statement for now or in the future? And I think it would be helpful to mention why relative sea level rise is greater--and what it actually is.	This comment was directed at the executive summary. The authors have chosen to incorporate this addition into the the text of the report, rather than in the executive summary.
Michael	MacCracken	144563	Text Region	23. Southern Great Plains		969	969	16	18	While this has been true in the past as there has been no real source of warm, moist air to generate snow on the eastern slopes of the Rockies, this seems to be changing. With less cold air coming south from Canada (at least happening a bit less often--and that trend will likely continue), warm Gulf of Mexico air has on occasion penetrated in to Denver region, etc., and ends up leading, under the right situation, to lots of snow on the eastern slope of the Rockies (and when the penetrates further north, it dumps on the northern Great Plains and can flood the Missouri River, etc., when it melts as the region is not (yet) hydrographically well carved by large runoffs.	The text has been modified to distinguish the rivers in the SGP that are not impacted by snow melt.
Michael	MacCracken	144564	Text Region	23. Southern Great Plains		969	969	18	20	Out of curiosity, is it lack of air moisture that has been the cause of the drought, or lack of undercutting cooler air that is needed to get thunderstorms going, that has contributed to these drought conditions. For example, in the Southeast, the air has often been quite humid and yet they have had a drought--I'd suggest because the summertime air masses coming out of Canada that in the past have triggered thunderstorms are, due to global warming, no longer as cool and massive. Here on the Atlantic coastal plain, I sense (however inaccurate that is likely to be) that the weaker cool fronts out of Canada are no longer deep and strong enough in mid-to late summer to pour over the Appalachians and then trigger thunderstorms in the humid air that is present--and so we get dry periods. I'd suggest that instead of always talking about the climate, we go back a bit to thinking about the weather systems that trigger precipitation and how they are changing and why--and then what that is likely to mean for the future.	The role of undercutting cooler air in modulating Southern Great Plains drought has not yet been investigated. Therefore, we have not changed the original text.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144565	Text Region	23. Southern Great Plains		972	972	11	13	If at all possible, I'd encourage trying to include here a sense of how the weather is projected to change. So, presumably it will be less likely for cool Canadian air to make it this far south, so it will be warmer, and perhaps less likely to have thunderstorms triggered. Perhaps if we think a bit more in terms of the shifts in weather types and systems that are occurring, we'll get better at projecting plausible changes in extreme vents.	There is still a significant amount of research to be done on specific weather phenomena. Therefore, the text was expanded to more clearly deliniate the spefici nature of, and confidence in, particular types of extreme weather phenomena (Drawing upon findings in the USGCP CSSR.
Michael	MacCracken	144566	Text Region	23. Southern Great Plains		972	972	24	25	Except more time to dry out also means, generally, a greater likelihood of reaching soil moisture stress conditions and even drought as the following sentences note.	The text was revised to take into account this perspective.
Michael	MacCracken	144567	Text Region	23. Southern Great Plains		977	977	34	35	Not only temperature will be going up, but absolute humidity is also very likely to be going up along with it, so the discomfort index will take an extra jump. This would seem to merit mention.	Absolute humidity has been added to the text wioth appropriate references.
Michael	MacCracken	144568	Text Region	23. Southern Great Plains		978	978	3	3	The energy use goes up particularly because it takes about 20 times as much energy to cool moist air a degree as to cool dry air, so the rising absolute humidity is really problematic.	The authors felt that the inclusion of absolutel humidity in a previous public comment also addressed this concern as well.
Michael	MacCracken	144569	Text Region	23. Southern Great Plains		978	978	15	15	Just "less"--seems a modest effect. I would think that were this to occur, rationing, etc. might well be likely. Is what is there all that can be aid--perhaps say unless actions to do this and that (e.g., improve water use efficiency by going to low flow options, whatever).	Change text on line 15 to "could face water supply needs" (the way it is phrased in the TWDB report).
Michael	MacCracken	144570	Text Region	23. Southern Great Plains		978	978	35	35	And I'll venture it was moist Gulf of Mexico air that was the source of the heavy rain--occuring because normally the cooler Canadian air keeps the moisture further to the south, etc.	The comment is correct that the source of moisture was from the Gulf of Mexico. Hoiwever, the discussion in key message 2 was authored to focus on impacts rather than physical mechanisms causing the heavy rainfall.
Michael	MacCracken	144571	Text Region	23. Southern Great Plains		980	980	34	35	Just as a point of information, a study several years ago found that, by convention, the standards by which hydrologic conditions are chosen for use in evaluating the viability of projects required that only past data be used and not projections. Hopefully, that has been changed by now.	We thank the reviewer for the comment. The National Climate Assessment is a scientific document that provides a basis for decision making, but does not prescribe policy. Discussion of policy options is beyond its defined scope.
Michael	MacCracken	144572	Whole Chapter	23. Southern Great Plains						Overall, very well done with very nice examples	Thank you!
Dave	White	140869	Whole Chapter	24. Northwest						The heating in the Northwest is from 1980 not 1900.	Thank you for this correction.
Dave	White	140870	Whole Chapter	24. Northwest						All the NOAA station data prior to 1950 is hand entered and taken. Most by 1950 are electronic. This is why we should trust data from 1950 onward as facts and data prior as inferences.	We appreciate your comment.
Rose	Miller	141646	Text Region	24. Northwest		1049	1049	32	33	[This comment applies to all places that this Key Message is listed]. The last sentence of this Key Message makes a connection between climate mitigation investments and reduced health risks. However, term 'health co-benefits' is typically used to describe the indirect effects associated with reducing greenhouse gas emissions (e.g., reduced ozone precursor emissions associated with cleaner energy generation). The traceable account describes active transportation and green infrastructure as the activities that can have substantial co-benefits, but most readers will not think of these as directly stemming from 'climate mitigation investments'. In other words, there's a step in the logic chain that the authors seem to be missing, as active transportation and green infrastructure are typically outside a classic mitigation policy. Co-benefits is already a challenging topic for the intended audience of this assessment, so helping them see your connection is needed.	We appreciate the comment, but after careful consideration of this point, we have determined that the existing text is clear and accurate, and in-line with current literature and consistent usage. In recent literature and analysis across several disciplines the term "heatlh co-benefits" has not been limited to clean energy measures which you describe as a "classic mitigation policy". For instance the most recent IPCC report on "Human Health: Impacts, Adaptation and Co-Benefits" states that: "The literature on health co-benefits associated with climate change mitigation strategies falls into several categories (Smith and Balakrishnan, 2009; Smith et al., 2009). These include: • Reduce emissions of health-damaging pollutants, either primary or precursors to other pollutants in association with changes in energy production, energy efficiency, or control of landfills • Increase access to reproductive health services • Decrease meat consumption (especially from ruminants) and substitute low-carbon healthy alternatives • Increase active transport particularly in urban areas • Increase urban green space."
David	Wojick	141735	Text Region	24. Northwest		1022	1022	10	16	10 Key Message 2: Valued aspects of Northwest heritage and quality of lifeâ€"the natural 11 environment, wildlife, outdoor recreation, and Tribal culturesâ€"will change with the climate. 12 Increasing temperatures, reduced water availability, changing snow conditions, forest fires, 13 habitat fragmentation, and other changes are endangering the well-being of a wide range of 14 wildlife, threatening popular recreational activities and tribal subsistence and culture. For 15 the Tribes, the health and vitality of the salmon runs is a direct indicator of the wider health 16 of the region. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	We disagree with this comment in its entirety; it is directly contradicted by the scientific literature as summarized in NCA4 Volume 1 (as well as many other prior analyses and assessments of the science). We refer the reviewer to Volume 1 for more information on the scientific basis for observed change, natural and anthropogenic forcing, and more. It is accessible at science2017.globalchange.gov.
David	Wojick	141736	Text Region	24. Northwest		1027	1027	10	13	Here is the present text: 10 Future climate 11 change raises the risk for many of these extreme events, potentially compromising the 12 reliability of water supplies, hydropower, and transportation across the region. Isolated 13 communities and those with systems that lack redundancy are the most vulnerable. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	We disagree with this comment in its entirety; it is directly contradicted by the scientific literature as summarized in NCA4 Volume 1 (as well as many other prior analyses and assessments of the science). We refer the reviewer to Volume 1 for more information on the scientific basis for observed change, natural and anthropogenic forcing, and more. It is accessible at science2017.globalchange.gov.
David	Wojick	141737	Text Region	24. Northwest		1032	1032	5	12	Present text says this: 5 Key Message 4: The ability of regional social and healthcare systems to expand quickly beyond 6 normal service levels will fall short if cascading or acute hazards occur, exacerbating 7 existing socioeconomic disparities. In addition to an increased likelihood of acute hazards 8 and epidemics, disruptions in local economies and food systems could result in more chronic 9 health risks. Organizations and volunteers that make up the Northwestâ€™s collective safety net 10 are already stretched thin with current demands and will be further challenged by climate 11 stressors. The potential health co-benefits of future climate mitigation investments could help 12 to counterbalance these risks. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	We disagree with this comment in its entirety; it is directly contradicted by the scientific literature as summarized in NCA4 Volume 1 (as well as many other prior analyses and assessments of the science). We refer the reviewer to Volume 1 for more information on the scientific basis for observed change, natural and anthropogenic forcing, and more. It is accessible at science2017.globalchange.gov.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
David	Wojick	141738	Text Region	24. Northwest		1035	1036	35	2	Present text: 35 Key Message 5: Communities on the front lines of climate change experience the first, and often 36 the worst, effects. Frontline communities in the Northwest include Tribal and Indigenous 37 peoples, the economically disadvantaged, and those most dependent on natural resources for 38 their livelihoods. These communities generally prioritize basic needs, such as shelter, food, 1 and transportation; frequently lack economic and political capital; and have fewer resources 2 to prepare for and cope with climate disruptions. Comment: This text falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	We disagree with this comment in its entirety; it is directly contradicted by the scientific literature as summarized in NCA4 Volume 1 (as well as many other prior analyses and assessments of the science). We refer the reviewer to Volume 1 for more information on the scientific basis for observed change, natural and anthropogenic forcing, and more. It is accessible at science2017.globalchange.gov.
Rebecca	Ambresh	141869	Text Region	24. Northwest		1038	1038	2	12	I have suggested a rewrite of this text region: CAPTION: Social cohesion and networks can help communities adapt to changing climate conditions. One example of this principle in action is the Pacific Northwest Tribal Climate Change Network (https://tribalclimate.uoregon.edu/). The Network helps Tribes work together with each other, Universities, Federal agencies, and private and non-profit organizations to share information, strengthen networks, and build resilience at events such as the 2018 Tribal and First Nations Climate Summit (http://atnitribes.org/climatechange/events/) hosted by the Tulalip Tribes and co-sponsored by the Affiliated Tribes of Northwest Indians, the North Pacific Landscape Conservation Cooperative and the Pacific Northwest Tribal Climate Change Project. Photo Credit: Peggy Harris, Affiliated Tribes of Northwest Indians. The Pacific Northwest Tribal Climate Change Network is a regional collaboration aimed at understanding and communicating the impacts of climate change on indigenous peoples, tribal sovereignty and culture. The Network does this by sharing resources such as the Online Tribal Climate Change Guide (https://tribalclimateguide.uoregon.edu/) and discussing key actions and initiatives that are building resilience among Tribes in the region.	We appreciate your comments, and we have revised the caption and the photo selected for the Box.
Christen	Armstrong	141940	Text Region	24. Northwest		1014	1014	1	8	cross reference to Chapter 9	Thank you for this comment. A cross-reference to Chapter 9, Oceans and Marine Resources, has been added.
Christen	Armstrong	141941	Text Region	24. Northwest		1018	1018	32	37	cross reference to Chapter 9	Thank you for this comment. We have added a cross-reference to Chapter 9.
Christen	Armstrong	141942	Text Region	24. Northwest		1021	1021	34	39	we don't need another review of OA. Probably easier to have in one place, like Chapter 9 p334, and then just cross reference in the regional chapters.	We appreciate your comment. We have simplified this paragraph and added a cross reference to Chapter 9.
Christen	Armstrong	141943	Text Region	24. Northwest		1021		35		delete (and silicone). The paper only discussed pteropods which have a shell made out of calcium carbonate	Thank you for your comment. We have simplified this paragraph and deleted this citation.
Juanita	Constible	142441	Whole Chapter	24. Northwest						There are a lot of references to tribal issues related to climate change, and several mentions of Washington Tribes and one for the Nez Perce Tribe in Idaho, but no case studies or references to Oregon Tribes. On pg. 1047, there is a discussion of the impacts of climate change on first foods. This might be a good place to reference the work that the Confederated Tribes of the Umatilla Indian Reservation has done on first foods and climate (see example here: http://greatnorthernlcc.org/sites/default/files/documents/gnlcc_summer_2011_newsletter.pdf) Discussions about health impacts and climate change could reference the Confederated Tribes of Warm Springs: https://www.storycenter.org/case-studies//oregon-health-authority-and-confederated-tribes-of-warm-springs-using-storytelling-to-illustrate-the-impacts-of-climate-change-on-health.	Thank you for your comment - we have added the reference in regards to CTUIR's First Foods Framework.
Juanita	Constible	142692	Text Region	24. Northwest		1013	1013	18	21	The way this sentence is phrased is confusing, making it seem like declines in snowpack are reducing fire risk. Recommended edits in ALL CAPS: "Warmer winters have led to reductions in mountain snowpack that has historically blanketed the region's mountains, REDUCED wildfire risk, and provided a slow release of water for communities, agriculture, rivers, and soils."	Thank you for this coment. The text has been revised as suggested.
Juanita	Constible	142693	Text Region	24. Northwest		1013	1013	24	26	Please provide a citation for the sentence about ocean temperatures.	Thank you for this coment. A citation has been added for Bond et al 2015 (Bond NA, Cronin MF, Freeland H, Mantua N. 2015. Causes and impacts of the 2014 warm anomaly in the NE Pacific. Geophysical Research Letters 42(9): 2015GL063306. DOI: 10.1002/2015GL063306.)
Juanita	Constible	142694	Text Region	24. Northwest		1013	1013	25	27	Please provide a citation for the sentence about preparedness efforts.	Thank you for this comment. Text was added to this sentence to show that the evidence of increased preparedness across these stakeholders is evidenced by the presentations at the 6th and 7th annual Northwest Climate Conference. A citation was added for the conference.
Juanita	Constible	142695	Text Region	24. Northwest		1013	1013	33	36	Please provide citations for the sentence about the transformation of mountain areas.	Thank you for this comment. A citation has been added for Hicke et al 2013 (Hicke, J. A., Meddens, A. J., Allen, C. D., Kolden, C. A., 2013, Carbon stocks of trees killed by bark beetles and wildfire in the western United States, Environmental Research Letters, 8, 035032.)
Juanita	Constible	142696	Text Region	24. Northwest		1015	1015	15	18	The way this sentence is phrased is confusing, making it seem like declines in snowpack are reducing fire risk. Recommended edits in ALL CAPS: "Warmer winters have led to reductions in mountain snowpack that has historically blanketed the region's mountains, REDUCED wildfire risk, and provided a slow release of water for communities, agriculture, rivers, and soils."	Thank you for this coment. The text has been revised as suggested.
Juanita	Constible	142697	Text Region	24. Northwest		1015	1015	21	22	Please provide a citation for the sentence about ocean temperatures.	Thank you for this coment. A citation has been added for Bond et al 2015 (Bond NA, Cronin MF, Freeland H, Mantua N. 2015. Causes and impacts of the 2014 warm anomaly in the NE Pacific. Geophysical Research Letters 42(9): 2015GL063306. DOI: 10.1002/2015GL063306.)
Juanita	Constible	142698	Text Region	24. Northwest		1015	1015	28	31	Please provide citations for the sentence about the transformation of mountain areas.	Thank you for this comment. A citatiom has been added for Hicke et al 2013 (Hicke, J. A., Meddens, A. J., Allen, C. D., Kolden, C. A., 2013, Carbon stocks of trees killed by bark beetles and wildfire in the western United States, Environmental Research Letters, 8, 035032.)
Juanita	Constible	142699	Text Region	24. Northwest		1016	1016	18	20	The dollar total (more than $139 billion) matches Figure 24.1, but the number of jobs is too low (more than 700,000 in the text, more than 1.1 million in the figure).	Thank you for this comment. There was an error in the creation of the table. The jobs number for Washington should have been be 303,321, as reflected in the narative text. The jobs number presented in the table for Washington was the total number across all three states as opposed to the residual for Washington. The table has been corrected to reflect the correct jobs number.
Juanita	Constible	142700	Text Region	24. Northwest		1017	1017	18	22	Please provide citations for the sentence about changes in forests and forest management.	Thank you for this comment. Citations have been added to this sentence.
Juanita	Constible	142701	Text Region	24. Northwest		1017	1017	23	27	The "NOAA Fisheries 2016" citation does not seem to appear in the Reference list. Also, does that citation adequately cover the claims in the sentence starting "River temperatures ..."?	We appreciate your comment. We have added additional citations to this paragraph, and added NOAA Fisheries 2016 to the reference list.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142702	Text Region	24. Northwest		1018	1018	3	6	It seems that "shifts in planting dates" should be listed as one of the potential reasons for improved dryland wheat yields, given this passage in Karimi et al 2017: "Much of the favorable SW response to climate change in our simulation was due to shifts in planting dates to account for shifts in climate. Adaptations to new climate norms, such as adjusted planting dates and better adjusted cultivars, will be a critical component of farm success and sustainability in the future."	Thank you for this comment, the text has been edited to reflect this important addition.
Juanita	Constible	142703	Text Region	24. Northwest		1018	1018	25	26	Please consider expanding the idea that some forests may increase in productivity whereas others may decrease. The bulk of the paragraph seems to point to decreases in productivity, making that statement confusing without additional detail.	We appreciate this comement. Clarification and detail were added to the sentence. In particular, this sentence addressed potential ring growth, and did not address changes in disturbance that the rest of the paragraph discusses. This was clarified and some explanation for increases and decreases was added. The geography of the potential changes is quite complex, so spatial details are not listed. Detailed coverage of these topics is beyond the scope of this report, and there are other reports that cover this topic in more detail.
Juanita	Constible	142704	Text Region	24. Northwest		1019	1019	19	19	"Jones 2010" does not appear to be in the References. Did you mean to cite Jones 2004? Regardless, there is more recent work that is less optimistic about the future of wine in the Northwest. E.g., https://link.springer.com/article/10.1007/s00382-012-1377-1	Thank you for this comment and for the suggested literature. We have made an edit to the Jone citations which was incorrectly cited as 2010 when it was intended to be 2004. We have also added the referenced Diffenbaugh citation as it adds complexity to the projections for the region.
Juanita	Constible	142705	Text Region	24. Northwest		1019	1019	26	28	This entire paragraph could use some clarification. The first sentence suggests climate change could have a net neutral effect, but the rest of the paragraph suggests a net negative effect, once the costs and difficulties of climate adaptation are factored in. Recommendation: Make it clear that the effects will be net negative OR that the net effects are unknown, given current research -- but that regardless, crop and livestock producers will need to change how they do business.	We appreciate this comment. We have revised the text for clarity. We agree that the main point of the paragraph is that crop and livestock producers will need to change how they do business as the climate changes if they want to maintain their livelihoods.
Juanita	Constible	142706	Text Region	24. Northwest		1020	1020	10	10	This rather stark claim could use more explanation (and citations): "Many of the changes to the ocean environment cannot be adapted to or reduced."	This sentence and the paragraph that follows have been revised for clarity. The intent of the sentence was to highlight that the ocean environment will change gradually (get warmer, more acidic, etc.), and fisheries management practices will need to change to work within the limits of the natural environment.
Juanita	Constible	142707	Text Region	24. Northwest		1024	1024	15	15	Please provide citations for this paragraph.	Thank you for this comment. As this was a generalization of the econmic impacts that preceeded it, we will add these references accordingly.
Juanita	Constible	142708	Text Region	24. Northwest		1025	1025	15	17	The meaning of this sentence about cultural practices vs health is not clear.	Thank you for the comment. The paragraph was modified to be more concise and applicable to the key message. This paragraph was also modified in response to other public comments.
Juanita	Constible	142709	Text Region	24. Northwest		1026	1026	4	11	Where does this information come from? From which tribe is the quoted elder? What is the vintage of the quote?	Thank you for the comment. We have revised the text to reflect the name of the elder and their Tribal affiliation, along with the citation.
Juanita	Constible	142710	Text Region	24. Northwest		1026	1026	20	31	This paragraph is hard to follow. Recommendation: Start with the sentence about species extinctions, then move to how research is underway and has already shown results. Also, the sentence starting "The institutional network" could use some additional detail (does the "network" have a name, or is it an unofficial group?), an example of a trend that has been reversed, and citations.	Thank you for your comment. We have revised the paragraph for clarity and added an improved topic sentence and a citation as suggested. We disagree with the comment about the need for additional clarity related to the "institutional network". This term refers to a network of instituions that work together on these issues, and the text mentions a broad range of institutions that are currently collaborating. However, their are too many institutions to list within the limited space available for this chapter. This collaboration is not united under a common umbrella organization or name.
Juanita	Constible	142711	Text Region	24. Northwest		1028	1028	3	13	Please add citations, if available.	Thank you for your comment. The citation for this Case Study is located in the first sentence (US Climate Resilience Toolkit, 2017). All of the details on the flooding issues and master plan for relocation can be found in this citation.
Juanita	Constible	142712	Text Region	24. Northwest		1028	1028	37	38	Please provide a citation.	Thank you for your coment. The appropriate citation is Washington State Department of Ecology (WA ECY) 2016. 2015 Drought Response Summary Report https://fortress.wa.gov/ecy/publications/documents/1611001.pdf ; we have moved the location of the citation to more clearly attach it to this statement.
Juanita	Constible	142713	Text Region	24. Northwest		1030	1030	31	36	Please provide citations.	Thank you for your comment. Please see the caption for Figure 24.3, which provides the citation for the Sentry database. This information will also be available in the figure's metadata, maintained by USGCRP
Juanita	Constible	142714	Text Region	24. Northwest		1032	1032	22	25	Given the importance of agriculture to the Washington economy, please consider expanding this paragraph to include a more thorough discussion of the effect of heat on farmworkers. E.g., http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0164498	We appreciate your comment. We have revised the text and added the citation suggested.
Juanita	Constible	142715	Text Region	24. Northwest		1034	1034	28	34	By "climate position", do you mean a staffer to do this kind of work? Also, citations in this paragraph would be helpful.	Thank you for asking for clarificiation here… we have changed the word "position" to now read "program". Additional citations have also been added.
Mikko	McFeely	142872	Whole Chapter	24. Northwest						Understandably there is limited space in the chapter to consider all aspects of climate change in the region. However, the chapter seems to have very little consideration of urban areas within the region where the majority of the population lives. Maybe a way to address this is to reference other chapters like the human health and built environment to acknowledge climate impacts to urban areas in the Northwest will be significant. Additionally, urban areas in the region are doing a lot to adapt to climate change but very few case studies are mentioned. Suggest mentioning the work of municipal water systems like the Portland Water Bureau and Seattle Public Utilities who have worked in colloboration with regional scientists to assess climate impacts to the largest drinking water systems in the region. These are the types of partnerships that illustrate why the Northwest is leading the way in many aspects of climate adaptation. A reference for the water utility impacts assessment case studies is: Vogel, J., Smith, J.B., O'Grady, M., Fleming, P., Heyn, K., Adams, A., Pierson, D., Brooks, K., Behar, D. 2015. Actionable Science in Practice: Co producing Climate Change Information for Water Utility Vulnerability Assessments. Water Utility Climate Alliance.	Thank you for the comment. We have added a citation to Vogel et al (2015) and noted some of the leadership role that urban infrastructure managers have taken in the Northwest. The edits appear in the subsection of Key Message 3, "Challenges, Opportunities, and Success Stories for Reducing Risk"
Mikko	McFeely	142873	Whole Chapter	24. Northwest						Most of the impacts described in this chapter focus on extreme events. While obviously important, another more nuanced aspect of climate impacts in the region is that of shifting baseline conditions (e.g. gradually warmer stream temperatures over time). These could have sustained impacts beyond acute events. Please consider working in language about shifting baselines or sustained stressors where not just the extremes but the averages are shifting which can have implications for resource managers and species throughout the region.	We appreciate this comment. After careful consideration of this point, the author team has agreed that the chapter focuses on both shifting baselines, chronic stresses, and extreme events. Our 2015 case study is intended to highlight how extreme events that occur today could be the more typical "new daily or seasonal" condition of the future. We agree that this topic is one that can be explored in great depth, but given the limited space, our analysis has focused on 5 key messages that the Northwest faces, and each key message has elements of slow chronic stressrs and extreme events associated with climate change.
Mikko	McFeely	142874	Text Region	24. Northwest		1015	1015	23	31	This text section would be complemented by an image of low snowpack in 2015 or low reservoirs. Can you obtain an image from the Army Corps of the Detroit Lake Reservoir in 2015? Those stark images highlight what 2015 meant for the region.	Thank you for this comment. We have selected a photo from the Detroit Lake Reservoir for this section.
Mikko	McFeely	142875	Text Region	24. Northwest		1017	1017	9	9	It seems like the words later snowfall should actually be less snowfall? Because there could be later snowfall in the winter and earlier snowfall in the spring but to capture both might be best to just say less snowfall overall?	Thank you for this comment. The text was revised for clarity to address the comment.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	142876	Text Region	24. Northwest		1017	1017	18	22	This text section should be supported by a reference. There are studies that show increased area burned in the Northwest and it would be stronger to reference one of these to support the wildfire claim at least. This could be either data from the federal agencies on area burned in OR, WA and ID, or John Abatzoglou from Univerity of Idaho may have some graphic or reference that could be used to support the increase in widlfire area burned.	We appreciate your comment. Citations have been added to this paragraph. Additional citations were also added where appropriate in the executive summary, and later in this chapter, related to wildfire areas and forest management practices.
Mikko	McFeely	142877	Text Region	24. Northwest		1019	1019	19	20	While wine producers may see opportunity in growing different grapes in the region due to warmer temperatures, this text section should also acknowledge increased water stress in the Columbia River Basin. Suggest editing sentence to read something like: Northwest wine producers may see the potential for growing higher quality and higher value wine grape varietals (Jones 2010), but may also be limited by water supplies available for viniculture due to changing hydrologic regimes in the region.	Thank you for this comment. We have revised this paragraph to address this comment, as well as other comments on this paragraph. We agree that there are multiple factors that need to be taken into consideration to take advantage of shifting crop regimes, including water availability.
Mikko	McFeely	142878	Text Region	24. Northwest		1028	1028	28	32	Suggest mentioning in this section that the Eagle Creek Fire in 2017 closed down a large section of Interstate 84 (a key commerical trucking route) and the parallel railroad for several weeks, along with a closure of Columbia River barge traffic. These closures had regional economic impacts which may not yet have been quantified but were noted signficantly at the time in the media and by commericial sectors.	Thank you for the comment. We have added text to discuss economic impacts and disruption from the Eagle Creek fire.
Mikko	McFeely	142879	Text Region	24. Northwest		1030	1030	18	23	While this section notes the incorporation of equity into the Portland and Multnomah County climate action plan, another key feature and success story of this plan is the incorporation of strategies to address preparation and adaptation across multiple sectors within the City and County, including water systems, natural and built infrastructure and human health. Seems like the integration of all of these components into the plan, as well as equity, is the bigger message.	Thank you for this comment. We have expanded the text to also highlight the corss-sector nature of the Portland-Multnomah climate plan.
Mikko	McFeely	142880	Text Region	24. Northwest		1030	1030	10	38	While most of the challenges and opportunities in this section are specific, it seems worth calling out a broader theme in this section that one of the key opportunities in the region lies in the collboration between resource managers and scientists to assess and prepare for climate impacts across multiple sectors and resources. The Northwest really stands out in this approach to actionable science.	Great point. We have added a sentence in this section that highlights the success of cross-sector partnerships in the Northwest.
Mikko	McFeely	142881	Text Region	24. Northwest		1033	1033	9	10	This text section doesn't recognize that contaminants to drinking water may be a problem for smaller systems that don't have the means to treat these contaminants, but most systems will continue to meet Safe Drinking Water Act standards even if it costs more. So suggest editing to: …or increased contaminants caused by flood events in untreated or smaller drinking water systems.	Thank you for pointing out that the risk of drinking water contamination is mainly an issue that concerns private well users, not communities with municipal water systems. We continue to use drinking water contamination as an example of how toxic exposures increase, but we now clarify that this specific risk is in more rural areas.
Mikko	McFeely	142882	Text Region	24. Northwest		1033	1033	37	38	This sentence should not signgle out Cryptosporidium as that seems arbitrary but rather should list the set of pathogens defined by the Safe Drinking Water Act that could increase waterborne illness risk. Suggest changing sentence to read: Future extreme precipitation events could increase the risk of exposure to water related illnesses as the runoff introduces contaminants and pathogens (such as Cryptosporidium, Giardia and viruses) into drinking water (Trtanj et al 2016).	Thank you for suggesting we name additional pathogens that could increase waterborne illness, we have made this change.
Mikko	McFeely	142883	Text Region	24. Northwest		1048	1048	23	27	The list of references at the end of this text section should include a reference from the water sector. Suggest using the following reference: Vogel, J., Smith, J.B., O'Grady, M., Fleming, P., Heyn, K., Adams, A., Pierson, D., Brooks, K., Behar, D. 2015. Actionable Science in Practice: Co producing Climate Change Information for Water Utility Vulnerability Assessments. Water Utility Climate Alliance.	Thank you for your comment. We have added the reference
Karin	Bumbaco	143116	Text Region	24. Northwest		1013		17		The reference to "Vose et al. 2017" is not the list of references.	Thank you for this comment. The reference has been added to the list of references for this chapter.
Karin	Bumbaco	143117	Text Region	24. Northwest		1014		2		Brewer and Mass (2016) does not appear to be the right citation for increasing heat events or heavy rainfall. That paper's main finding is that one of the main components for heat waves in the coastal Northwest - offshore flow - may actually decrease the occurrence of heat events in the future.	Thank you for this comment. We have modified this citation to Kossin et al 2017 (Kossin, J.P., T. Hall, T. Knutson, K.E. Kunkel, R.J. Trapp, D.E. Waliser, and M.F. Wehner, 2017: Extreme storms. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 257-276, doi: 10.7930/J07S7KXX.)
Karin	Bumbaco	143118	Text Region	24. Northwest		1014	1014	2	3	The "severe winter storm" phrase can come across as referring to a snow storm. It may be better to word it as "severe storms may also occur more often during winter" to avoid any confusion in that area.	We appreciate this comment. After consideration of this point, we have determined that the existing text is more accurate and reflective of the citations. In general, severe storms only occur during the winter. The suggested text change may cause confusion regarding the prevalence of storms in other seasons.
Karin	Bumbaco	143119	Figure	24. Northwest	24.2	1014				A reference to this figure in the text is missing.	Thank you for this comment. We have re-written the Executive Summary and are no longer including this figure.
Karin	Bumbaco	143120	Text Region	24. Northwest		1015	1016	2	3	Why is this text the exact same as what's in the "summary overview"? It is incredibly redundant to have two sections back-to-back with the same exact text. Please rephrase one or the other. It reads like it's a mistake.	Thank you for this comment. We have re-written the Executive Summary to better highlight the chapter, the broader themes, and support the key messages.
Karin	Bumbaco	143121	Text Region	24. Northwest		1018	1018	7	8	Replace "Earlier high" with "Higher" for clarity.	Thank you for the comment. This is a good suggestion and the text has been revised.
Karin	Bumbaco	143122	Text Region	24. Northwest		1018	1018	2	13	This is a rather long sentence. Please separate into two sentences. So: "Earlier higher spring temperatures…. and can effect fruit quality as well as yield. Additionally, summer heat stress…".	Thank you for the comment. This is a good suggestion and the text has been revised.
Karin	Bumbaco	143123	Text Region	24. Northwest		1018		25		The sentence that some forests could increase in productivity reads a little like an offhand comment. Could some examples be provided here for a little more context?	We appreciate this comement. Clarification and detail were added to the sentence. In particular, this sentence addressed potential ring growth, and did not address changes in disturbance that the rest of the paragraph discusses. This was clarified and some explanation for increases and decreases was added. The geography of the potential changes is quite complex, so spatial details are not listed. Detailed coverage of these topics is beyond the scope of this report, and there are other reports that cover this topic in more detail.
Karin	Bumbaco	143124	Text Region	24. Northwest		1018	1018	32	33	For this sentence, inserting "negative" might be more clear. So: "The negative impacts on Northwest fisheries…".	Thank you for the comment. The text has been revised as suggested.
Karin	Bumbaco	143125	Text Region	24. Northwest		1028	1028	35	37	Please provide a reference for emergency water being used for human consumption during the 2015 drought in WA. Where, specifically, in the state did this occur? This part of the sentence comes across as anecdotal.	Thank you for your comment. The appropriate citation is Washington State Department of Ecology (WA ECY) 2016. 2015 Drought Response Summary Report https://fortress.wa.gov/ecy/publications/documents/1611001.pdf ; we have moved the location of the citation to more clearly attach it to this statement. The reference provides a map which indicates the locations of all projects funded, included those for public water supplies.
Devin	Thomas	143126	Text Region	24. Northwest		1034	1034	6	8	The word "marine" seems redundant in this sentence. It's probably not needed.	Thank you for your comment. We have removed the word marine.
Karin	Bumbaco	143128	Text Region	24. Northwest		1034	1034	11	13	Please replace the "in" with "among". So: "Oregon, Washington, and Idaho are all ranked among the top 10 states..".	Thank you for this correction. We have revised the text accordingly.
Devin	Thomas	143129	Text Region	24. Northwest		1036	1036	35	38	The point about barriers to climate adaptation for Tribes is vague. Can some examples of these challenges be provided? If it's too much to detail, perhaps this sentence should be removed.	We agree that additional examples of existing barriers would be helpful, and have made those addtions.
Devin	Thomas	143133	Text Region	24. Northwest		1037	1037	12	14	The reference to Bumbaco et al. (2013) is misquoted here. They did NOT find significant increasing trends in the intensity and duration of heat waves. The only significant trend was in the frequency of nighttime high temperature events.	We appreciate the reviewer's attention to detail. The text was revised to correctly cite the Bumbaco et al 2013 work and include additional citations for the broader national projections of increasing frequency and intensity of heatwaves.
Devin	Thomas	143136	Text Region	24. Northwest		1040	1040	15	16	Please specify whether these 2015 numbers are for the entire Northwest or not.	Thank you for your comment. We have clarified in the text that the numbers quoted here are for the Northwest.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Devin	Thomas	143138	Text Region	24. Northwest		1041	1041	15	24	These two paragraphs focus heavily on Oregon impacts. Are there winter and fish impacts that can be highlighted for Washington and Idaho as well?	We have added statements about winter recreation and fish impacts of the 2015 drought experienced in Washington and Idaho.
Devin	Thomas	143140	Text Region	24. Northwest		1042	1042	3	9	This paragraph discusses the 2015-16 winter. While this is relevant for the point of illustrating extremes, it's a little confusing since the section was framed as a discussion of the 2015 drought year (and now the discussion shifted to heavy rain). Perhaps a transitional sentence is needed to explicitly say that now the next winter is being referred to (not the drought year winter).	We appreciate your comment. We have moved this discussion to KM3 regarding impacts to infrastructure that occured during the extreme El Nino winter of 2015-2016.
Nicholas	Bond	143408	Text Region	24. Northwest		1018	1018	34	37	There is some evidence (Rykaczewski and Dunne 2010) based on model simulations that the ocean's productivity is liable to increase in a narrow strip along the US West Coast. The impacts are liable to impact through the entire food web with one negative consequence being hypoxia becoming more prevalent. My recommendation would be to include a general statement that the marine ecosystem will evolve as the climate changes, with both winners and losers. Rykaczewski, R. R., and J. P. Dunne (2010), Enhanced nutrient supply to the California Current Ecosystem with global warming and increased stratification in an earth system model, Geophys. Res. Lett., 37, L21606, doi:10.1029/2010GL045019.	We appreciate your comment and the citation. We have added a statement to this paragraph that highlights that there will be both consequences and opportunities as the marine ecosystem responds to climate change. A cross-reference was also added to Chapter 9 as this chapter provides additional detail on the larger marine ecocystem and the shifting species trends that may occur.
Nicholas	Bond	143409	Text Region	24. Northwest		1021	1021	23	27	I think there should be recognition of the work by Yoder and others that water markets provide a means for helping cope with drought. Yoder, Jonathan, Michael Brady, & Joseph Cook. 2016. Water markets and storage: Substitutes or complements for drought risk mitigation? Water Economics and Policy.	Thank you for this comment. After review of the literature, we have included a citation to Libecap 2011 as a reference to the potential use of water markets.
Nicholas	Bond	143413	Text Region	24. Northwest		1025	1025	20	22	There has been a recent increase in field studies testing how to best improve freshwater habitats. The Nooksack Tribe has been involved in this kind of effort, and I think there are other examples. The following EPA report may merit citing as an example. USEPA (U.S. Environmental Protection Agency). 2016. Final Project Report: EPA Region 10 Climate Change and TMDL Pilotâ€"South Fork Nooksack River, Washington. EPA/600/R-17/281. U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Western Ecology Division, Corvallis, OR.	Thank you for the comment. We have included the suggested citation (Please note that the recommended citation for this report is Klein et al, 2016).
Nicholas	Bond	143416	Text Region	24. Northwest		1031		13		There are certainly some areas, such as the location of the NOAA tide gauge in Seattle, where sea level is rising significantly relative to the ground level. A message worth getting across is that the isostatic rebound from the last Ice Age is location dependent, and that this mitigating factor cannot be relied upon everywhere across the Pacific NW, especially in the Puget Sound region.	We appreciate your comment. In repsonse to this comment, as well as other comments, we have revised this paragraph and eliminated reference to the Cascadia Subduction Zone and tectonic uplift. Although this is an important topic, it cannot be treated sufficiently within the limited space in this chapter.
Nicholas	Bond	143588	Text Region	24. Northwest		1032		30		Humans are beginning to become infected with WNV in the Pacific NW, as indicated on the following web site. These infections have led to fatalities in WA during 2016 and 2015. https://www.doh.wa.gov/DataandStatisticalReports/DiseasesandChronicConditions/WestNileVirus	Thank you. We have expanded the sentence to include the additional information you provided.
Nicholas	Bond	143589	Text Region	24. Northwest		1033	1033	33	36	The study by Jackson et al. (2010) should be cited here. Jackson, J. E., and Coauthors, 2010: Public health impacts of climate change in Washington State: Projected mortality risks due to heat events and air pollution. Climatic Change, 102, 159â€"186.	Thank you for suggesting this additional reference. We have revised the text accordingly.
Nicholas	Bond	143590	Text Region	24. Northwest		1037	1037	12	14	Bumbaco et al. (2013) showed that it was the "hot night" type heat waves that are increasing in frequency. These type of events appear to have greater impacts on human health (e.g., Gershunov et al. 2009). Gershunov, A., D. R. Cayan, and S. F. Iacobellis, 2009: The great 2006 heat wave over California and Nevada: Signal of an in- creasing trend. J. Climate, 22, 6181â€"6203.	We appreciate the reviewer's attention to detail. The text was revised to correctly sight the Bumbaco et al 2013 work and include additional citations for the broader national projections of increasing frequency and intensity of heatwaves and the influence of nighttime temperatures on human health.
Nicholas	Bond	143591	Text Region	24. Northwest		1042		26		I recommend substituting "bolster" for "save".	We have changed the word "save" to "bolster" as suggested.
Amber	Ziegler	143600	Text Region	24. Northwest		1025	1025	11	14	Tribes' management of their resources is not generally a matter of being "allowed," it is a matter of exercising sovereign rights (often recognized in treaties). A change to the language in this particular sentence is advised, perhaps to something along the lines of, "Facilitating Tribes' in exercising their sovereign rights to manage their resources in a self-determined and culturally-sensitive manner…"	Thank you for your comment. We agree with the need of the text changes to reflect Tribal sovereignty, which is not granted or allowed to them, but rather retained since time immemorial. We have revised the text to more appropriately reflect this.
Amber	Ziegler	143601	Text Region	24. Northwest		1026	1026	7	11	If this tribal elder requested not to be quoted by name, it should be stated somewhere, otherwise it seems more appropriate to state the elder's name and tribal affiliation.	Thank you for the comment. We have revised the text to reflect the name of the elder and their Tribal affiliation, along with the citation.
Michelle	Tigchelaar	143617	Text Region	24. Northwest		1018	1018	35	37	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Annie Crawley, Dr. Michelle Tigchelaar, Dr. Ronda Strauch, Dr. Cecilia Bitz, Dr. Richard Gammon. Regarding the conclusion that â€œrange shiftsâ€¦ may also open up new fishing opportunities in the Northwest (Cheun et al 2015).â€ A suggested change to this sentence to more sufficiently capture the complexity of this issue in light of management restrictions: â€œThe warming ocean will also result in range shiftsâ€¦shifting as far north as the Bering Sea; yet these changes may also open up new fishing opportunities in the Northwest (Cheung et al 2015), depending on interstate and international coordination between management agencies.â€ While the potential for range shifts to open new fishing opportunities is one that must be considered, the simplification of this issue may produce an inappropriate optimism that the movement of fish into Pacific Northwest waters is immediately equivalent to new fishing opportunities. However, this ignores the nuances of interstate (and potentially international, in the Northwest) management of fisheries, which may include the continuation of fishing rights with the original fishing fleet until serious (and potentially lengthy) negotiations have been completed. For example, North Carolina fishermen have one of the largest federal fishing quotas for black sea bass; as the species shifts itsâ€™ distribution north, the North Carolina fishermen have retained their quota allocation. So even though black sea bass are occurring in greater abundance off of the New Jersey / New York coast, fishermen there still have to respect federal quota allocations, and so additional fishing opportunities have yet to open up for northeastern fishermen in this fishery. The role of management in opening new fishing opportunities in response to range shifts could also be mentioned in the section â€œChallenges, Opportunities, and Success Stories of Reducing Risk.â€	We appreciate this comment and the detailed example provided; however, within the space limitations, this level of detail and speculation about changes in management/regulations is not appropriate. We have modified the text to highlight this as a potential area of concern, and we provided an additional reference to this potential concern in the Challenges, Opportunities, and Success Stories section.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michelle	Tigchelaar	143650	Whole Chapter	24. Northwest						This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Annie Crawley, Dr. Michelle Tigchelaar, Dr. Ronda Strauch, Dr. Cecilia Bitz, Dr. Richard Gammon. On the whole we thought Chapter 24 organized the key messages well and provided a substantial compendium of evidence to back the key messages. However, we hoped for more synthesis so that business owners or policy makers in the Northwest could use Chapter 24 as a guide for impacts planning or creating adaptation legislation. Similarly, the text provides little quantification of the magnitude of the projected climate impacts, or their relative importance compared to each other or non-climatic risks and vulnerabilities. The visual graphics in Figure 24.2 and 24.1 are examples of helpful synthetic information. We would be interested in seeing additional graphics. Visual representations of the content could be helpful to aid the reader in assessing how the impacts interact, and which of them to prioritize or prepare for. For example, a map showing locations of businesses that support outdoor activities that have reported climate impacts would be useful, or maps of crop or fisheries impacts.	We appreciate this comment; however, this comment is outside the scope of the document. The aim of the National Climate Assessment (NCA) is assessing the state of understanding of climate change, the science underlying it, and current and potential impacts on the United States. Volume 1 of NCA4 provides quantification of the magnitude of the projected climate changes. The Traceable Account for the chapter provides qualification of the likelihood of the identified climate impacts occuring based on the current state of the science. However, the assessment is not aimed at the creation of adaptation legislation, or with promoting speciifc ideas for mitigating or adapting to climate change.
Michelle	Tigchelaar	143651	Whole Chapter	24. Northwest						This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Annie Crawley, Dr. Michelle Tigchelaar, Dr. Ronda Strauch, Dr. Cecilia Bitz, Dr. Richard Gammon. Repeating the â€œSummary Overviewâ€? word-for-word in the â€œBackgroundâ€? is unnecessary and confusing to the reader. Also Figures 24.2 appears before Figure 24.1	Thank you for this comment. We have re-written the Executive Summary to better highlight the chapter, the broader themes, and support the key messages.
Michelle	Tigchelaar	143668	Text Region	24. Northwest		1027	1049	8	23	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Annie Crawley, Dr. Michelle Tigchelaar, Dr. Ronda Strauch, Dr. Cecilia Bitz, Dr. Richard Gammon. General comment for pages 1027-1032 and 1048-1049. The text accompanying Key Message 3 on Infrastructures has few supporting citations, especially key citations addressing the topic in the NW. It would be helpful to begin by defining infrastructure, and perhaps breakdown into several types. One of the most critical implications of linkages of climate to infrastructure is the vast interconnectedness of infrastructure. Without electricity, water canâ€™t be treated, and cell tower and hospital generators eventually run out of fuel. If trees and powerlines are down on the road, then emergency response is hampered and supply routes are cut off. This highlights the impact of wind and ice storms that may be tied to more extreme weather. This section could be strengthened by tying infrastructure to health and safety. When a severe storm knocks out power and roads, the first issues are health and safety, not the economy. Infrastructure was designed to historical climate, but also the environmental conditions resulting from that climate, such as the hydrology or fire regime. Additional citations to consider: â€¢ Douglas, E., Jacobs, J., Hayhoe, K., Silka, L., Daniel, J., Collins, M., … & Mallick, R. (2017). Progress and Challenges in Incorporating Climate Change Information into Transportation Research and Design. Journal of Infrastructure Systems, 23(4), 04017018. â€¢ Strauch, R. L., Raymond, C. L., Rochefort, R. M., Hamlet, A. F., & Lauver, C. (2015). Adapting transportation to climate change on federal lands in Washington State, USA. Climatic Change, 130(2), 185-199. â€¢ Wilhere, G. F., Atha, J. B., Quinn, T., Tohver, I., & Helbrecht, L. (2017). Incorporating climate change into culvert design in Washington State, USA. Ecological Engineering, 104, 67-79.	Thank you for your comment. We have adopted the "infrastructure" list provided in the Built Environment chapter (Chapter 11: p411, Lines 32-33). In the NW chapter, we focus on transportation, water, and electricity since we have documented examples of impacts and adaptation activities for those systems. We agree with the interconnectedness of infrastructure systems, and the importance of health impacts that follow from disruptions or damage to infrastructure systems. Your point is supported by our examples from floodng in Tillamook County, the important of "lifelines" in the Washington DOT analysis, and the map of shallow groundwater wells (Fig. 24.3). Notably, two of these examples were found in literature or data produced by the Departments of Health for Oregon and Washington, respectively. We have added references to Strauch et al (2015). A reference to Wilhere et al (2017) already appears on p. 1031, line 2. We chose not to cite the Douglas et al paper since it only considered infrastructure risks and adaptation at the national level, and lacks any regional examples.
Marnie	Boardman	143936	Figure	24. Northwest	24.3	1031				Since risk and vulnerability of drinking water systems is complex and relates to many factors besides well depth, we suggest using a cooler color scheme instead of â€œyellow/redâ€? (as noted in the caption) to denote well depth. We would be happy to assist in using Sentry data to develop a revised figure that would more accurately convey information about these particular two factors (single source and well depth).	Thank you for the comment, and for providing an alternate figure. We will insert the new figure with the cooler color scheme
Marnie	Boardman	143952	Text Region	24. Northwest		1031	1031	4	4	Title for Figure 24.3: The current title, "Groundwater Supply at Risk" is somewhat misleading. That phrasing may imply that the groundwater itself it at risk, which is not the main message being expressed with this figure. Rather, the figure/text are describing wells at different depths with a single source of water. The focus is about systems that lack a backup supply source. We would recommend the more accurate title â€œGroup A public water systems in WA with a single source of supplyâ€?.	Thank you for your comment. We agree, and we have updated the figure title. We have chosen to explain the meaning of "Group A" within the caption text
Marnie	Boardman	143960	Text Region	24. Northwest		1031	1031	5	9	If Figure 24.3 is altered to reflect a different color scheme, some of the language in this caption will need to be adjusted. As well, perhaps discussion of climate-sensitive risks in addition to drought could be mentioned (e.g., sea level rise, flooding), depending on the evidence and clarity of message.	We agree - we have edited the caption to address the better explain the relationship between single-source systems and climate risk.
Marnie	Boardman	143970	Text Region	24. Northwest		1034	1034	28	34	Great to see discussion of the public health / health sector and growing climate change capacity and actions in the northwest - thank you for including this. There are a few other examples of resilience actions that may be of interest: The Department of Health Office of Drinking Water's State Revolving Fund has made it possible for water system managers / utilities to apply for low interest loans that support resilience projects. As well, the DOH Marine Biotoxin Program operates an early warning system in partnership with academics, organizations and citizen scientists to increase the geographic breadth and frequency of sampling for harmful algal blooms that could compromise the safety of shellfish. More information about these activities could be provided upon request if the authors would like to add these examples.	Thank you for sharing these examples, we have added them to the 'opportunities and success stories' section.
Michael	MacCracken	144573	Text Region	24. Northwest		1018	1018	36	36	Just a note that use of the word "may" should be avoided as it really provides no indication of likelihood (nor does the word "could"). Proper practice is to choose phrasing related to the likelihood lexicon, even if one needs to add a qualifying phrase to do that. On the northward shift, do note that climate chnage will very likely continue after 2100, so a further shift would seem likely, although ocean acidification would eventually limit that. So, a predicament coming for the fish, and it is quite possible that fisheries might eventually no longer exist. So, in this paragraph, it would seem some time reference point is needed, etc.	Thank you for this comment. This sentence was modified for clarity, but the word "may" was retained. There are many factors beyond the range shift that will impact whether or not new fishing opportunities open up (the fishing rights currently allocated to tribes or fisherman in the old geographic area would need to be given to the tribes or fisherman in the new geographic area). Additional information was also added for clarity to help address this comment in the Challenges, Opportunities, and Success Stories section. In particular, we noed that there is uncertainty in the full extenet of the potential impacts on fishieries as the marine ecosystem evolves.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144574	Text Region	24. Northwest		1018	1018	39	39	Phrasing makes it seem as if the specific year 2090 is being indicated--would it not be better to say the lat 21st century or the end of the 21st century. Such specificity (also in saying 22% instead of rounding) also seems overdone.	Thank you for this comment. As the statistics were drawn directly from the primary report, we have chosen to keep the wording as is in the body of the report.
Michael	MacCracken	144575	Text Region	24. Northwest		1019	1019	3	3	Another misuse of "may". Might say "inappropriate land management practics would very likely adversely impact" or similar. One does need to say if impact would be harmful or not as well.	We appreciate your comment. The text was modified to use "will affect" instead of "may". The cited reference provides additional detail, the important point in this sentence is that the climate change response has dependence on land management practices.
Michael	MacCracken	144576	Text Region	24. Northwest		1019	1019	4	5	"are expected" as subject is plural. Also, scenarios are about the future, so "future" can be dropped, especially as we have the scenarios now.	Thank you for the comment. This sentence has been revised for clarity.
Michael	MacCracken	144577	Text Region	24. Northwest		1019	1019	19	19	Need to replace "may" on lines 19, 21, and 24--using words from lexicon. I'll now try to restrain myself and uge that a scrub be done on the chapter and words from the lexicon be chosen so that there is some indication of likelihood (there are lots of places).	Thank you for these suggested edits. The text has been revised as appropriate to be more precise.
Michael	MacCracken	144578	Text Region	24. Northwest		1022	1022	27	27	It seems to me it would be better here to say "While changes in climate Ã‰" (replacing "may, of course) and save the phrase "climate change" as singular to summarize all that is happening (see 1029, lines 1 and 2 where the singular is used in an encompassing way--really confusing to use it in plural).	We appreciate your comment. The text has been revised as suggested.
Michael	MacCracken	144579	Text Region	24. Northwest		1023	1023	1	2	Again, I think "changes in climate' would be better than "climate changes" as one is referring to particular aspects and not the overall problem. And another "may" on line 2--here one could indicate a condition or action that would make it likely for them to thrive (e.g., if range not overly restricted, or whatever) to make statement more meaningful.	We appreciate your comment. The text has been revised as suggested.
Michael	MacCracken	144580	Text Region	24. Northwest		1034	1034	5	5	The word "could" is as meaningless as "may"--really best to pull words from the lexicon to provide reader some useful insight as just about anything could occur. Again, a word to scrub from chapter as much as possible.	Thank you for this guidance. We have removed the word "could" and re-framed the sentence to be about increased risk.
Michael	MacCracken	144581	Text Region	24. Northwest		1035	1035	17	20	Is there some reason for this that could be offered as an explanation? Perhaps, the equitable climate. I'd actually imagine that in the Southeast the effective rate is likely higher--it is just that the needs for shelter are currently a good bit less because it is quite warm so even huts will do. As summers get hotter and the heat index goes up, my guess would be that the Southeast will have the most serious problem due to the share of population without air-conditioned living quarters. Perhaps those then homeless will head to the Northwest--its temperate climate might thus attract even more homeless.	We appreciate the reviewer's attention to detail. In this section, we do not have the space to further explore or explain the higher percentage of homeless populations in the Northwest. This sentence is included because the authors identified homeless populations as a vulnerable population. Climate influences on future migration patterns among homeless populations is not well-supported in the current literature.
Michael	MacCracken	144582	Text Region	24. Northwest		1041	1041	10	14	These are pretty high-precision estimates, especialy when there is then rounding to give the $500 million sum. I'd urge a bit of rounding to no more than two-figure precision or something. Seems quite odd the way it is.	We have rounded these figures to two significant digits and added text indicating these values are approximations of the numbers cited in the reference.
Michael	MacCracken	144583	Whole Chapter	24. Northwest						Overall, very well done, particularly in how the tribal and indigenous aspects were integrated in throughout the chapter.	We greatly appreciate the reviewer's comment.
Gregory	Swift	140864	Text Region	25. Southwest		1086		13		smoke	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Rose	Miller	141638	Text Region	25. Southwest		1094	1094	8	9	Line 8 and 9 seem slightly out of place for this paragraph. It is recommended moving this line up and address is earlier within the statement.	We thank the reviewer for the suggestion. The paragraph has been revised to clarify the flow of information.
Rose	Miller	141639	Text Region	25. Southwest		1115	1115	4	24	Most of this page seems very redundant to the information on page 1095. It is unknown if it was the effect of the authors to reiterate this information more than once.	We thank the reviewer for the comment. We have revised the Traceable Account to reduce repetition and better clarify basis of the Key Message.
Rose	Miller	141640	Text Region	25. Southwest		1095	1095	12	14	This statement seems excessive for the amount of information presented within this paragraph.	The sentence concisely summarises the numerous references documenting tree mortality in Southwest forests and woodlands.
Jeremy	Martinich	141641	Whole Chapter	25. Southwest						This is a very well written chapter pertaining to climate impacts in the Southwest. There is a plethora of information covering issues within California while not as much discussion over other parts of the southwest.	Thank you for your comment. We acknowledge that the chapter has much information pertaining to California, in contrast to the other southwestern states. This is because, since the 3rd National Climate Assessment, much new material, published studies, and climate impact stories have focused on California drought, the region's coast (California), and that state's renewable energy innovation.
Jeremy	Martinich	141642	Text Region	25. Southwest		1094	1094	31	32	The following sentence is policy prescriptive and should be edited. "Cutting greenhouse gas emissions through energy conservation and renewable energy can reduce ecological vulnerabilities." Adding a "for example" could probably fix it.	We have added a reference to the sentence to clarify that it reports results of studies that related greenhouse gas emission levels with the ecological vulnerabilities. An example is also given.
Janet	Andersen	141643	Text Region	25. Southwest		1085	1085	10	12	Please consider changing the beginning of the second sentence of Key Message 2 so that it starts with "Greenhouse gas emission reductions, …" This word change will improve consistency with other chapters, and remove confusion as to whether this sentence could be referring to vegetative ecosystem carbon.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
David	Wojick	141739	Text Region	25. Southwest		1091	1091	2	6	Here is the present text: 2 Key Message 1: Water supplies for people and nature in the Southwest are decreasing during 3 droughts due in part to human-caused climate change. Intensifying droughts, increasingly 4 heavy downpours, and reduced snowpack are combining with increasing water demands from 5 a growing population, aging infrastructure, and groundwater depletion to reduce the future 6 reliability of water supplies. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	We thank the reviewer for this comment. We disagree with this comment. The text supporting this key message represents the scientific understanding of the Earth's climate system, its responses to forcing factors and physical drivers of climate, and the state of the art with respect to modeling the Earth's climate system—all of which has been drawn from peer-reviewed literature and summarized in NCA4 Volume 1, which was published in November 2017. We refer the reviewer to Volume 1, in particular Chapters 1, 2, 3 and 4, for more information on the scientific basis for causes of changes in climate and the use of climate models to project future climate changes. NCA Volume 1 includes relevant citations. With respect to the likelihood of negative impacts, we refer you to NCA Volume 1, Chapters 5, 6, 7, 8, and 9, in addition to the literature cited in this chapter's text, and the Traceable Account text associated with this key message.
David	Wojick	141740	Text Region	25. Southwest		1093	1093	20	24	The present text says this: 20 Key Message 2: The integrity of Southwest forests and other ecosystems and their ability to 21 provide natural habitat, clean water, and economic livelihoods have declined as a result of 22 recent droughts and wildfire due in part to human-caused climate change. Carbon emissions 23 reductions, fire management, and other actions can help address future vulnerabilities of 24 ecosystems and human well-being. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	We thank the reviewer for this comment. We disagree with this comment. The text supporting this key message represents the scientific understanding of the Earth's climate system, its responses to forcing factors and physical drivers of climate, and the state of the art with respect to modeling the Earth's climate system—all of which has been drawn from peer-reviewed literature and summarized in NCA4 Volume 1, which was published in November 2017. We refer the reviewer to Volume 1, in particular Chapters 1, 2, 3 and 4, for more information on the scientific basis for causes of changes in climate and the use of climate models to project future climate changes. NCA Volume 1 includes relevant citations. With respect to the likelihood of negative impacts, we refer you to NCA Volume 1, Chapters 5, 6, 7, 8, and 9, in addition to the literature cited in this chapter's text, and the Traceable Account text associated with this key message.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
David	Wojick	141741	Text Region	25. Southwest		1096	1097	27	4	Present text: 27 Key Message 3: Homes, beaches, fish, and other coastal resources in the Southwest have 1 experienced sea level rise, ocean heating, ocean acidification, and reduced oxygen, all 2 manifestations of human-caused climate change. Coastal infrastructure, marine plants and 3 wildlife, and people who depend on fishing confront increased risks under continued climate 4 change. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	We thank the reviewer for this comment. We disagree with this comment. The text supporting this key message represents the scientific understanding of the Earth's climate system, its responses to forcing factors and physical drivers of climate, and the state of the art with respect to modeling the Earth's climate system—all of which has been drawn from peer-reviewed literature and summarized in NCA4 Volume 1, which was published in November 2017. We refer the reviewer to Volume 1, in particular Chapters 1, 2, 3 and 4, for more information on the scientific basis for causes of changes in climate and the use of climate models to project future climate changes. NCA Volume 1 includes relevant citations. With respect to the likelihood of negative impacts, we refer you to NCA Volume 1, Chapters 5, 6, 7, 8, and 9, in addition to the literature cited in this chapter's text, and the Traceable Account text associated with this key message. For evidence regarding observed and projected changes to sea level and ocean acidification, we refer the reviewer to NCA Volume 1, Chapters 12 and 13.
David	Wojick	141742	Text Region	25. Southwest		1102	1102	22	26	Present text: 22 Key Message 5: Renewable hydropower in the Southwest has shown declines during drought, 23 due in part to climate change. Continued temperature increases, energy use from a growing 24 population, and water competition with farms and cities reduce the future reliability of fossil 25 fuels and hydropower. Renewable solar and wind energy are increasing and offer future 26 options to cut carbon emissions and reduce water use. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	We thank the reviewer for this comment. We disagree with this comment. The text supporting this key message represents the scientific understanding of the Earth's climate system, its responses to forcing factors and physical drivers of climate, and the state of the art with respect to modeling the Earth's climate system—all of which has been drawn from peer-reviewed literature and summarized in NCA4 Volume 1, which was published in November 2017. We refer the reviewer to Volume 1, in particular Chapters 1, 2, 3 and 4, for more information on the scientific basis for causes of changes in climate and the use of climate models to project future climate changes. NCA Volume 1 includes relevant citations. With respect to the likelihood of negative impacts, we refer you to NCA Volume 1, Chapters 5, 6, 7, 8, and 9, in addition to the literature cited in this chapter's text, and the Traceable Account text associated with this key message.
David	Wojick	141743	Text Region	25. Southwest		1109	1109	8	12	The present text says this: 8 Key Message 7: Heat-associated deaths and illnesses, vulnerabilities to disease, and other health 9 risks to people in the Southwest increase in extreme heat and in climate conditions that foster 10 the growth and spread of pathogens. Improving stressed public health systems, community 11 infrastructure, and personal health can reduce serious health risks under future climate 12 change. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. That these health claims are highly questionable has already been pointed out to the USGCRP. See for example: "Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment" by Patrick J. Michaels and Paul C. "Chip" Knappenberger, Cato Institute, June 2015. https://www.cato.org/publications/public-comments/draft-impacts-climate-change-human-health-united-states-scientific Apparently the USGCRP has chosen to ignore this information.	We thank the reviewer for this comment. The text supporting the physical climate basis for this key message represents the scientific understanding of the Earth's climate system, its responses to forcing factors and physical drivers of climate, and the state of the art with respect to modeling the Earth's climate system—all of which has been drawn from peer-reviewed literature and summarized in NCA4 Volume 1, which was published in November 2017. We refer the reviewer to Volume 1, in particular Chapters 1, 2, 3 and 4, for more information on the scientific basis for causes of changes in climate and the use of climate models to project future climate changes. NCA Volume 1 includes relevant citations. With respect to the likelihood of negative impacts, we refer you to NCA Volume 1, Chapters 5, 6, 7, 8, and 9, in addition to the literature cited in this chapter's text, and the Traceable Account text associated with this key message. Given the model projections of future climate, in the absence of sufficient public health-related adaptations, the risks described in the text supporting this key message are plausible.
David	Iinouye	141816	Whole Page	25. Southwest		1090				Re: Fig. 25.1. I don't see a figure like that in the cited paper.	Thank you for your comment. Figure 6.1 was cropped and the color ramp adjusted for the SW to create the figure. The adaptation is noted in the caption.
Rebecca	Ambresh	141817	Whole Page	25. Southwest		1086				Line 13 missing a period.	The text has been modified as suggested.
Christen	Armstrong	141944	Text Region	25. Southwest		1098	1098	28	34	this paragraph needs work. "off California"" is not clear as I could interpret this is as the coastal waters also which the Carter 2017 paper does not address. The Carter 2017 paper references the Pacific Ocean - open ocean - surface water only. I suggest adding information from and reference to: Feely, R.A., et al., Chemical and biological impacts of ocean acidification along the west coast of North America, Estuarine, Coastal and Shelf Science (2016),	The reviewer makes a good point about research focusing on nearshore versus open ocean regions. Citations and text have been revised to summarize key findings from nearshore observation and modeling studies.
Christen	Armstrong	141945	Text Region	25. Southwest		1101		17		cross reference to Chapter 15	The text has been modified as suggested.
Felix	Guerrero	142065	Whole Chapter	25. Southwest						These findings noted in the executive summary should be publicized among all available media outlets. The scarcity of and the fights over water resources is increasing in this region and will add another layer of problems. The work in this report is summarized very well.	We greatly appreciate the reviewer's comment about the report and hope that the content is useful.
David	Peterson	142414	Text Region	25. Southwest		1085		10		Attributing recent droughts and wildfire to climate change is highly speculative. Atmospheric and biological processes that contribute to variability need to be considered more equitably here.	We thank the reviewer for this comment. The statements here are directly supported by specific analysis to discern attribution, as detailed in the cited references. No text revision is needed.
David	Peterson	142415	Text Region	25. Southwest		1095		21		What is meant by a â€œtipping pointâ€? This is too vague.	We thank the reviewer for this comment. The text has been revised to state what is meant by tipping point.
David	Peterson	142416	Text Region	25. Southwest		1095		31		Attributing the observed changes in subalpine forest to climate change is inappropriate. As stated in Millar et al. (2004), complex interactions of environmental variables, including climatic variation (e.g., PDO) were the proximal causes.	Millar et al. (2004) specifcally analyze the relative contributions of temperature, precipitation, and the Pacific Decadal Oscillation. They find that "Minimum temperature was the main effect related to accelerating annual branch growth in krummholz whitebark pine and initiation of pine invasion into formerly persistent snowfield openings." Climate change caused the increase in minimum temperature. This example has been reviewd and cited in the IPCC Fifth Assessment Report (Settele, J., R. Scholes, R.A. Betts, S. Bunn, P. Leadley, D. Nepstad, J.T. Overpeck, and M.A. Taboada. 2014. Terrestrial and inland water systems. In Intergovernmental Panel on Climate Change. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY.) So, the statement in this chapter is supported.
David	Peterson	142416	Text Region	25. Southwest		1116	1116	17	17	Change human climate change to human cause climate change	The text has been modified as suggested.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
David	Peterson	142417	Text Region	25. Southwest		1115		21		Attributing the observed changes in subalpine forest to climate change is inappropriate. As stated in Millar et al. (2004), complex interactions of environmental variables, including climatic variation (e.g., PDO) were the proximal causes.	Millar et al. (2004) specifcally analyze the relative contributions of temperature, precipitation, and the Pacific Decadal Oscillation. They find that "Minimum temperature was the main effect related to accelerating annual branch growth in krummholz whitebark pine and initiation of pine invasion into formerly persistent snowfield openings." Climate change caused the increase in minimum temperature. This example has been reviewd and cited in the IPCC Fifth Assessment Report (Settele, J., R. Scholes, R.A. Betts, S. Bunn, P. Leadley, D. Nepstad, J.T. Overpeck, and M.A. Taboada. 2014. Terrestrial and inland water systems. In Intergovernmental Panel on Climate Change. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY.) So, the statement in this chapter is supported.
Hannah	Fogle	142418	Text Region	25. Southwest		1115		26		The notion of tripling area burned is mostly conceptual, because if that were true, the negative feedback of existing burned areas would eventually reduce the extent of wildfires as fuels are reduced.	We thank the reviewer for the comment. We have revised the sentence to make clear that the statement refers to a projection from a scenario.
David	Peterson	142419	Text Region	25. Southwest		1116		15		Crimmins et al. (2011) has been largely discredited. If you cite this paper, then you also need to cite the published response to it, which demonstrated errors in the original analysis.	We thank the reviewer for this comment. The reference has been removed.
Juanita	Constible	142716	Text Region	25. Southwest		1085	1085	13	17	The first sentence of Key Message 3 is confusing, largely because the word "all" makes it seem like things like reduced oxygen have affected people's homes. Recommended edit: "Multiple manifestations of human-caused climate change, including sea level rise, ocean heating, ocean acidification, and reduced oxygen have affected the Southwest's shoreline and coastal resources. Marine plants and wildlife; people who depend on fishing; and coastal neighborhoods, businesses, and infrastructure face increased risks as the climate changes."	The key message text has been revised
Juanita	Constible	142717	Text Region	25. Southwest		1086	1086	28	33	Recommend starting a new paragraph with the marine heat wave section.	We thank the reviewer for this suggestion. In addition to starting a new paragraph with the marine heat wave section, I added a new sentence describing the historical variations in ocean temperature in the northeast Pacfiic and off the coast of California.
Juanita	Constible	142718	Text Region	25. Southwest		1086	1086	37	38	Starting the 2nd sentence in this paragraph with "Yet" makes it seem like tribes are developing adaptation and mitigation actions despite the increased drought and heat, instead of in reaction to the changes.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Juanita	Constible	142719	Figure	25. Southwest	3	1087				Please consider adding more information to the Y-axis label. E.g., "Estimated cumulative forest fire area (million hectares)."	The text has been modified as suggested.
Juanita	Constible	142719	Figure	25. Southwest	3	1096				Please consider adding more information to the Y-axis label. E.g., "Estimated cumulative forest fire area (million hectares)."	The text has been modified as suggested.
Juanita	Constible	142720	Text Region	25. Southwest		1089	1089	7	8	The sentence about transferring water seems out of place. Is there a connection between installation of renewables and water transfers?	We thank the reviewer for the comment and have deleted the sentence.
Juanita	Constible	142721	Text Region	25. Southwest		1089	1089	7	11	Please provide citations for the latter half of this paragraph.	We thank the reviewer for the comment and have added supporting citations.
Juanita	Constible	142722	Whole Page	25. Southwest		1088				This section could be made more clear if it was reordered along these lines: Diversity of Southwest (currently lines 2-10, p 1088), diversity of ecosystems (currently lines 26-33, p 1088), California coast (currently line 34, p 1088 to line 3, p 1089), scarce water (currently lines 11-25, p 1088), hottest temperatures (currently lines 25-31, p 1089), heat + human health (currently lines 12-23, p 1089), heat + water (currently line 32, p 1089 to line 5, p 1090), projected temperatures (currently lines 6-11, p 1090), heavy rainfall (currently lines 12-16, p 1090), mitigation (currently lines 4-11, p 1089)	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Juanita	Constible	142723	Text Region	25. Southwest		1092	1092	29	31	An example of the new techniques in use would be helpful here.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion, and we have included references.
Juanita	Constible	142724	Text Region	25. Southwest		1093	1093	25	26	This sentence sounds like fire is only "natural" because it's beneficial. Recommended edit: "Wildfire, which can facilitate germination and kill pests, is a natural part of many ecosystems in the Southwest."	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Juanita	Constible	142725	Text Region	25. Southwest		1093	1093	28	28	The sentence starting "Furthermore" is confusing. Recommended edit: "Furthermore, climate change made a larger contribution to burned area in the western United States from 1916 to 2003 than fire suppression, local fire management, or other non-climate factors."	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Juanita	Constible	142726	Text Region	25. Southwest		1094	1094	20	22	The sentence starting "While ecosystems" is confusing. Recommended edit: "Although ecosystems can naturally slow climate change by storing carbon, recent wildfires have made California ecosystems and Southwest forests net carbon emitters."	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Juanita	Constible	142727	Text Region	25. Southwest		1095	1095	14	16	Isn't drought also thought to be an important driver of bark beetle outbreaks? E.g., http://onlinelibrary.wiley.com/doi/10.1002/ecy.1963/full	We thank the reviewer for the comment. Drought is indeed implicated as an important driver of beetle outbreaks, as evidenced in the Hart et al. reference mentioned in the comment. We have addded this information and citation to the sentence.
Juanita	Constible	142729	Text Region	25. Southwest		1100	1100	19	21	To what time frame are the elders referring?	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Juanita	Constible	142730	Text Region	25. Southwest		1101	1101	27	29	Starting the 2nd sentence in this paragraph with "Yet" makes it seem like tribes are developing adaptation and mitigation actions despite the increased drought and heat, instead of in reaction to the changes.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Juanita	Constible	142731	Text Region	25. Southwest		1101	1101	36		Is fire currently being used as a climate adaptation tool? That's not clear from the paragraph.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Juanita	Constible	142732	Text Region	25. Southwest		1102	1102	6	13	The water supply section of this paragraph feels out of place in a paragraph that starts with climate adaptation plans. Recommend moving it earlier in the section, to group it with the other climate impact statements.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Juanita	Constible	142733	Text Region	25. Southwest		1103	1103	15	17	The sentence about the growth of renewables is confusing in the middle of information about drought and hydropower. Recommend moving to page 1104, to the paragraph starting on line 16.	The sentence moved further down.
Juanita	Constible	142734	Text Region	25. Southwest		1104	1104	6	10	Which is the biggest water user/source of "water supply stress": Agriculture, or energy? The first 2 sentences of this paragraph seem to contradict each other. Also, by "energy", do you specifically mean electricity production, versus oil and gas extraction or other activities in the energy sector?	We thank the reviewer for this comment and have changed the second sentence to distinguish the varying stressors in different regions of the Southwest.
Juanita	Constible	142735	Text Region	25. Southwest		1105	1105	17	22	This paragraph ignores the fact that transportation electrification provides a net reduction in fossil energy use and emissions compared to driving on gasoline. Furthermore, electric vehicle load can be aligned with intermittent generation to improve their capacity factors and help the economics in a way that can accelerate their deployment. For more information: https://www.epri.com/#/pages/product/3002006881/; https://www.nrdc.org/resources/americas-clean-energy-frontier-pathway-sa… and https://www.nrdc.org/resources/driving-out-pollution-how-utilities-can-a…	We thank the reviewer for this comment. The text has been revised to incorporate this perspective.
Juanita	Constible	142736	Text Region	25. Southwest		1107	1107	10	10	Please consider explaining what "center pivot irrigation" is, or using a less technical term.	We thank the reviewer for this suggestion and have simplified the text.
Juanita	Constible	142737	Text Region	25. Southwest		1107	1107	27	29	Please add citations for the last two sentences in this paragraph.	We thank the reviewer for this suggestion. Citations were added to both sentences.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142738	Text Region	25. Southwest		1107	1107	34	35	Please clarify why almond acreage has expanded (i.e., is it due to non-climatic factors?), and what the chilling requirements are for almonds (i.e., are they at risk of warmer winters?)	Thank you for your comment. Details about California almond production have been added.
Juanita	Constible	142739	Text Region	25. Southwest		1110	1110	4	16	Please consider highlighting poverty and other social vulnerability metrics. E.g., https://www.ncbi.nlm.nih.gov/pubmed/27583525 and http://www.sciencedirect.com/science/article/pii/S0013935115000687 and https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3569676/	We thank the reviewer for the comment. The chapter text has been edited in the overview and the KM7 sections with references added (Harlan 2013, Eisenman 2016)
Juanita	Constible	142740	Text Region	25. Southwest		1110	1110	29	31	The sentence starting "Increased temperatures may increase" seems like it belongs in the previous paragraph.	Thank you for the comment. We have not moved this text as it relates to how temperature affects ozone formation and aeroallergen production, versus the previous paragraph which discusses the direct impacts of high temperatures on health. However, we have edited the paragraph to clarify that distinction.
Juanita	Constible	142741	Text Region	25. Southwest		1111	1111	22	30	This section would benefit from Southwest-specific examples and citations.	Thank you for the comment. We have added some citations for literature that supports the value of these strategies in studies from Arizona, California, and New Mexico
Juanita	Constible	142742	Text Region	25. Southwest		1111	1111	31	37	Recommend moving this paragraph before the one currently starting at line 15. (Which starts "Policies and interventions ...")	Thank you for comment. We have made the suggested change.
Juanita	Constible	142743	Text Region	25. Southwest		1112	1112	1	9	This paragraph feels out of place after the adaptation discussion. Recommend moving it up to group it with other problem statements. (E.g., before the paragraph starting on line 2 of page 1111.)	Thank you for the suggestion. The author team had established an organization for key message text such that each one ended on one or more emergent issues of concern (and research focus). Mental health impacts met that criterion for KM7. Therefore we have not moved the paragraph; however, we have modified the text to highlight that mental health impacts is an emergent issue.
Juanita	Constible	142744	Figure	25. Southwest	8	1112				The figure caption seems to have some words missing. Currently the meaning isn't clear.	The caption has been edited for clarity.
Mikko	McFeely	142884	Text Region	25. Southwest		1085	1085	14	14	Change ocean heating to ocean warming. Warming has been used throughout the document and is more widely used	We thank the reviewer for this suggestion and have changed the text accordingly.
Mikko	McFeely	142885	Text Region	25. Southwest		1085	1085	15	16	plants and wildlife are terms more appropriate for terrestrial ecosystems and doesn't encompass plankton, algae etc. which will be affected and are discussed further on in the document. Consider marine flora and fauna	The text has been modified as suggested.
Mikko	McFeely	142886	Text Region	25. Southwest		1086	1086	13	13	Add period at end of sentence	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142887	Text Region	25. Southwest		1086	1086	14	15	Confusing sentence, extreme heat events in heat waves. Remove and extreme heat events or in heat waves to make it simpler, less confusing.	Thank you for your comment. We have edited the sentence.
Mikko	McFeely	142888	Text Region	25. Southwest		1086	1086	25	25	Golden Gate or Golden Gate Bridge? Add bridge, unless golden gate is a place, but I've never heard of it used this way.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142889	Text Region	25. Southwest		1086	1086	25	25	Decimals are used throughout the document, this is the only place there is a fraction. Change to 8.75	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142890	Text Region	25. Southwest		1086	1086	31	33	Add a phrase or sentence to describe that this would be detrimental to marine life and the economy. The effects of heat stress are described in prior sentences, but ocean acidity is left undescribed.	added this sentence: "One ecosystem modeling study suggests negative effects of projected ocean acidification on California's state-managed crab, shrimp, mussel, clam and oyster fisheries, but an increase in the urchin fishery (Marshall et al. 2017)."
Mikko	McFeely	142891	Text Region	25. Southwest		1086	1087	37	38	These two sentence seems dropped in here. Needs to be expanded on. The focus also is on adaptation and mitigation despite forcible relocation rather than focusing on climate change effects, which the rest of the text in this section describes.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142892	Whole Page	25. Southwest		1086				sentences and paragraphs are lifted from elsewhere in the chapter so it feels a bit choppy at times. Work on the flow	This Executive Summary is mandated to use verbatim text from the body of the chapter. Consequently, the text in this section will be redundant with text elsewhere in the chapter. It has been edited to flow more smoothly.
Mikko	McFeely	142893	Text Region	25. Southwest		1088	1088	18	18	replace Increasing temperatures of climate change, with the increasing temperatures associated with climate change	Increasing temperature is the core component of climate change, so "of" is retained.
Mikko	McFeely	142894	Text Region	25. Southwest		1088	1088	26	28	Wordy sentence. Consider: Ecosystems of the Southwest gradually change from deserts and grasslands in hotter, lower elevation area to the south, to forests and alpine meadows in cooler, higher elevation areas in the north.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142895	Text Region	25. Southwest		1089	1089	35	35	remove due to climate change. The prior sentence describes this and it is unnecessary.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142896	Text Region	25. Southwest		1090	1090	10	10	What is a mega drought. Add a sentence	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142897	Text Region	25. Southwest		1091	1091	7	10	Human caused climate change intensified the recent severe drought in first sentence and the higher temperatures of climate change intensified drought in the next sentence. Repeated. Remove one as it is redundant	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142898	Text Region	25. Southwest		1091	1091	20	20	Confusing word choice in this line. Change significant alterations or word order. Consider: While natural variation can significantly alter the water cycle in the Southwest, climate change has been identified as a greater contributer than any natural variation	We thank the reviewer for the comment. The chapter text has been revised to change the word order.
Mikko	McFeely	142899	Text Region	25. Southwest		1092	1092	15	16	replace, and filled some dams, with and filled dammed reservoirs. The word some is vague.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142900	Text Region	25. Southwest		1092	1092	36	36	Three Key Actions is an incomplete sentence.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion
Mikko	McFeely	142901	Text Region	25. Southwest		1092	1092	38	38	Change being forced use it to being forced to use it	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142902	Text Region	25. Southwest		1093	1093	1	1	Change lose the rights to lose their rights	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142903	Text Region	25. Southwest		1093	1093	27	27	Change doubled to two times greater	The text has been modified as suggested.
Mikko	McFeely	142904	Text Region	25. Southwest		1093	1093	25	28	The first sentence doesn't connect with the point of the next sentence. The word Yet doesn't lead to an antagonistic argument of the first point, it is a completely different statement. The lead sentence is more appropriate at paragraph starting on line 18.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142905	Text Region	25. Southwest		1094	1094	24	25	Suggest adding the year the wildfire happened or name the wildfire. Saying one wildfire in New Mexico seems too vague.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. The name of the fire, "Las Conchas" has been added.
Mikko	McFeely	142906	Text Region	25. Southwest		1094	1094	30	30	Define very large fire e.g. fires greater than xxx	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. The size of very large fires has been added as >5000 ha.
Mikko	McFeely	142907	Text Region	25. Southwest		1094	1094	30	33	burned area in California could triple repeated on line 33 climate change could triple burned area. Line 33 is more specific to Sierra Nevada, consider removing it on line 30	We thank the reviewer for the comment. We have revised the paragraph to improve the flow of information and reduce redundancy.
Mikko	McFeely	142908	Text Region	25. Southwest		1095	1095	6	10	and attributed, in part, to human caused climate change on line 6. attributable, in part, to human caused climate change on line 10. Repetative language choice, consider changing	We thank the reviewer for the comment. The chapter text has been reorganized and this redundancy has been eliminated.
Mikko	McFeely	142909	Text Region	25. Southwest		1095	1095	14	15	Incorrect sentence construction. Change to Driven by winter warming, bark beetle infestation etc. rather than tacking on driven by winter warming on the end.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142910	Text Region	25. Southwest		1097	1097	1	1	Ocean warming not Ocean heating	Changed all instances.
Mikko	McFeely	142911	Text Region	25. Southwest		1097	1097	2	3	plants and wildlife are terms more appropriate for terrestrial ecosystems and doesn't encompass plankton, algae etc. which will be affected and are discussed further on in the document. Consider marine flora and fauna	Thank you for the comment. The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	142912	Text Region	25. Southwest		1097	1097	5	5	Golden Gate or Golden Gate Bridge? Add bridge, unless golden gate is a place, but I've never heard of it used this way.	Thank you for the comment. The text has been clarified.
Mikko	McFeely	142913	Text Region	25. Southwest		1097	1097	11	14	This paragraph doesn't flow with the others, doesn't relate to climate change. It speaks to sea level rise but still doesn't really fit in with the paragraph. Consider removing or turning into a simpler one contrary sentence in one of the other paragraphs	Thank you for the comment. The text has been revised to incorporate this suggestion.
Mikko	McFeely	142914	Text Region	25. Southwest		1097	1097	19	19	so much of this population is a very vague statement. What is meant by so much of? Define more clearly.	Thank you for the comment. The text has been revised to incorporate this suggestion.
Mikko	McFeely	142915	Text Region	25. Southwest		1097	1097	25	25	in one part of is vague. What part? Or just remove	Thank you for the comment. The text has been revised to indicate that the area is Stinson Beach.
Mikko	McFeely	142916	Text Region	25. Southwest		1097	1097	32	35	Word choice. A plan cannot construct. Change to Includes the construction of terraced wetlands, and change avoids to limits	Thank you for the comment. The text has been revised to incorporate this suggestion.
Mikko	McFeely	142917	Text Region	25. Southwest		1098	1098	23	23	Change economic damage to economic losses	Thank you for the comment. The text has been revised to incorporate this suggestion.
Mikko	McFeely	142918	Text Region	25. Southwest		1098	1098	33	33	unnecessary comma	Thank you for the comment. The text has been revised to incorporate this suggestion.
Mikko	McFeely	142919	Text Region	25. Southwest		1098	1099	35	8	Ends line 8 next page. This whole paragraph starts with a very specific sentence and then gets more general. Lead with the problem of what acidification can do as a whole and then get more specific. The section is choppy sentences grabbed from different sources not flowing together	Thank you for the comment. The text has been revised to incorporate this suggestion.
Mikko	McFeely	142920	Text Region	25. Southwest		1100	1100	17	25	Remove first sentence discussing acorns, corn etc. or move to next paragraph after lines 2 through 4 on page 1101. There is no real context for why this is important and it is very specific	We thank the reviewer for the comment. The chapter text has been revised to clarify the importance of including this information.
Mikko	McFeely	142921	Text Region	25. Southwest		1101	1101	20	20	Does inundation damage or kill shellfish? Why is this bad?	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142922	Text Region	25. Southwest		1101	1101	29	30	In the phrase, a traditional ecological knowledge or traditional plants, remove a traditional. It sounds repetitive.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142923	Text Region	25. Southwest		1101	1102	39	39	How does the use of fir for cultural purposes reduce risk of damaging wildfires. Move the sentence from lines 18 through 20 (the description of the figure) to here in the text	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142924	Text Region	25. Southwest		1103	1103	14	14	Change to which echoes across the Southwest otherwise it is confusing as the next phrase is only talking about California. Or reorder sentence	The text has been modified as suggested.
Mikko	McFeely	142925	Text Region	25. Southwest		1103	1103	16	16	change to by 15 times instead of 15 times, otherwise it is incorrect	The text has been modified as suggested.
Mikko	McFeely	142926	Text Region	25. Southwest		1103	1103	27	28	Is this the same statement in line 20 to 21?	No - line 20-21 is refering to the loss of hydroelectric capacity due to reduced stream flow. Line 27 and 28 are refering to the loss of thermoelectric capacity due to efficiency loss because cooling water used to cool power generators are warming.
Mikko	McFeely	142927	Text Region	25. Southwest		1103	1103	7	8	What is the capacity and what is the current level, might be more impactful to say the numbers	We thank the reviewer for this comment. More specific information has been added to the text.
Mikko	McFeely	142928	Text Region	25. Southwest		1103	1103	35	39	Very long sentence, split in two after earlier snowmelt	Thank you for your comment. We agree and have split the sentence.
Mikko	McFeely	142929	Text Region	25. Southwest		1107	1107	3	3	Delete the word Indeed. It is unnecessary. Also what is a large fraction of?	Thank you for your comment. The word has been removed and percentages and citation have been added.
Mikko	McFeely	142930	Text Region	25. Southwest		1107	1107	18	18	Delete comma after differently	The text has been modified as suggested.
Mikko	McFeely	142931	Figure	25. Southwest	8	1112				The description says days greater than 90 between 1976 and 2005 and 2036 and 2065 within the figure. Erase this as there is a description under the figure and this doesn't agree	Figure legend and caption changed.
Mikko	McFeely	142932	Whole Page	25. Southwest		1112				Might want to mention the potential link between extreme heat and an uptick in violent crime somewhere in this section as it can consridered a public health concern for victims (both physical and mental) and economically costly	Thank you for your comment. We have inserted some text to make this point (in the section discussing mental health impacts). Due to space limitations we could only add a brief note related to this important and to date understudied area of concern.
Mikko	McFeely	142933	Text Region	25. Southwest		1113	1113	32	36	Consider making this sentence two sentences after other forcing	Thank you for your comment. We agree and have split the sentence.
Mikko	McFeely	142934	Text Region	25. Southwest		1115	1115	4	7	Put in the beginning of this traceable accounts section as it is useful for understanding all the key messages, not just this ecosystem one. Attribution is mentioned on line 3 of page 1114 but this description comes after	Thank you for your comment. We have made the suggested change to the Traceable Accounts section.
Mikko	McFeely	142935	Text Region	25. Southwest		1115	1115	15	24	These sentences are wordy and confusing. Use shorter simpler sentences instead of, and, and commas.	Thank you for your comment. We simplified and corrected the text to make it easier to comprehend.
Mikko	McFeely	142936	Text Region	25. Southwest		1115	1115	4	24	The heat of human cause climate change is used many times in this section, consider changing it in some places to not sound so repetitive	Thank you for your comment. We have eliminated some of the redundancy.
Mikko	McFeely	142938	Text Region	25. Southwest		1116	1116	24	24	Change ocean heating to ocean warming. Warming has been used throughout the document and is more widely used	The text has been modified as suggested.
Mikko	McFeely	142939	Text Region	25. Southwest		1116	1116	26	26	Change marine plants and wildlife to marine flora and fauna	The text has been modified as suggested.
Mikko	McFeely	142940	Text Region	25. Southwest		1116	1116	29	29	Golden Gate or Golden Gate Bridge? Add bridge, unless golden gate is a place, but I've never heard of it used this way.	The text has been modified as suggested.
Mikko	McFeely	142941	Text Region	25. Southwest		1116	1116	38	38	Change in the Pacific to in the Pacific Ocean	The text has been modified as suggested.
Mikko	McFeely	142942	Text Region	25. Southwest		1117	1117	2	4	Vague statement. What times of year? What acidic values? Also change increasing as much to increasing by as much	Thank you for this helpful comment. We have added information and revised as suggested.
Mikko	McFeely	142943	Text Region	25. Southwest		1117	1117	11	13	Word choice is confusing. Change sentence to Climate change impacts compound overfishing and make fish populations more vulnerable. Second sentence potential economic changes are the result of these factors, it is economies that are subject to	Thank you for these very helpful suggestions and comments. The text has been revised accordingly.
Mikko	McFeely	142944	Text Region	25. Southwest		1117	1117	15	17	Remove and and make two sentences	Thank you for this helpful comment. We have revised as suggested.
Mikko	McFeely	142945	Text Region	25. Southwest		1124	1124	26	26	Delete will or may	Thank you for your comment. The text has been edited.
Mikko	McFeely	142946	Text Region	25. Southwest		1125	1125	16	16	In the phrase, may be in because, delete the word in.	The text has been modified as suggested.
Mikko	McFeely	142947	Whole Chapter	25. Southwest						Possibly discuss the effect of climate change on Arizona monsoons (and haboobs and the possible health effects)?	Thank you for your comment. The text supporting Key Message 7 has been edited to discuss the effect of climate change on haboobs and possible health effects. Given limited space, we will not be addressing the effect of climate change on Arizona monsoons.
Mikko	McFeely	142948	Whole Chapter	25. Southwest						This chapter will benefit from a technical editor, many statements are abrupt and disjointed.	Thank you for your comment. The text has been edited.
Mikko	McFeely	142949	Whole Chapter	25. Southwest						Human caused climate change or human activities are noted five times on page 1086 and throughout the Southwest Chapter. We recommend using the phrase Human caused climate change once in the chapter and only climate change elsewhere. Based on other chapters the audience should be well aware that climate change is human caused. This phrasing becomes unnecessarily repetitive and over the top. Similarly greenhouse gases emitted from human activities need only be stated once. All other references to rising greenhouse gases can drop the emitted from human activities phrase.	Thank you for your comment. We agree that the phrasing is unnecessarily repetitive and so have eliminated it in much of the main chapter text.
Mikko	McFeely	142950	Text Region	25. Southwest		1086	1086	10	10	Water demanding is not the correct wording. Watering during and after rainfall is a bad practice, not a water demanding practice.	We thank the reviewer for the comment. The sentence has been edited
Mikko	McFeely	142951	Text Region	25. Southwest		1086	1086	15	16	Please rewrite this sentence. Changing and to with may help.	Thank you for your comment. The sentence has been edited.
Mikko	McFeely	142952	Text Region	25. Southwest		1086	1086	29	30	How are birds and sea lions stranded? What does this mean?	Thank you for this comment. Expanatory text has been added.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	142953	Text Region	25. Southwest		1087	1087	3	4	The authors should also include a statement about the importance of adaptation somewhere in the summary.	Adaptation to climate change impacts in the southwest are mentioned throughout the chapter. For instance, an example of adaptation is described in the second paragraph of the Summary Overview.
Mikko	McFeely	142954	Text Region	25. Southwest		1085	1085	3	4	We recommend modifying the first sentence of Key Message 1 to be: Water supplies for people and nature in the Southwest are decreasing in part from climate change. It's implicit that droughts result in decreased water supplies, and the reciprocal is true that drought can be defined as reduced water supply. Human caused climate change is repetitive. The audience knows climate change is human caused.	We thank the reviewer for the comment. The drought portion has been revised. The human-caused portion remains in light of the strong attribution between many water cycle changes and human-caused climate change. In addition, public surveys reveal that many Americans are not aware of the anthropogenic link to climate change.
Mikko	McFeely	142955	Text Region	25. Southwest		1093	1093	7	8	Insert an additional action, 4. In a 2017 binational agreement, Mexico agreed to absorb a share of shortages should Lake Mead fall below specific elevations. Another provision allows Mexico to bank their unused water in Lake Mead for future use. Consistent with basin states in the U.S., Mexico will pursue water conservation projects and environmental restoration within that nation.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142956	Text Region	25. Southwest		1089	1089	7	8	This sentence is awkward, consider cutting. This is not the only high energy practice.	The text has been modified as suggested.
Mikko	McFeely	142957	Text Region	25. Southwest		1089	1089	12	12	Extreme heat threatens all people and vulnerable populations are even more susceptable to negative outcomes.	We thank the reviewer for the comment. We agree with your statement. However, the lack of specificity in the statement "extreme heat threatens all people" led to a bland statement, that we found unhelpful. We will continue to focus on especially vulnerable populations.
Mikko	McFeely	142958	Text Region	25. Southwest		1089	1089	20	20	change the sentence order to The impacts of climate change exacerbates this historical legacy because…	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142959	Text Region	25. Southwest		1089	1089	23	23	what is material health?	We greatly appreciate the reviewer's comment. This phrase has been re-worded.
Mikko	McFeely	142960	Text Region	25. Southwest		1089	1090	24	24	Box 25.1: The language is overly definitive. Please be very specific with impact characterization. For example, are the findings consistent across states and within states?	We thank the reviewer for the comment. The chapter text has been revised and refined to reflect differences within the region.
Mikko	McFeely	142961	Text Region	25. Southwest		1089	1089	32	34	This statement is not consistent with local observations throughout the Colorado's headwaters. I believe the NCA authors are overusing this finding and Fyfe et al. is overstating their results.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. We have diversified the references, and have added some precision to the text, to note whether changes are region-wide, pertain to parts of the region, pertain to specific altitude bands, and pertain to more maritime or continental locations.
Mikko	McFeely	142962	Text Region	25. Southwest		1090	1090	3	3	Not all the droughts since the 2000s have low precipitation. Climate warming has enhanced the impacts of hydrologic drought while average precipitation has stayed the same. - Droughts can be caused by low precipitation and or higher temperatures but in recent years warming climate appears to be a larger contributor to recent droughts	We thank the reviewer for the comment. The key point is that increasing temperatures have interacted with precipitation variations, to reduce the effectiveness of precipitation in replenishing water supplies and soil moisture. A close reading of the literature indicates that recent episodes of hydrologic drought have been exacerbated by increasing temperatures, and that precipitation amounts have been below average--this is true of drought in California, the Colorado River Basin, and the Rio Grande Basin. When compared with earlier droughts, these recent droughts are characterized by low precipitation, just not as low as during drought episodes of cooler periods, like the 1950s (e.g., Udall and Overpeck, 2017).
Mikko	McFeely	142963	Text Region	25. Southwest		1091	1091	2	3	We recommend rewording this sentence, because the link between droughts and reduced water supplies is obvious. More significant is to highlight the increasing importance temperature is having on exacerbating declining water supplies. Perhaps, During droughts water supplies are declining in part due to climate warming and	We thank the reviewer for the comment. The chapter text has been revised and refined to reflect multiple climate and human factors, with less emphasis on only drought.
Mikko	McFeely	142964	Text Region	25. Southwest		1091	1091	21	22	Decreased snowpack is not a robust observation across the high elevation regions in Colorado. Snowpack is not lasting as long, though. Plus, Fyfe et al uses reanalysis data- not as robust as snotel sites	We thank the reviewer for this comment. Elsewhere in the chapter, we noted elevation-related variations in snowpack. Clow 2010 found decreases in Colorado SWE using one technique. In addition, the Mote et al. 2018 study found significantly more decreases in Colorado than did Mote et al. 2005
Mikko	McFeely	142965	Text Region	25. Southwest		1086	1086	4	7	We recommend changing, Reduced river flow and water withdrawals for cities and agriculture dropped the level of Lake Mead, which provides the water storage for the Hoover Dam hydroelectric plant, to 160 feet (48 m) below capacity in 2016, the lowest level since formation of the lake in 1936, to Diminished river flow and increased water demand between 1987 and 2016 (see Chapter 3: Figure 3.3) reduced the level of Lake Mead by 160 feet (48 m) resulting in the lowest lake levels since the formation of the reservoir in 1936. Lake Mead provides water storage for the Hoover Dam hydroelectric plant and water supply for California, Arizona, Nevada and Mexico. The word increased needs to be in front of water demand because flow and demand have opposing trends. The term dropped is too colloquial when discussing declining reservoir levels.	Thank you for the helpful comment."increased" added, "dropped" changed to "fallen"
Mikko	McFeely	142966	Figure	25. Southwest	2	1087				Decreased snowpack is not a robust observation across the high elevation regions in Colorado. Snowpack is not lasting as long, though. - Fyfe et al uses reanalysis data- not as robust as snotel sites, plus the point of the paper was to demonstrate that their was a climate change imprint in additional to natural variability. Further- high elevations not showing this trend in CO, but lower elevation's in Sierra's are.	Multiple references support decreased snowpack due to increased temperatures, not just Fyfe et al. So, we have retained the conclusion of decreased snowpack.
Mikko	McFeely	142967	Text Region	25. Southwest		1089	1089	35	35	We recommend removing, due to climate change, because these trends are linked elsewhere to climate change and need not repeat every time.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Tomi	Vest	143093	Whole Chapter	25. Southwest						Many references in this chapter are relied on too heavily. We recommend broadening your sources of information (for example Fyfe et al. 2017)	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. In particular, we have expanded references related to snowpack changes in the Southwest.
Devin	Thomas	143146	Text Region	25. Southwest		1086	1086	7	7	Recommend changing "formation of the lake" to "the filling of the reservoir"; Lake Mead is a reservoir, and it was filled, not formed.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. This was alos changed on p 1105 for consistency

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
David	Wojick	143190	Text Region	25. Southwest		1091	1091	4	5	A portion of Key Message 1--"increasing water demands from a growing population"--is not supported by the text in that section, and in fact is apparently contradicted by statements on p. 1092, lines 7-11, about per-capita or total water use declining from 20-38% in CA, NV, and CO in recent years. Suggest deleting this statement unless the section cites regional analyses which demonstrate increasing total municipal water use in recent years. Reductions in per-capita use like those cited are keeping pace with population growth in several SW cities, so that total municipal use is stable or declining, but it is not clear whether this holds across the SW region.	We thank the reviewer for the comment. The reductions noted were for temporary measures. Indeed, water use in California has now rebounded to pre-drought levels according to recent newspaper reports. See https://www.mercurynews.com/2018/03/10/california-water-use-continues-to-increase-as-conservation-declines/. The reviewer is correct that per capita and indeed total water use in many cities is either remaining flat or decreasing (See J. Fleck's book). However, in other places, municipalities have been active in seeking new supplies. These actions in some cases have been forward looking, rather than to meet immediate needs. The Southern Nevada Water Authority continues the process of acquiring water rights in northeastern Nevada. St. George, Utah is pursuing a ~ 100 kaf/year pipeline from Lake Powell. The Metropolitan Water District of Southern California has continued to investigate fallowing opportunities on the Colorado River (e.g. Bard summer fallowing program, admittedly small but potentially bigger in the future). In the Front Range of Colorado, state planning documents indicate a large supply-demand gap of approximately 560 kaf to meet growth in the decades ahead, some of which is expected to come from the Colorado River. Colorado expects to almost double its population from 5m to 10m by 2050. A pipeline proposal from Wyoming to the Colorado Front Range has resurfaced which would move 55 kaf/year for municipal use. https://www.sltrib.com/news/environment/2018/02/27/entrepreneur-revives-zombie-pipeline-proposal-to-carry-green-river-water-from-utah-to-colorado/ The Central Arizona Project is pursuing the acquisition of farm lands in Mohave County to assist with firming supplies for its canal, some of which is used for municipal uses. The recent system conservation efforts in the Colorado River Basin have been funded in large part by municipalities desiring to firm reservoir supplies. The Southwest is one of the fastest growing regions in the country and this growth drives at least some municipal entities to be proactive about their future needs even while they are making substantial progress on water conservation.
Jeff	Lukas	143199	Text Region	25. Southwest		1086	1086	2	3	The 6-state Southwest region does not have a single "climate"; in fact; the huge climatic diversity of the SW is a key driver of the ecosystem, cultural, and economic diversity cited in this sentence. Thus, the notion that the SW is "under the hottest and driest climate" in the US is an unhelpful generalization that elides the enormous spatial variability in temperature and precipitation regimes across the region--and it's not even true, if "hottest" is interpreted as "highest annual average temperatures", for which the SE US is hotter overall. The implication of this statement appears to be that SW, being already hot and dry, is especially vulnerable to further warming and drying. But that isn't uniformly true for the SW: the mountain snowpack of Utah and Colorado--which builds and melts in a cool/wet climate--is less vulnerable to the impacts of future warming than the snowpacks of the PNW or Northern Rockies, for example. Recommend changing to "The Southwest encompasses diverse ecosystems, cultures, and economies, in part reflecting its enormous climatic diversity, including the hottest and driest climates in the U.S."	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Social Science	Coordinating Committee	143200	Text Region	25. Southwest		1086	1086	14	15	The phrasing "has already led to heat-associated deaths and illnesses" implies that occurrences of such in AZ and CA are novel, which they are not. What is *new* about recent heat-related deaths and illnesses that is plausibly linked to hotter temperatures; e.g., an increasing trend?	Thank you for your comment. We have edited the text to clarify the point and to highlight aspects of heat waves that are changing.
Social Science	Coordinating Committee	143312	Text Region	25. Southwest		1088	1088	29	30	Preservation of cultural heritage also should be mentioned here as a purpose of national parks and government management of other lands at the national scale (reference: NPS 1916 Organic Act, 1906 Antiquities Act).	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Social Science	Coordinating Committee	143313	Text Region	25. Southwest		1088	1088	36	36	LAX airport is also at sea level in California	Thank you for your comment. We checked, and found that the elevation of Los Angeles International Airport is 128 ft. (39 m) above mean sea level.
Social Science	Coordinating Committee	143314	Text Region	25. Southwest		1089	1089	18	20	Glad this point is recognized here	We greatly appreciate the reviewer's comment. [NO CHANGES TO TEXT REQUIRED]
Social Science	Coordinating Committee	143315	Text Region	25. Southwest		1089	1089	22	23	Indigenous peoples also rely on their cultural heritage- places, traditional homes and building materials, sites, sacred places. All of these can be materially affected by climate change; and the material loss of cultural heritage disrupts and can lead to loss of traditional lifeways and knowledge. Recommend that this section incorporate the concept of cultural heritage and climate risks to cultural heritage more fully. Starting references would be the 2012 UN report "Weathering Uncertainty: Traditional knowledge for climate change assessment and adaptation" by Nakashima et al., and the 2016 National Park Service Cultural Resources Climate Change Strategy (https://www.nps.gov/subjects/climatechange/culturalresourcesstrategy.htm).	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Social Science	Coordinating Committee	143316	Text Region	25. Southwest		1091	1091	28	29	This description of the potential for decade-length droughts should include information from the historical and paleoenvironmental records, which show multiple multi-decade droughts over recent millennia before modern anthropogenic warming, which had substantial consequences for the human populations living there at those times. Relevant authors for the American Southwest include Tim Kohler, Scott Ingram, Margaret Nelson, Michelle Hegmon (among many others). Doug Kennett and James Kennett, Jon Erlandson, are good sources for the California coast.	We thank the reviewer for the comment. The prospect of multi-decade drought before anthropogenic warming was well established in the Southwest chapters of the Second and Third National Climate Assessments. We cite paleoclimatological records, including Ault et al. (2016) and Cook et al. (2015). The purpose of this section is to reflect on projected drought risk. We are grateful for your insights; your main point--that multi-decade drought affected human populations in the region, prior to anthropogenic warming, seems aside the point. It is worthy, however, of a comprehensive assessment of regional paleodrought impacts and lessons for the 21st Century.
Social Science	Coordinating Committee	143317	Text Region	25. Southwest		1097	1097	3	4	Key message and discussion that follows should recognize that it is not only ecosystems and modern infrastructure along the coast, but also a great deal of cultural heritage as well, which is an integral part of modern life, tourism, and community identity. Anderson et al. 2017 "Sea-level rise and archaeological site destruction: An example from the southeastern United States using DINAA. (Digital Index of North American Archaeology)" is an analysis of heritage that is at risk as sea levels rise and communities both begin to build more protective coastal infrastructure and move inland across the American Southeast. A similar analysis is needed for the Southwest and West coast.	We thank the reviewer for the comment. We now mention indigenous archeological site vulnerability to SLR in Pt. Reyes in the body of the text.
Social Science	Coordinating Committee	143318	Text Region	25. Southwest		1097	1097	26	26	LAX airport is also at sea level in California	Thank you for your comment. We checked, and found that the elevation of Los Angeles International Airport is 128 ft. (39 m) above mean sea level.
Social Science	Coordinating Committee	143319	Text Region	25. Southwest		1097	1097	28	30	This statement/assessment should include recognition that archaeology is also at risk at Point Reyes due to sea level rise and ecosystem change; see report by Newland 2012 for the National Park Service: "The Potential Effects of Climate Change on Cultural Resources Within Point Reyes National Seashore, Marin County, California."	We thank the reviewer for the comment. We have modified the text to acknowledge the risk to archeological sites, and have added the reference to work by Newland.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Social Science	Coordinating Committee	143320	Text Region	25. Southwest		1100	1100	12	16	The framing of this key message should be re-assessed and filled out. Attention to indigenous peoples is certainly important. However, they are not the only groups with history, heritage, and attachment to landscapes in the Southwest. The framing of this section leaves out centuries of Hispanic settlement and the history of other European arrivals and lives in this region. Other major themes that are missing include: Gold Rush history and other mining/extractive industries; development of cattle ranching; early of water infrastructure. Authors should examine -- why is it indigenous peoples are recognized as having history that is important and relevant to them and their adaptation, but other communities in the region do not? It may be appropriate to add another key message.	We appreciate this comment. However, with limited space, it is necessary to focus on a few themes. This is not to imply that other themes are not important. Part of the determination to focus on Indigenous peoples was learning from the previous assessments, which included that Indigenous peoples and communities are among those experiencing and witnessing climate change impacts first and foremost, and among those leading in actions to adapt to and mitigate such impacts. As such, a distinct need was articulated to not only have a standalone Tribal and Indigenous Peoples Chapter, but that tribal-related issues are part of each region as well. Indigenous communities are certainly not the only frontline communities and not the only ones with important local knowledge. We recognize that there are other place-based subsistence communities whose livelihoods, practices, values, and life ways are also deeply rooted to the land. There are also other frontline communities in urban locales that are at the forefront of climate impacts and environmental injustices. However, tribes and Indigenous peoples are particularly unique with their status as sovereign nations, extensive traditional homelands upon which they have dwelled for millennia, and Indigenous knowledges developed over generations of long-term observations about changes occurring to the ecosystems, water bodies, plant and animal species, air, and land.
Social Science	Coordinating Committee	143321	Text Region	25. Southwest		1108	1108	31	34	1. Recommend connecting this section back to the indigenous peoples section- what are the community-wide implications of losing or experiencing major reductions in significant food sources? 2. Review the phrasing of this section and whole key message with respect to urgency and social implications: loss of food sources can be socially devastating, and ready adoption of new unfamiliar foods should accustomed food sources is not a given. Archaeological work in the Southwest by Margaret Beck and Matt Hill, for example, shows generational persistence of foodways by emigrants across the region.	We thank the reviewer for the comment. We revised the text, to incorporate recommendation 1, and connected it to effects on Indigenous peoples. We have reviewed comment #2. We acknowledge the importance of the points made. However, we do not believe that these points merit major changes to the key message.
Social Science	Coordinating Committee	143322	Text Region	25. Southwest		1112	1112	4	9	Recommend adding here discussion of status of research about non-indigenous peoples connections to landscape/community/identity. Attention to indigenous lifeways is important, but so are ties to accustomed lifeways by non-indigenous communities. Non-indigenous identity and connection to lifeways also have strong implications for success of adaptation for those communities.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Social Science	Coordinating Committee	143323	Text Region	25. Southwest		1117	1117	34	38	Sources should include attention to the impacts of climate change on cultural heritage/cultural resources. Recommended reference is the National Park Service Climate Change Impacts on Cultural Resources (https://www.nps.gov/subjects/climatechange/impactsonculturalresources.htm; also published in National Park Service Cultural Resources Climate Change Strategy: https://www.nps.gov/subjects/climatechange/culturalresourcesstrategy.htm, see Goal 2).	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Social Science	Coordinating Committee	143324	Text Region	25. Southwest		1119	1119	34	34	Recommend rephrasing to refer to both Indigenous and non-indigenous communities. Non-indigenous peoples also live in communities.	We thank the reviewer for the comment. The chapter text has not been modified because this sentence is specifically about impacts on Indigenous peoples and Indigenous communities.
Jeff	Lukas	143377	Text Region	25. Southwest		1086	1086	17	18	The phrasing of this sentence presents the finding of the Abotzoglou and Williams (2016) study on wildfire attribution as received fact, equivalent to the historically observed wildfire damage in the next sentence. But the AW 2016 finding, being based on climate model simulations, should be treated in the same way as future-oriented analyses that use climate model projections: as an estimate subject to uncertainties related to climate sensitivity, as well as uncertainties in the statistical association of particular climate conditions and burned area. Also, the use of "doubled" is awkward as it implies a trend over time (e.e., 1984-2015), rather than a difference between two scenarios. Recommend changing to "The area that was burned by wildfire across the western United States from 1984-2015 is estimated to be twice what would have burned had human-caused climate change had not occurred."	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Jeff	Lukas	143380	Text Region	25. Southwest		1086	1086	37	38	The phrase "where the U.S. Government forcibly located Southwest tribes" is not inclusive of the many native nations in the Southwest who still occupy at least a portion of ancestral/pre-European homelands (e.g., Hopi, the New Mexico Puebloan nations, Tohono O'odham, Gila River Indian Tribes). That is, they currently live in "arid conditions," but they were not forcibly relocated to those areas. Recommend changing to "Increasing heat intensifies the arid conditions of, and drought impacts to, the reservations and homelands of most of the Southwest tribes" , or similar.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Anne	Marsh	143395	Figure	25. Southwest	25.3	1087				The adaptation of the figure is somewhat misleading. Indicate that the graph shows the estimated cumulative contribution due to anthropogenic climate change and other factors based on fuel aridity.	We recgonize the complexity of the analysis and provide more detail in the traceable account.
Anne	Marsh	143400	Text Region	25. Southwest		1094	1095	37	5	Qualification is needed in this paragraph-- if fires burn too hot in some areas and there is limited restoration, the system may transition altering patterns of carbon uptake.	Thank you for the helpful comment. A qualification has been added.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Jeff	Lukas	143603	Text Region	25. Southwest		1089	1089	32	33	The specific assertion that there has been a â€œ20% reduction of [Southwest] snowpack and its water content since 1950â€ is not directly attributable to Fyfe et al. 2017 (hereafter F17) or Pierce et al. 2008 (hereafter P08), contrary to the citations of those two studies. F17 found that there was a 10-20% reduction in annual maximum SWE (SWEmax) between the periods 1982-1991 and 2001-2010, over a domain that covers the entire Western US, i.e. about double the area of the 6-state SW region. F17 expressed their main findings as a range since they analyzed two types of SWE data: 1) The 10% reduction was calculated from the in-situ SNOTEL observational network; this result is likely both more robust and more comparable with prior SWE analyses, though with the caveats about data omission and exclusion given below. 2) The 20% reduction was derived from the average of four gridded reanalysis datasets; the robustness of the SWE output from these reanalyses has not been rigorously assessed. For 1 above, F17 analysed only SNOTEL data from the NRCS network, which has relatively few sites in California. Most of the in-situ SWE observations in CA are from the California Dept. of Water Resourceâ€™s network (functionally equivalent to SNOTEL), whose data were not analysed by F17. Thus California is under-represented in their analysis 1. F17 also excluded all sites below 1500m, for unknown reasons. This excludes a handful of SNOTEL sites in CA, and many dozens of sites in OR, WA, ID, and MT, further affecting analysis 1. These issues, combined with the difference in coverage between the SW region and the much larger F17 domain (affecting analyses 1 and 2), mean that it is unclear how the F17 findings for regionally averaged SWEmax trend (both 1 and 2) might scale to the smaller SW region. We can say that F17 shows (in Figure 1) that the vast majority of SNOTEL sites in the SW region declined in SWEmax between 1982-1991 and 2000-2010. P08 found that from 1950-1999, the ratio of April 1 SWE to March-April precipitation (SWE/P), had declined from 5-20% across a Westwide domain similar to that used by F17. SWE was taken from manually measured snowcourses, which are mostly co-located with current SNOTEL sites. While the SWE/P metric is importantâ€”arguably more so than SWE itselfâ€”it does not speak clearly to trends in SWE. In fact, P08 found that the site-based trends in SWE from 1950-1999 mainly ranged from +6% to -10%, with 71% of the trends	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion--by diversifying the number of studies on this topic, adding more specific language about snow-related parameters and associated observed impacts, and highlighting the spatial diversity in observed climate effects on snowpack within the Southwest region.
Jeff	Lukas	143610	Text Region	25. Southwest		1093	1093	26	28	The phrasing of this sentence presents the finding of the Abotzoglou and Williams (2016) study on wildfire attribution as received fact, equivalent to the historically observed wildfire damage in the next sentence. But the AW 2016 finding, being based on climate model simulations, should be treated in the same way as future-oriented analyses that use climate model projections: as an estimate subject to uncertainties related to climate sensitivity, as well as uncertainties in the statistical association of particular climate conditions and burned area. Also, the use of "doubled" is awkward as it implies a trend over time (e.e., 1984-2015), rather than a difference between two scenarios. Recommend changing to "The area that was burned by wildfire across the western United States from 1984-2015 is estimated to be twice what would have burned had human-caused climate change had not occurred."	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Jeff	Lukas	143614	Text Region	25. Southwest		1094	1094	8	10	This statement about the impacts of fire suppression invites an overly broad reading that reinforces commonly held and false beliefs about the extent of these impacts. Many mid- and high-elevation conifer forest types in the Southwest region, especially the lodgepole and spruce-fir type, but also most pinon-juniper woodlands, have not been impacted by fire exclusion as described in this sentence. Recommend adding a qualifier: "In addition, historical fire suppression policies have caused unnatural accumulations of understory trees and coarse woody debris in many lower-elevation forest types, fueling more intense and extensive wildfires (Hessburg et al. 2016, Stephens and Ruth 2005)."	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144587	Text Region	25. Southwest		1086	1086	21	22	This seems a bit of a reach. Won't it take global action to really have an effect, or are there really such actions that could also help locally. I'd suggest a bit of clarification on this sentence about what is meant (reading on the next page, I see what is meant is by reducing water demands--so perhaps the sentence could say "Reducing the water demands associated with the extraction and use of fossil fuels would make more water available for other uses and help reduce ecological vulnerabilities" to make clearer what the linkage is.	The sentence refers to the lower vulnerabilty under lower emissions scenarios. An example is given in the following sentence.
Michael	MacCracken	144588	Text Region	25. Southwest		1086	1086	25	27	I'd suggest saying about 9 inches instead of suggesting there is accuracy to a quarter of an inch. And a natural question is going to be if earthquake effects were accounted for. On line 26, I would think that "has" could be dropped. And on line 27, why say "heated"--why not say "ocean"?	Good point. In 1st sentence of coastal section changed "8.75 inches" to "~9 inches". That statistic is based on the water-level change that is relative to the gage near the Golden Gate Bridge. According to Gary Griggs (UC Santa Cruz coastal geology expert), because the San Andreas fault is a strike slip fault, this is little vertical land movement over the 1900-present at this location due to earthquakes. Later in this section, "has" was deleted, and I changed "expansion of heated water" to "thermal expansion of the ocean"
Michael	MacCracken	144589	Text Region	25. Southwest		1086	1086	29	29	First, I'd say "warmed" instead of "heated", and wasn't at least some of the already warmed waters due to an El Nino--which is presumably variability driven rather than due to human-induced climate change.	Changed "heated" to "warmed". Revised first sentence to: "A marine heat wave along the Pacific Coast from 2014 to 2016 has been attributed to a confluence of complementary natural forcings (Jacox et al. 2017); climate model simulations show that the likelihood of experiencing the record-setting magnitude of the event was essentially zero without anthropogenic climate warming (Jacox et al. 2017; Oliver et al., 2017)."
Michael	MacCracken	144590	Text Region	25. Southwest		1086	1086	34	35	Perhaps change "provides" to "grows" or similar, and it might read more smoothly if it said "grows half of the nation's fruits Ã‰" and leave off "of the entire country.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144591	Text Region	25. Southwest		1086	1086	36	36	This needs to be phrased to say that "Increasing heat stress during Ã‰ is likely to lead to increased incidences of crop failure." That is, state the coming effect, not just what the sensitivity is.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144592	Text Region	25. Southwest		1086	1086	37	38	I'd suggest changing "intensify" to "will further intensify" and it might help to add a time reference here, so add to the sentence something like "during the past several centuries" if that is when it was. I'd also expand a bit on "Yet", perhaps saying something like "Despite the increasingly challenging conditions"	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144593	Text Region	25. Southwest		1087	1087	2	4	I'd suggest not making this about reducing carbon emissions (as carbon capture and storage could conceivably do this, but requires a lot of water), but focus on the need for a shift away from water-consuming energy sources. The Key Messages really emphasize that water is the key, so keep the focus on that being the reason to get away from use of fossil fuels.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144594	Text Region	25. Southwest		1087	1087	7	11	It is really important to explain a bit more about how the figure was developed, so based on models that considered the weather with and without climate change, etc.--just giving the reference I don't think is convincing or informative enough.	Thank you for the comment. The main text of the energy section gives more detail, so we have made the figure caption concise.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144595	Text Region	25. Southwest		1087	1087	14	16	I'd imagine the photo is going to show water levels in Lake Mead--so this is what needs to be said. And then the next sentence explains what is happening, namely drought. Just a note that if one is going to say "drought", that is usually used to describe a depression in water availability that is expected to then end at some point in the future (and if this is the case then that period should be provided). With climate change, what is really happening is aridification--that is, the average amount of rainfall is dropping--so the baseline is dropping, and then there will be fluctuations about this declining baseline that is projected. So, I'd really suggest changing "drought in the Colorado River" (by the way, it is not drought in the River, but in the Colorado River Basin), so I'd suggest saying "Water withdrawals and the increasing aridification of the Southwest region caused by climate change have led to a drop in the level of Lake Mead to the lowest level since Hoover Dam was built in 1936."	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144596	Text Region	25. Southwest		1088	1088	8	8	I'm surprised this says "fish" and would instead, or in addition, say "fruits and vegetables". Saying "food" sounds as if this means manufacture of prepared items--so maybe say "meat, fruits, and vegetables".	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144597	Text Region	25. Southwest		1088	1088	12	12	It would be helpful to have a pie chart regarding the apportionment of water--I thought agriculture was the overwhelming user. Also, it might be said that the energy to move water is a key factor.	We thank the reviewer for the comment. We mention, a little further down in the text, that agricultural irrigation accounts for 70%. We regret that we lack the space to include a pie chart.
Michael	MacCracken	144598	Text Region	25. Southwest		1088	1088	18	19	I'd suggest rephrasing to say "with the increasing temperatures brought on by climate change now reducing the overall amount of precipitation falling in the region." (the first half of sentence already mentions the natural variations)	We thank the reviewer for the comment. We lack evidence to say that increasing temperatures brought on by climate change are reducing the overall amount of precipitation falling in the region. However, the literature that we have cited provides convincing evidence that increasing temperature is affecting replenishment of water supplies, through its effects on snow hydrology and soil moisture. We have revised the text, as follows: "Water supplies vary with year-to-year variability in precipitation, but the increasing temperatures brought on by climate change now interact with natural variations in precipitation to reduce the effectiveness of precipitation in replenishing soil moisture and water supplies (Dettinger et al. 2015, McCabe et al. in press, Udall and Overpeck 2017, Williams et al. 2015)."
Michael	MacCracken	144599	Text Region	25. Southwest		1088	1088	26	28	Sentence is not clear about the changing patterns of ecosystems.	We thank the reviewer for the comment. We have revised the text accordingly to be more clear.
Michael	MacCracken	144600	Text Region	25. Southwest		1088	1088	28	28	While many wildfires are natural, not all are. I'd somehow suggest indicating that natural wildfire is the historic (pre-human) and now dominant force, but not the only one.	We thank the reviewer for the comment. We have revised the text accordingly.
Michael	MacCracken	144601	Text Region	25. Southwest		1088	1088	36	36	And how about LAX and San Diego airports? And then there is the whole Sacramento-San Joaquin River delta region, with much of the land below river (and sea) level--this inland area is in very precarious shape and merits special mention.	Thank you for your comment. We double checked the elevations of these airports. Los Angeles International Airport is approximately 128 ft (39 m) above mean sea level (AMSL). San Diego International Airport is 17 ft (5 m) AMSL. San Francisco (13 ft or 4 m AMSL), and Oakland (9 ft or 2.7 m AMSL). We changed this statement to reflect multiple airports and the Sacramento-San Joaquin River Delta.
Michael	MacCracken	144602	Text Region	25. Southwest		1089	1089	8	9	I'd suggest saying that "uses large amounts of energy. Furthermore, changes in the climate are likely to reduce the availability of hydropower while also increasing the need for energy for air conditioning and moving water across the region."	Deleted sentence referencing the high use of energy to provide water
Michael	MacCracken	144603	Text Region	25. Southwest		1089	1089	20	21	Does not the historical legacy also include treaty commitments giving priority (and/or special) use of high-quality water to tribes in some regions? I would think mention of the complexities of the legal aspects of ths issue aslo merit mention.	We thank the reviewer for the comment. The chapter text has been revised to address the suggestion.
Michael	MacCracken	144604	Text Region	25. Southwest		1089	1089	25	27	I thought the Middle East (Iran?) had gotten a hotter value--I would say "some of the hottest"	Thank you for your comment. The World Meteorological Organization, verified global daily maximum temperature record is Furnace Creek Ranch, CA, USA 56.7 C (134 F). We cite the source, in the text, and we have double-checked it, in response to your review comment.
Michael	MacCracken	144605	Text Region	25. Southwest		1089	1089	33	34	So, what is the other half possibly attributable to. Perhaps say "definitively attributed to"	Thank you for your comment. We agree that the attribution to human caused climate change is definitive. However, the change only accounts for a fraction of the reduction in snowpack and snow water content. No change recommended for this comment.
Michael	MacCracken	144606	Text Region	25. Southwest		1090	1090	2	3	What is really happening here is the aridification of the southwestern North America--and this is different than being struck by a drought. What is happening is that the baseline is changing, not just a variation in temperature that will soon end.	We thank the reviewer for this comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144607	Text Region	25. Southwest		1090	1090	12	14	It is best to avoid the word "may" as it is really meaningless--almost anything "may" happen. Good practice is to draw from the likelihood lexicon. On line 12, it would seem that "may" should be replaced by "is projected to"; on line 14, perhaps say "are expected to bring" instead of "may become". In general, the chapter should be searched for the word "may" and a replacement term chosen from the likelihood lexicon (perhaps with an added qualifying phrase--so 'if this, then that is likely' type sentence.	We thank the reviewer for this comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144608	Text Region	25. Southwest		1090	1090	20	20	"has already" can be dropped	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144609	Text Region	25. Southwest		1091	1091	2	3	Just to note that what is happening is increasing aridification--and then variations around the declining baseline (average). A bit of a rephrasing here could indicate this.	We thank the reviewer for the comment. There are multiple factors impacting the availability of surface water. But water availability of surface water is only one part of a complex phenomenon; thus, we have reframed this key message in terms of the reliability of water supplies (surface and groundwater), and the role that climate plays among many factors. We have mentioned the projected increase in aridity in other sections of the chapter. We believe it is less important than the factors that we mention in the key message, in terms of the reliability of water supplies.
Michael	MacCracken	144610	Text Region	25. Southwest		1091	1091	11	19	Indeed, "years of low precipitation"--another way to say this is increasing aridification. And rest of paragraph might be better framed indicating an aridification trend due to human-induced climate change.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. It is important to note that, on balance, the literature backs projections of future aridification.
Michael	MacCracken	144611	Text Region	25. Southwest		1091	1091	26	27	"may" needs to be replaced--there is really no other alternative, so this could say "will cause" or "will lead to"--be direct and not vague.	With thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion
Michael	MacCracken	144612	Text Region	25. Southwest		1091	1091	28	30	This is all a bit confused because the text is not clear that climate change is causing general aridification of the region (so a decline in the baseline) and then on top of this there are still fluctuations that will create, basically, more dry and slightly less dry conditions, then perhaps with an occasional wet year thrown in (e.g., when Pacific hurricanes might stream into parts of the region). How can it really be suggested that what is now considered a drought in the region will end when what is happening is that the baseline for precipitation is declining as the subtropics expand? I just think some reworking of the text and framing here is needed to really be clearer about trends and variations because how one responds would be different. If a longer or more intense drought, one might build bigger reservoirs to hold more in reserve from wet years; if instead a declining baseline is the dominant influence, one needs to reduce demand long-term and find additional supplies (desalination). This is a really important issue and is not well handled here.	We thank the reviewer for the comment. Elsewhere in the chapter, we have acknowleged your perspective and mentioned the aridification of the region. We acknowledge the expansion of the subtropics globally, and in the region (e.g., Prein et al. 2016). However, discussion of the *effects* of expansion of the subtropics across the Southwest is more complicated than portrayed by Prein and colleagues, as some parts of the region will receive more precipitation. Moreover, in the Southwest, there is better attribution of other factors that reduce increase the likelihood of drought, and reduce the water reliability. In revision of an earlier part of this section of text to support Key Message 1, we acknowledge the effects of temperature increase as a preview of more common and arid future conditions for the region. Thus, we continue to frame the evidence for this key message in terms of drought, and these better attributed characteristics, related to snowpack and soil moisture.
Michael	MacCracken	144613	Text Region	25. Southwest		1091	1091	34	34	Give the result--so take out "changes" and put in "reductions"	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

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Michael	MacCracken	144614	Text Region	25. Southwest		1091	1091	37	38	True, and likely the only way for this to happen with an expanding subtropics would be increased incidence of Pacific hurricanes. The several hurricanes a few years ago in Arizona will make the 10-year average precipitation amounts look as if things are okay (and so might the occasional atmospheric rivers), but having one wet year and then 9 years of dryness is really quite problematic, indicating one has to be very careful of averaging when the situation is so variable and very wet years also have serious consequences--flash floods, flooding generally, and so on. I'd suggest expanding the discussion a bit.	We thank the review for the comment. The chapter text has been revised to incorporate the suggestion. Specifically, we now discuss future projections in the context of between-year and within-year variability, including how dry days will increase.
Michael	MacCracken	144615	Text Region	25. Southwest		1092	1092	3	3	The report really needs to tell the public this is not just a drought--don't expect wet conditions to return. This is aridification and long-term there is going to be less water available. That California recognized that the way of life needed changing (line 8) is an indication they are indeed considering aridification playing a role--this report, by not clearly making this point, kind of fogs up the issue. Per capita uses of water are going to really need to keep being pushed down as having a policy relying on occasional wet years with large amounts of storage would be a really risky, expensive and disrupting strategy for dealing with an ongoing trend.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. It is important to note that, on balance, the literature backs projections of future aridification, and we note this in the Background section.
Michael	MacCracken	144616	Text Region	25. Southwest		1092	1092	27	28	Sentence not clear	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144617	Text Region	25. Southwest		1092	1092	33	34	Phrasing implies the drought is now over, which simply is not the case--it takes a lot more than a year or two of snow to call a drought over. This is ongoing aridification--with occasional wet years (so a reverse in how thinking normally has been going on).	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion. It is important to note that, on balance, the literature backs projections of future aridification, and we note this in the Background section, as well as earlier in the body of text supporting Key Message 2.
Michael	MacCracken	144618	Text Region	25. Southwest		1094	1094	37	39	Regarding prescribed burns, I think it might be worth mentioning that if timed and managed well, they can be done so as not to inevitably lead to landslides when heavy vegetation is not present to moderate the effects of heavy rainfall.	We think the reviewer for the comment. We have added qualifications of prescribed burning to Traceable Account.
Michael	MacCracken	144619	Text Region	25. Southwest		1095	1095	22	22	I'd suggest saying "If the world does not limit climate change by undertaking sufficient reductions in emissions of greenhouse gases, Ã‰" It is not enough to just reduce emissions, one has to really do a lot.	We thank the reviewer for the comment. The reviewer is correct that substantional reductions are necessary, as illustrated in many cited studies by comparisons of scenarios with differing greenhouse gas emissions. Examples of the substantial differences in expected impacted between emissions scenarios are explicitly noted elsewhere in the text.
Michael	MacCracken	144620	Text Region	25. Southwest		1095	1095	28	35	This paragraph needs to be talking about changes in the range of species, not implying that individual plants or animals relocated. The next paragraph does this quite well.	We thank the reviewer for the comment. The reviewer is correct that changes in population ranges are the appropriate focus. We have revised the text to be more clear that the text refers to population range changes, not individual movements.
Michael	MacCracken	144621	Text Region	25. Southwest		1097	1097	15	18	Somewhere here the point needs to be made that sea level rise will continue beyond 2100 at similar rates and so response strategies need to prepare for that even if the increase in global average temperature is moderated or even halted.	We thank the reviewer for this comment. Whereas we agree with the reviewer's sentiment, the NCA4 is required only to assess projections for the next 25 and 100 years. Moreover, the best studied and most widely accepted sea level rise projections are for the timeframe between present and 2100.
Michael	MacCracken	144622	Text Region	25. Southwest		1098	1098	6	6	Was not an El Nino also a factor?	Revised this sentence to: "A marine heat wave along the Pacific Coast from 2014 to 2016 occurred due to a combination of natural factors and climate change. This led to mass strandings of sick and starving birds and sea lions and shifts of pelagic red crabs and tuna into the region. The ecosystem disruptions contributed to closures of commercially important fisheries. Ocean water acidity off the coast of California increased 25% to 40% (decreases of 0.10 to 0.15 pH units) from the preindustrial era (ca. 1750) to 2014 due to increasing atmospheric carbon dioxide from human activities."
Michael	MacCracken	144623	Text Region	25. Southwest		1106	1106	2	2	The word "may" needs to be replaced by drawing from the lexicon. So, perhaps something like "Projected changes in climate are very likely to reduce electricity generation capacity". That would seem to be the overwhelming expectation from ongoing aridification--what is happening is not a fluctuation but a trend.	Thank you for this comment. The figure title has been changed to reflect this.
Michael	MacCracken	144624	Text Region	25. Southwest		1108	1108	25	25	Another "may" to replace. Is there really an expectation that there will be enough of a gradient such that a shift will make a difference? What does "northward" mean here--within the region or to the Northwest region?	Thank you for your comment. The shifts will vary based upon both scale (microclimatology) and area. I removed northward because these shifts that will likely occur could be related to water availability, elevation and/or latitude, thus the geography is now more general in the text, but the certainty is stronger (i.e. may was changed to is likely). And, yes, there will be enough of a gradient that a shift could make a difference, if there are other factors present, such as soil, water, processing plants and other infrastructure necessary to support successful agricultural enterprise.
Michael	MacCracken	144625	Text Region	25. Southwest		1108	1108	31	32	Two uses of "may" to replace. Also more uses of "may" on next page, Ã‰ What to do is to give a phrase about what would lead to some outcome being likely or unlikely.	Thank you for your comment. Changes have been made to address this.
Kristin	Strydhorst	144760	Text Region	25. Southwest		1089	1089	16	17	While some non-federally recognized tribes are seeking recognition, not all tribes are doing so. It could be more appropriate to say 182 federally-recognized tribes, and a number of state-recognized and other non-federally recognized tribes, the Southwest has the largest population of Indigenous people in the country.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Julie	Maldonado	144761	Text Region	25. Southwest		1089	1089	23	23	Suggest changing material and spiritual health to physical, mental, emotional, and spiritual health. Material health is often used to refer to a product; this does not appropriately capture what is being pointed to in this sentence.	We greatly appreciate the reviewer's comment. [NO CHANGES TO TEXT REQUIRED]
Kristin	Strydhorst	144765	Text Region	25. Southwest		1101	1101	29	29	The references in this line should be re-ordered to match the rest of the chapter's formatting that has the references listed in alphabetical order.	This will be corrected by the TSU during final reference review.
Julie	Maldonado	144766	Text Region	25. Southwest		1102	1102	19	19	Suggest changing prescribed burning to cultural burning to reflect the practice.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Elizaveta Barrett	Ristroph	140917	Whole Chapter	26. Alaska						for key message 3: after "increased injuries" add "due to thin ice"; consider eliminating "smoke inhalation" as it does not seem to be an effect on par with the others (none of the 150 participants in my study about climate change in Alaska mentioned it)	The authors thank the reviewer fo these comments. After consideration, the authors think the text as written for this introductory paragraph is clear and accurate. Increased risk of injuries could arise from several causes, including, but not limited to, thin ice. Health risks from smoke inhalation are well-established, as are the increased length and severity of wildland fires in Alaska. This concern has been frequently raised by communities and is an ongoing aspect of public health preparedness and response. We appreciate the reviewer's experience with interviewing 150 Alaskans, but suggest those responses do not align with the documented threats.
Elizaveta Barrett	Ristroph	140918	Whole Chapter	26. Alaska						for key message 4: add "western and northern" before "coastal communities such as flooding and erosion"	The authors appreciate this suggestion, however the Key Message has changed and this is no longer applicable.
Elizaveta Barrett	Ristroph	140919	Whole Chapter	26. Alaska						for key message 5: after "maintenance of infrastructure" consider adding something like "as well as shifts toward smaller-scale infrastructure more appropriate to Arctic communities"	The authors appreciate this suggestion; although a shift to smaller scale infrastructure may be appropriate in some instances, in this case it is not directly related to climate change.
Elizaveta Barrett	Ristroph	140920	Text Region	26. Alaska		1170	1170	1	1	eliminate "of" before "issues" or add "a" before myriad	The text has been modified to 'a myriad'.
Elizaveta Barrett	Ristroph	140921	Text Region	26. Alaska		1172	1172	4	4	consider eliminating "smoke inhalation" as it does not seem to be an effect on par with the others (none of the 150 participants in my study about climate change in Alaska mentioned it)	Page/line numbers do not correspond to comment.
Elizaveta Barrett	Ristroph	140922	Text Region	26. Alaska		1172	1172	35	35	Because Celsius and Fahrenheit are not ratio variables (there is no true "zero," unlike for distance and age) it does not make sense to say that the Arctic is warming twice as fast as the rest of the planet. Suggest deleting "more than twice as fast as" and inserting "much faster than"	The commenter is correct that one cannot say that the temperature is twice as warm, but it is accurate to say that the rate of change is twice as fast. The sentence has been modified slightly to clarify this.

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Elizaveta Barrett	Ristroph	140923	Text Region	26. Alaska		1180	1180	16	17	The use of ice cellars is not as extensive as suggested….at this point some families, often whaling captains, are using them. Suggest changing "Many of these foods are stored" to "These foods are sometimes stored"	The authors appreciate this suggestion and the text has been modified slightly.
Elizaveta Barrett	Ristroph	140924	Text Region	26. Alaska		1180	1180	20	21	This sentence also applies to the Inupiaq community of Kaktovik, consider adding it	The authors appreciate this suggestion and the text has been modified slightly to reflect that Nuiqsut is one community among others to use this the new technology.
Elizaveta Barrett	Ristroph	140925	Text Region	26. Alaska		1182	1182	16	16	suggest replacing "riprap, but may only slow the erosion process" with "riprap. But these may only slow the erosion process and in some cases may be maladaptive."	Change has been made as suggested.
Elizaveta Barrett	Ristroph	140926	Text Region	26. Alaska		1184	1184	14	17	I have not heard of the kind of adaptation described here regarding wildfire exposure for rural Alaska and am wondering if they only apply to areas closer to urban settings	The authors thank the reviewer for this comment. The recommendations cited from the State of Alaska are for rural Alaska residents.
Elizaveta Barrett	Ristroph	140927	Text Region	26. Alaska		1185	1185	3	4	I'm not sure if it's accurate to see that people have had to "adapt" to decreased water in villages. Water has never been abundant in those villages that still lack running water in the homes--people have been managing with limited water in homes since the villages consolidated. I suggested changing "Adaptations to decreased water availability include use of" to "People cope with limited water availability by using"	The authors thank the reviewer for this comment and the text has been modified. We appreciate the point that communities with long-standing water scarcity are not technically adapting, rather, are coping with water shortages.
Elizaveta Barrett	Ristroph	140928	Text Region	26. Alaska		1186	1186	30	33	the same sentence is repeated twice	Repeat sentence has been deleted.
Elizaveta Barrett	Ristroph	140929	Text Region	26. Alaska		1189	1189	37	37	suggest removing "coastal" since erosion and flooding may also require relocation of riverine communities (it has in the past)	Sentence has been modified.
Elizaveta Barrett	Ristroph	140930	Text Region	26. Alaska		1190	1190	8	8	suggest adding something here about the need to expand the Arctic -appropriate infrastructure prototypes developed by Cold Climate Housing Research Center and ANTHC	This section only addresses costs; however, text and a reference to the CCHRC has been added to the Adaptation section.
Elizaveta Barrett	Ristroph	140931	Text Region	26. Alaska		1190	1190	37	37	after "within Alaska" add "in the near term"	Suggested text has been added.
Elizaveta Barrett	Ristroph	140932	Text Region	26. Alaska		1197	1197	12	14	this implies that barging is regularly occurring to riverine communities. Many villages were made to consolidate in these locations because of the ease of barge access, but currently there is little barging. The location on the river is important, though, for subsistence activities that continue today. I suggest deleting the part of the sentence after "adjacent to rivers" and replacing it with ",which are important for subsistence activities."	The authors appreciate the comment by this reviewer, but the paragraph is concerned with erosion. We have however, deleted the first sentence as it is not directly related to erosion.
Elizaveta Barrett	Ristroph	140933	Text Region	26. Alaska		1197	1197	16	16	this construction "episodes …are ..episodic" seems awkward. My understanding of riverine erosion is that it is not as episodic as that of the coast, which can be episodic when storms strike. I would suggest saying something like, "Riverine erosion tends to be gradual and more easily measureable than coastal erosion. Pockets of permafrost or variations in material along river banks may affect the rates of erosion."	The authors appreciated this comment. While the suggestion was not used, the text was modified to make the discussion more clear.
Elizaveta Barrett	Ristroph	140934	Text Region	26. Alaska		1198	1198	35	35	I often hear of respiratory problems in Nuiqsut associated with oilfield development but do not ever hear of respiratory problems associated with smoke inhalation in Alaska. If this is really the case, maybe provide a specific example.	Thank you for the suggestion. Additional references have been added to provide more Alaska-specific details.
Elizaveta Barrett	Ristroph	140935	Text Region	26. Alaska		1203	1203	13	18	The suggestion that climate change is a risk management problem belies the many significant challenges that Alaska Native Villages face alongside with climate change, all of which can threaten physical and cultural continuity. I don't think there is a deficit of knowledge and risk analysis--most Alaskan communities have hazard mitigation plans with all this information (developed by external consultants). The problem is more with putting this knowledge into action in a manner that communities can control and maintain.	The authors appreciate this comment. Most of the concerns stated in this comment are addressed in the Adaptation section.
Elizaveta Barrett	Ristroph	140936	Text Region	26. Alaska		1204	1204	2	3	I'm wondering why there is high confidence when there is limited evidence of successful, community-driven, proactive adaptation. There is a much longer history of reactive adaptation among Alaskan communities.	The text has been modified to clarify that proactive adaption can reduce costs related to Alaskan public infrastructure (see Larsen et al 2008; Melvin et al 2016; Hong, Perkins & Trainor 2014).
Elizaveta Barrett	Ristroph	140937	Text Region	26. Alaska		1204	1204	12	12	Again, given the limited amount of evidence for actual success in Alaska (regardless of what the literature prescribes), I'm wondering why this is considered "very high confidence."	Needs assessments and previous research (including Knapp & Trainor 2013) as well as guidebooks and recommendations for scientists working in Indigenous communities point to the need and importance of community involvement and partnership. The importance of partnerhip and involvement of communities is further evidenced earlier in the chapter (see Key Message #4)
Michael	Kruk	141647	Figure	26. Alaska	26.1	1173				The axis values on the upper left image of this figure seemed too small to read. Increasing the font size would solve this problem.	
David	Wojick	141744	Text Region	26. Alaska		1174	1175	37	3	Here is the present text: 37 Key Message 1: Retreating and thinning arctic summer sea ice plays an important role on 38 Alaskaâ€™s marine wildlife and fish habitats, distributions, and food webs, all of which are 1 important to Alaskaâ€™s residents. These changes are anticipated to continue with unabated 2 increases in CO2 emissions, which will accelerate ecosystem alterations that are difficult to 3 predict. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	The authors appreciate this reviewer comment. Assertions that climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: “Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013).” (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: “The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation).” (Chapter 1) And over longer time scales, Vol. 1 concludes that: “While climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that can contribute to feedbacks, compound extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the range projected by climate models cannot be ruled out (very high confidence). Moreover, the systematic tendency of climate models to underestimate temperature change during warm paleoclimates suggests that climate models are more likely to underestimate than to overestimate the amount of long-term future change (medium confidence).” (Chapter 15) The supporting evidence and traceable accounts for these key messages are available from NCA4 Vol. 1,

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David	Wojick	141745	Text Region	26. Alaska		1179	1179	2	5	Present text says this: 2 Key Message 2: Alaskan residents, communities, and their infrastructure continue to be affected 3 by permafrost thaw, coastal and river erosion, increasing wildfire, and glacier melt. These 4 changes are expected to continue into the future with increasing temperatures, which will 5 directly impact how and where many Alaskans will live. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	The authors appreciate this reviewer comment. Assertions that climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: "The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation)." (Chapter 1) And over longer time scales, Vol. 1 concludes that: "While climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that can contribute to feedbacks, compound extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the range projected by climate models cannot be ruled out (very high confidence). Moreover, the systematic tendency of climate models to underestimate temperature change during warm paleoclimates suggests that climate models are more likely to underestimate than to overestimate the amount of long-term future change (medium confidence)." (Chapter 15) The supporting evidence and traceable accounts for these key messages are available from NCA4 Vol. 1,
David	Wojick	141746	Text Region	26. Alaska		1183	1183	5	11	5 Key Message 3: Climate change brings a wide range of human health threats to Alaskans 6 including increased injuries, smoke inhalation, damage to vital infrastructure, decreased 7 food and water security, and new infectious diseases. The risks are greatest for rural 8 residents who face physical harm from storms and flooding, loss of vital food sources, 9 disrupted traditional practices, and who must consider relocation. Further adaptation 10 strategies would reduce the physical, social, and psychologic harm likely to occur under a 11 warming climate. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. That these health claims are highly questionable has already been pointed out to the USGCRP. See for example: "Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment" by Patrick J. Michaels and Paul C. "Chip" Knappenberger, Cato Institute, June 2015. https://www.cato.org/publications/public-comments/draft-impacts-climate-change-human-health-united-states-scientific Apparently the USGCRP has chosen to ignore this information.	The authors appreciate this reviewer comment. Assertions that climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: "The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation)." (Chapter 1) And over longer time scales, Vol. 1 concludes that: "While climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that can contribute to feedbacks, compound extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the range projected by climate models cannot be ruled out (very high confidence). Moreover, the systematic tendency of climate models to underestimate temperature change during warm paleoclimates suggests that climate models are more likely to underestimate than to overestimate the amount of long-term future change (medium confidence)." (Chapter 15) The supporting evidence and traceable accounts for these key messages are available from NCA4 Vol. 1, Chapters 1, 4, and 15.

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David	Wojick	141747	Text Region	26. Alaska		1187	1187	10	16	Present text: 10 Key Message 4: The subsistence activities, culture, health, and infrastructure of Alaskaâ€™s 11 Indigenous peoples and communities face a variety of threats in a warming climate, and 12 those threats are expected to increase in the future. Some of the threats affecting coastal 13 communities such as flooding and erosion are expected to increase as sea ice is forming later 14 in the fall season. Flexible, community-driven adaptation strategies may lessen these impacts 15 by ensuring that climate risks are considered in the full context of the existing sociocultural 16 systems. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	The authors appreciate this reviewer comment. Assertions that climate projections at appropriate spatial scales do not accurately represent the scientific understanding of climate change or the assessment of the peer-reviewed literature as presented in NCA4 Vol. I. NCA4 Vol. 1, which provides the underlying scientific basis for the impacts analyses in Vol. 2, addresses observations of past trends in climate, including severe weather events, the ability of global climate models to reproduce those trends, and the projections of future changes in climate and the models used to make those projections. On models in general, it states: "Confidence in the usefulness of the future projections generated by global climate models is based on multiple factors. These include the fundamental nature of the physical processes they represent, such as radiative transfer or geophysical fluid dynamics, which can be tested directly against measurements or theoretical calculations to demonstrate that model approximations are valid. They also include the vast body of literature dedicated to evaluating and assessing model abilities to simulate observed features of the earth system, including large scale modes of natural variability; and to reproduce their net response to external forcing that captures the interaction of many processes which produce observable climate system feedbacks (e.g., Flato et al. 2013)." (Chapter 4) Regarding the specific performance of global climate models in reproducing observed trends, on extreme precipitation, for example, Vol. 1 concludes: "The frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world (very high confidence). These trends are consistent with expected physical responses to a warming climate. Climate model studies are also consistent with these trends, although models tend to underestimate the observed trends, especially for the increase in extreme precipitation events (very high confidence for temperature, high confidence for extreme precipitation)." (Chapter 1) And over longer time scales, Vol. 1 concludes that: "While climate models incorporate important climate processes that can be well quantified, they do not include all of the processes that can contribute to feedbacks, compound extreme events, and abrupt and/or irreversible changes. For this reason, future changes outside the range projected by climate models cannot be ruled out (very high confidence). Moreover, the systematic tendency of climate models to underestimate temperature change during warm paleoclimates suggests that climate models are more likely to underestimate than to overestimate the amount of long-term future change (medium confidence)." (Chapter 15) The supporting evidence and traceable accounts for these key messages are available from NCA4 Vol. 1, Chapters 1, 4, and 15.
George	Backus	141846	Text Region	26. Alaska		1190	1190	19	19	The economic consequences of climate change seem a bit one-sided and narrow in this chapter. The Arctic is becoming a newly accessible ocean. Completely discounting the idea that technological change and economic conditions could not cause rapidly unfolding consequences, possibly similar to those associated with the newly accessible Atlantic and the Pacific Oceans of the 16th century, seems overly focused on an exceptionality of the present. It is reminiscent of the â€œThis Time is Differentâ€ misguided view of modern financial markets. Although it is assumed in the report that climate will be drastically different than the historical conditions, technology and economic sophistication are treated as statically locked in the present. Physical and economic opportunity in a globalized world can induce rapid exploitation and technology advances that allow it. Counterpoint papers indicate a more problematic expansion of economic activities that reinforces itself, as well as creating requisite infrastructure. [CrÃ©pin, A. S., Karcher, M., & Gascard, J. C. (2017). Arctic Climate Change, Economy and Society (ACCESS): Integrated perspectives. Ambio, 46(3), 341-354. And Oâ€™Garra, Tanya. "Economic value of ecosystem services, minerals and oil in a melting Arctic: A preliminary assessment." Ecosystem Services 24 (2017): 180-186. And Melia, Nat, Keith Haines, and Ed Hawkins. "Sea ice decline and 21st century transâ€Arctic shipping routes." Geophysical Research Letters 43, no. 18 (2016): 9720-9728. (The report notes Melia in a narrower context just a few lines above.)] The use of airships is becoming more realized as a viable alternative to vessels plowing through ice. Much of this literature is non-peered reviewed but rather from industry itself. For example, see Lockheed-Martin (https://www.lockheedmartin.com/us/products/HybridAirship.html, https://www.adn.com/business-economy/2017/04/04/lockheed-martin-cargo-airship-on-track-for-alaska-delivery-in-2019/) or industry journals (https://www.ainonline.com/aviation-news/aerospace/2017-06-15/will-hybrid-airships-really-take, http://www.rcinet.ca/en/2016/03/31/airship-comeback-transport-to-remote-areas-in-the-arctic/). Two acceptable references might be Sherwood, Blair, and Barry E. Prentice. "Airship logistics centres: The 6 modes of transport." In Proceedings from the 45th Annual Canadian Transportation Research Forum. 2010. http://ctrf.ca/wp-content/uploads/2014/07/29SherwoodPrenticeAirshipLogisticsCentres.pdf and Ghanmi, A., and Abderrahmane, S., â€œAirships for military logistics heavy lift,â€ Canadian Operational Support Command Operational Research & Analysis, DRDC CORA TM 2010-011, January 2010 http://cradpdf.drdc-rddc.gc.ca/PDFS/unc92/p532881.pdf)	After consideration of this point, the authors have determined that the existing text is clear and accurate. The opportunities for expanded economic activity and role of new technologies are entirely possible, but very speculative at this time. Even if they occur, they would require a large investment in infrastructure that would take many decades to be realized.
George	Backus	141847	Text Region	26. Alaska		1190	1190	39	39	I think this sentence needs revision in light of the passed Congressional act that reopens Arctic exploration. https://www.congress.gov/bill/115th-congress/house-bill/1/text Title II, SEC.2001. Technical (cost-reducing) advances and rising oil prices have increased the economic incentives for Arctic oil extraction.	After consideration of this point, the authors have determined that the existing text is clear and accurate. The statement refers to economic viability, not whether the area is currently open for leasing. The areas that are prospective for oil and gas development in the Beaufort and Chukchi seas are already open for exploration and not affected by the recent Congressional action.
Anne	Jensen	141897	Text Region	26. Alaska		1170	1170	2	2	Should "potently" be "potentially"?	The text has been modified as suggested
Anne	Jensen	141898	Text Region	26. Alaska		1170	1170	2	3	Three to six billion seems likely to be an underestimate. Given that the Utqiagvik utilidor would cost at least $.5B to replace, and the cost of construction of homes, let alon public buildings like schools & clinics and water plants in rural areas, and the fact that a single storm could wipe out most of the infrastructure in a community, it doesn't seem high enough.	After consideration of this point, the authors have determined that the existing text is clear and accurate. The cost estimate represents the cost of early replacement of infrastructure due to shortened useful life, not the replacement cost of all potentially at-risk infrastructure if it had to be replaced today.
Anne	Jensen	141899	Text Region	26. Alaska		1172	1172	28	29	Three to six billion seems likely to be an underestimate. Given that the Utqiagvik utilidor would cost at least $.5B to replace, and the cost of construction of homes, let alone public buildings like schools & clinics and water plants in rural areas, and the fact that a single storm could wipe out most of the infrastructure in a community, it doesn't seem high enough.	After consideration of this point, the authors have determined that the existing text is clear and accurate. The cost estimate represents the cost of early replacement of infrastructure due to shortened useful life, not the replacement cost of all potentially at-risk infrastructure if it had to be replaced today.
Anne	Jensen	141900	Text Region	26. Alaska		1175	1175	28	29	Perhaps rely is too strong a word. Denning studies show a lot of on-shore denning, with USFWS sources stating up to 50% terrestrial denning (https://www.fws.gov/refuge/arctic/pbdenning.html).	The authors appreciate this comment, but the narrative was written by USGS polar bear and walrus reserachers for the period covered by this report.
Anne	Jensen	141901	Text Region	26. Alaska		1177	1177	5	8	This sentence is unclear. It appears to say that pteropods are feeding on pink salmon, sole and herring. Isn't it the other way around? That would make more sense given the rest of the paragraph.	The text has been modifed for clarity.
Anne	Jensen	141902	Text Region	26. Alaska		1181	1181	29	29	Perhaps use "cultural resources or "tangible cultural heritage" instead of "cultural features"?	The text has been modified as suggested.
Anne	Jensen	141903	Text Region	26. Alaska		1182	1182	4	4	Perhaps "cultural resources or "tangible cultural heritage" instead of "cultural features"?	The text has been modified as suggested.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Anne	Jensen	141904	Text Region	26. Alaska		1182	1182	15	17	Shore protection measures often merely displace erosion, which should perhaps be noted.	The text has been modified as suggested.
Anne	Jensen	141905	Text Region	26. Alaska		1187	1187	35	35	The sea ice is also a platform for spring whaling in many North Alaskan villages, so whaing should be mentioned. Thining ice is also a problem for safe retreival and butchering of whales that are caught. There have been a couple of instances where the ice would not hold the whale for butchering.	The authors appreciate this suggestion and the text has been modified slightly to include the butchering of whales with an appropriate citation.
Anne	Jensen	141906	Text Region	26. Alaska		1189	1189	23	36	These estimates seem very low. The Utqiagvik utilidor (at risk of failure with a big enough storm surge) cost ~$250M in 1980 dollars. Road repairs average $1M/mile, so over that period a single community could easily spend 1/3 of the low 2017 estimate just repairing roads after storm surges with low/no sea ice present.	After consideration of this point, the authors have determined that the existing text is clear and accurate. The cost estimate represents the cost of early replacement of infrastructure due to shortened useful life, not the replacement cost of all potentially at-risk infrastructure if it had to be replaced today.
Anne	Jensen	141907	Text Region	26. Alaska		1190	1190	1	3	More recent estimates e.g. for Newtok and Kivialina) are a bit higher.	The authors appreciate this comment, but we are not aware of updated properly documented costs for relocation. The "more recent estimates" for Newtok and Kivalina that mention a range from $100-$400 million appear to come from from a 2003 report, found at https://www.gao.gov/products/GAO-04-142. The USACE study that was cited in the chapter was more recent and more detailed than the GAO report, so the authors determined that it provided a more reliable figure.
Anne	Jensen	141908	Text Region	26. Alaska		1193	1193	23	31	More recent estimates e.g. for Newtok and Kivialina) are a bit higher.	The authors appreciate this comment, but we are not aware of updated properly documented costs for relocation. The only ones we are aware of are those in the local media.
Anne	Jensen	141909	Text Region	26. Alaska		1186	1187	25	8	This section omits any consideration of the loss of cultural heritage (archaeological sites, old cemeteries, TCPs, etc.) which can occur due to erosion or permafrost thawing. Such loss is of great concern to many in rural communities. These places represent ties to a community's history which connects people to their forebears. Many sites also contain information which could be useful in developing culturally appropriate adaptations, which is lost when the sites are lost.	The authors thank the reviewer for this suggestion and the text has been modified to include loss or damge of cultural sites.
Anne	Jensen	141910	Text Region	26. Alaska		1180	1180	6	14	Societal consequences of thawing permafrost also include the loss of tangible cultural heritage, incluing archaeological sites, structures and objects and traditional cultural properties (TCPs). The consequences often include the thawing and decay of the artifacts and associated information which can be highy significant in connecting present-day people to their ancestors and their past.	The authors thank the reviewer for this suggestion and the text has been modified to include these items.
Anne	Jensen	141911	Figure	26. Alaska	4	1171				Appears twice	The Executive Summary is intended to repeat material from the chapter itself.
Jun	Zhang	141912	Figure	26. Alaska	4	1181				This figure appears twice.	The Executive Summary is intended to repeat material from the chapter itself.
Christen	Armstrong	141946	Text Region	26. Alaska		1170	1170	8	10	cross reference to Chapter 9	It is not appropriate to reference Chapter 9 here, but it has been referenced in other sections of this chapter.
Christen	Armstrong	141947	Text Region	26. Alaska		1174	1175	37	3	cross reference to Chapter 7 and 9	Key Messages are intended to stand alone and are not an appropriate place for cross referencing.
Christen	Armstrong	141948	Text Region	26. Alaska		1178	1178	7	12	would be great to add graphics of northward migration of species (like in Northeast chapter). Or maybe cross reference Northeast chapter for the idea.	The text has been modified and a reference provided that provides such a figure.
Christen	Armstrong	141949	Text Region	26. Alaska		1188	1188	6	9	also reference Chapter 9	Reference to Chapter 9 has been added.
Social Science	Coordinating Committee	143359	Text Region	26. Alaska		1175	1175	16	16	Remove comma after "such as"	Comma removed as suggested.
Social Science	Coordinating Committee	143360	Text Region	26. Alaska		1176	1176	8	8	Add an "s" to water	The text has been modified as suggested.
Social Science	Coordinating Committee	143361	Whole Chapter	26. Alaska						This chapter has signficant detail about the changes in climate happening in AK. It could potentially be shortened, perhaps even reducing the number of key messages, by referencing the CSSR and relying on that document for the details of climate change in AK. Then this NCA4 chapter could focus more on the impacts.	The authors appreciate the reviewer's comment and have included references to the the CSSR where appropriate. The authors feel that the subject matter presented in the Alaska chapter goes beyond that presented in the CSSR. In addition, the Alaska chapter was produced to be used as a stand-alone document and simpley citing the CSSR may not provide the information contained in the Alaska chapter to all readers.
Social Science	Coordinating Committee	143362	Text Region	26. Alaska		1181	1181	8	11	There is no citation for this statement.	Two references were added to the text and the lit-cited section
Social Science	Coordinating Committee	143363	Text Region	26. Alaska		1182	1182	14	17	This paragraph should be expanded greatly and should be the main focus of this section. The key message is focused on AK residents, communities, etc., but hardly any mention is made of the risks, impacts, and adapation options of the people.	Text has been modified with citations.
Social Science	Coordinating Committee	143364	Whole Chapter	26. Alaska						Related to the comment about relying more heavily on the CSSR for the climate change details, this chapter lacks information on the impacts and responses of communities/people. All of the KMs mention people, but the supporting text for the KMs mostly focuses on physical changes.	The authors appreciate these comments about the chapter and Key Messages and have modifed both in various places.
Social Science	Coordinating Committee	143365	Text Region	26. Alaska		1182	1182	26	26	Are there no citations for any of the statements in this paragraph?	Citation has been added.
Social Science	Coordinating Committee	143366	Text Region	26. Alaska		1183	1183	33	38	Are there no citations for any of these statements?	The authors thank the reviewer for this suggestion. Additional references have been provided to support these effects.
Social Science	Coordinating Committee	143367	Text Region	26. Alaska		1186	1186	30	33	This sentence is repeated.	Repeat sentence has been deleted from text.
Social Science	Coordinating Committee	143368	Text Region	26. Alaska		1187	1188	9	15	While I appreciate the desire to have a KM focused on Indigenous communities, it means that much of the ideas in prior KMs are repeated in this section (and others). Is this the best approach?	This is a good question and the authors appreciate this input. The KMs have been written to stand alone, and some have been modified based on this comment and others. We hope we have addressed this in the updated draft.
Social Science	Coordinating Committee	143369	Text Region	26. Alaska		1189	1189	15	15	I believe "ecosystem services" is more widely accepted than "environmental services"	The definition of ecosystem services has a different meaning from environmental services, which include ecosystem services and services provided directly by the physical environment (such as temperature moderation, stable ground for supporting infrastructure, smooth surface for overland transportation).
Social Science	Coordinating Committee	143370	Text Region	26. Alaska		1190	1190	1	3	There are more challenges to relocation than just the costs. It would be worthwhile to mention the legal and societal aspects as well.	A sentence has been added to the text to reflect this comment.
Marcus	Sarofim	143611	Text Region	26. Alaska		1169	1169	3	7	Key message 1 could be improved for clarity. Suggestions: 1st sentence: it is sea ice that is important for wildlife, not retreating sea ice. 2nd: Start with the climate effect first. And "unabated increases in CO2 emissions" is awkward (and not entirely correct, as even constant CO2 emissions would lead to continued sea ice retreat) So: "GHG induced warming has caused Arctic summer sea ice to thin and retreat. This sea ice plays an important role for the habitats, distributions, and food webs of Alaskan marine wildlife and fish, and for the Alaskan residents who rely on them."	The authors appreciate this comment and the Key Message has been modified.
Marcus	Sarofim	143612	Text Region	26. Alaska		1169	1169	16	16	Delete "Further"	"Further" has been deleted from the sentence.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Marcus	Sarofim	143613	Whole Page	26. Alaska		1169				Is there a way to condense the key messages? Message 2 & 5 have a lot of redundancy in terms of infrastructure, and 3, 4, and 6 all have adaptation. I know the chapter structure and the key messages are intertwined in such a way that it might be difficult to make the changes, but this would be a great place to streamline.	The authors appreciate the reviewer's comment, and have made modifications to the KMs.
Marcus	Sarofim	143618	Text Region	26. Alaska		1172	1173	35	21	Line 35: "has warmed" (since it modifies "since the middle of the 20th century). Line 35-37: It might also be interested to reference the Berkeley Earth dataset (http://berkeleyearth.lbl.gov/regions/alaska) (though it frustratingly ends in late 2013, so maybe not) Line 38-1173-line-4: I don't find the 'record-high' to 'record-low' comparisons very compelling in this context. 1173: Line 5-21: I found this to wander: condensing to some key points would be useful. (also, extra parenthesis in line 8)	Page 1172, Line 35 - The authors appreciate these comments and the text has been modified. Page 1172, Line 35-37 - The Berkeley Earth dataset does not display uncertainty levels for its putative 1830s-recent statewide temperature, which we speculate had been informed primarily by model data with greater extrapolation (given fewer data points) and a small handful of historical measurements confined to Russian activities in Alaska prior to the transfer to US control in 1867. In addition, we could not quickly find the peer-reviewed citations for this dataset, which unfortunately, makes is less usful in our analysis. Thus, we decline to include this citation without more comprehensive peer review and a distinct difference in the nature of the information. Page 1172, Line 38-page 1173, Line 4 - NCA4 set the task of reporting science new and relevant since NCA3. This comparison points out that both average and extreme temperatures are responding faster in Alaska than the rest of the US, a key consideration for adaptation. Page 1173: Line 5-21 - Without clear direction, it is difficult to understand the reviewers comment. There are five clear ideas presented here, all supported by the literature, and all required to present appropriate context: (1) Temperature was variable, than has an obvious directional trend; (2) There is variation within Alaska as to how large this trend is, but in all cases it is larger than the rest of the US; (3) Decadal variation is a key aspect still, despite the trend; (4) That variability has a known cause, namely couple North Pacific and Arctic variation, with decadal persistence; and (5), Precipitation is not as clear as temperature. Most of these ideas get one, at most two sentences, and the entirety is abstract length - 259 words. The authors respectfully do not think it wanders, and have declined to make changes. Parenthesis after Hartmann and Wendler 2015 have been removed.
Marcus	Sarofim	143619	Text Region	26. Alaska		1175	1175	11	11	is projected' would be better than 'may'. A likelihood would be even better.	Text has been modified.
Marcus	Sarofim	143620	Text Region	26. Alaska		1177	1177	15	15	I'd argue that acidity is an indicator of declining aragonite saturation, as aragonite saturation is my preferred metric. Maybe, "average aragonite saturation (one of the consequences of increased ocean acidity)"?	Text has been modified following suggestion.
Marcus	Sarofim	143621	Text Region	26. Alaska		1178	1178	7	12	EPA's marine species distribution indicator could be useful to cite here: https://www.epa.gov/climate-indicators/climate-change-indicators-marine-species-distribution, "In the Bering Sea, Alaska Pollock, snow crab, and Pacific halibut have generally shifted away from the coast since the early 1980s (see Figure 3). They have also moved northward by an average of 14 miles."	The text has been modified and the USEPA reference added.
Marcus	Sarofim	143623	Text Region	26. Alaska		1180	1180	13	14	Melvin, Larsen et al. 2017b isn't in the reference list: maybe this should be Melvin, Larsen et al. 2016?	Reference has been corrected here and in other locations.
Marcus	Sarofim	143624	Text Region	26. Alaska		1186	1186	12	23	this would be a good place to cite the USGCRP climate and health assessment: https://health2016.globalchange.gov/water-related-illness - Alaska appears several times here, with regards to Vibrio, drinking water, and seafood contamination. There may be other relevant Alaskan references elsewhere in the USGCRP assessment, and if so, those would be valuable for this chapter	The authors thank the reviewer for this suggestion. The additional material has been referenced and the section has been modified to describe the anticipated increased risk of Vibrio infections due to sea surface temperature rise.
Marcus	Sarofim	143625	Text Region	26. Alaska		1192	1192	19	20	Check Melvin, Larsen et al. 2017b in the references.	Reference has been corrected here and in other locations.
Marcus	Sarofim	143627	Traceable Account	26. Alaska		1196	1196	1	8	There are confidence statements about sea ice here, but no likelihood statements: a likely range of "no summer sea ice" would be good here.	A statement about the likelyhood of no sea ice has been added.
Marcus	Sarofim	143628	Traceable Account	26. Alaska		1198	1198	7	17	Is there any likelihood statements that can be made here (rather than just confidence?)	There are likelyhood statements in the text except for wildlfires because we do not know how likely fires will occur in any particular geographic area.
Michael	MacCracken	144627	Text Region	26. Alaska		1169	1169	5	7	Actually, the changes will continue for a good time even after emissions are brought to zero, so they will surely be continuing, perhaps less rapidly through the century. The only real chance of moderating the changes in the few decades ahead is climate engineering--a subject that I think needs to be considered given the amplified rate of climate change in the Arctic (my personal work has focused on exploring the potential for regionally focused intervention being undertaken before full global intervention, if that becomes necessary and is the only approach left other than the relatively slow reduction in forcing that carbon dioxide removal is likely to involve unless some breakthrough occurs). I'd suggest that at least in the research section of the discussion, the issue of climate engineering needs to be raised--and that, other than with this, the present statement is unfortunately overly optimistic.	The authors thank the reviewer for this comment, and the KM has been modified slightly; however it is beyond the scope of this regional chapter to discuss climate engineering at this time, although it is discussed slightly in Chapter 29.
Michael	MacCracken	144628	Text Region	26. Alaska		1169	1169	10	11	I'd suggest simplifying to "with continued warming, which will .." I'd also suggest adding a sentence that the ongoing thawing of the permafrost will also contribute to overall global warming due to the associated release of carbon dioxide and methane.	The authors thank the reviewer for this comment. The Key Message has been modified using a slightly different narrative.
Michael	MacCracken	144629	Text Region	26. Alaska		1169	1169	23	23	Ideally, this sentence should be rephrased to get rid of "may", which conveys no useful information. If one cannot say that it is likely that these actions will help, then ssy it is poissible that they have the potential to do this, or something similar. Using "may" just provides no insight about likelihood.	The authors appreciate this comment and the text has been modified.
Michael	MacCracken	144630	Text Region	26. Alaska		1169	1169	31	33	I'd suggest starting this sentence by saying that "Although climate change is and will continue to dramatically transform the climate and environment of the Arctic, proactive adaptation in Alaska has the potential to reduce costs Ã‰" and then at the end second sentence add something like "in order to avoid the much higher costs and impacts that would be associated with simply reacting to the projected changes as they occur." That is, make the main point be that proactive adaptation is really important compared to just reacting, but also make the point that the environment will be changing to a very large degree.	The authors thank the reviewer fo these two comments. In regards to the first comment, a modification of the text has been made. In regards to the second comment an economic analysis has not been verified and does not account for the spontaneous adaptations such as adjusting hunting and fishing practices to changing conditions, which do not necessarily have associated additional costs.
Michael	MacCracken	144631	Text Region	26. Alaska		1170	1170	1	2	Change "potently" to "potentially". In addition, that $3-6B is a really large number needs to be made clearer. Is this an annual or cumulative cost? What share of the economy is this? What is change in per capita costs?--something. This number seems very small given how much the overall environment will change--so these must be direct dollar costs to people and not account at all for the environmental costs that would arise due to biodiversity losses, effects on migrating species, cultural disruption, etc. --some sort of context is needed. I would suggest this should say something like "The annual costs of damage to Alaskan infrastructure is projected to be very large, potentially ranging from three to six billion dollars, although proactive repair and maintenance has the potential to reduce the overall costs"--of course adjusting to what is meant (annual vs. total, whatever).	The authors appreciate this comment. The text has been modified based on part of this suggestion. In response to the $3-8 billion cost, this estimate represents a porjected cost for 2008 to 2030, and includes the cost of early replacement of infrastructure due to shortened useful life, not associated environmental costs as stated.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144632	Text Region	26. Alaska		1170	1170	3	3	The chapter needs to be scrubbed of the word "may"--using instead a word from the likelihood lexicon, rephrasing as necessary to do so. I'll try to not mention too much in my comments, leaving that to a systematic look at the issue, but see lines 10, 26, and 28 on this page alone.	The text has been modified in three of the four places. On page 1170, line 26 however, 'may' has been retained as there are undoubtedly other residents that will be affected.
Michael	MacCracken	144633	Text Region	26. Alaska		1170	1170	9	9	I'd suggest changing 14-36 years to something more general like "within a few decades"	The text has been modified to state 'within this century'.
Michael	MacCracken	144634	Text Region	26. Alaska		1170	1170	34	34	There are not degrees of certainty; there cabe be degrees of confidence and uncertainty. Here it would better be said "There is high confidence in some of these effects, Ã‰"	The term certain has been changed to assured.
Michael	MacCracken	144635	Text Region	26. Alaska		1172	1172	13	14	Does it not need to be mentioned that these species are also important for Alaskan marine mammal species? Also on line 14, the "it" is a bit unclear.	The authors appreciate this comment and the text has been modified.
Michael	MacCracken	144636	Text Region	26. Alaska		1172	1172	19	22	Two more uses of "may" needing replacement. And also, "could" does not really give an indication of likelihood either and that word should also be avoided.	The text has been modified to replace 'may' with other terms in the three places identified
Michael	MacCracken	144637	Text Region	26. Alaska		1172	1172	28	28	Again, context is needed for the numbers. Are these annual costs? As a percentage of what? etc.	The $3-8 billion cost, this estimate represents a porjected cost for 2008 to 2030 and is further clarified in the Economics section of the chapter.
Michael	MacCracken	144638	Text Region	26. Alaska		1172	1172	35	35	Change "is" to "has been"	Text has been modified following suggestion.
Michael	MacCracken	144639	Text Region	26. Alaska		1173	1173	8	8	Extra parenthesis needs to be taken out	Text has been modified following suggestion.
Michael	MacCracken	144640	Text Region	26. Alaska		1174	1174	27	29	I'd suggest starting the sentence with the phrase: "With these projected changes, lowest Ã‰"	After review of the section, the text was modified slightly.
Michael	MacCracken	144641	Text Region	26. Alaska		1175	1175	12	12	Again, I'd generalize to "the next few decades"	The text has been modified to state 'within this century'.
Michael	MacCracken	144642	Text Region	26. Alaska		1177	1177	24	24	I'd suggest changing "are reported from" to "have been found in"	Text has been modified following suggestion.
Michael	MacCracken	144643	Text Region	26. Alaska		1182	1182	21	23	With the rate increasing, at what point will the amount of glacial ice that can be lost become so low that the amount of loss has to drop. Would it be possible to give the rate of loss of Alaska glaciers (e.g., at present rate they would be melted away in 200 years, or whatever--and this time is shrinking as the rate of melt increases?	The authors would like to thank the reviewer for this question; however, the evolution of glaciers is not fully known and needs more attention. At this point in time, we do not know enough about glacial processes to answer this question, and depending on how the glaciers might change, one could get dramatically dfferent results.
Michael	MacCracken	144644	Text Region	26. Alaska		1184	1184	22	22	Another "may" and this one would really seem to be a "will" or "will very likely"--there are quite a number of others to search out and change.	There is no 'may' on the page/line number provided, however, the use of 'may' has been examined throughout the chapter and changed when appropriate.
Michael	MacCracken	144645	Text Region	26. Alaska		1188	1188	22	22	Another "may" that can be replaced by "will"--really important not to pull punches in the statements.	It appears that the reviewer has provided a wrong page and line location, as there is no 'may' in the location provided.
Michael	MacCracken	144646	Text Region	26. Alaska		1189	1189	19	19	There are no degrees of "certain"--'Some of these effects are understood with high confidence" would be an alternative phrasing.	Text has been changed to assured.
Michael	MacCracken	144647	Text Region	26. Alaska		1190	1190	21	24	Two uses of "could" that really don't convey likelihood. Would be good to reword to indicate likelihood.	The use of the term 'could' has been retained here as it refers to a future state and there are no current studies that would provide evidence that these events will actually reduce costs or offset beneficial effects.
Michael	MacCracken	144648	Text Region	26. Alaska		1191	1191	3	14	I was surprised not to see mention of the problems from wildfire smoke--health, visibility, etc.	The health issues associated with wildfire in Alaska is mentioned under Key Message 3: Human Health.
Michael	MacCracken	144649	Text Region	26. Alaska		1192	1192	2	4	Present title is pretty awkward. How about "Changes in heating degree days across Alaska" and then indicate in the caption that this is leading so savings.	After consideration of the this point, we have determined that the existing text is appropriate. The graphic does not show changes in heating degree days, but the percent change from two different temporal periods.
Michael	MacCracken	144650	Whole Chapter	26. Alaska						Very interesting chapter with lots of information	The authors greatly appreciate the reviewer's comment about the chapter and hope that the content was useful.
Michael	Jasinski	144768	Whole Chapter	26. Alaska						This chapter was especially interesting because it focused on the climate change effects Alaska is experiencing. It mentions the effects on ecosystems, animal species, infrastructure, and human health. The chapter provides an interesting perspective of an area of the globe where not many people witness the effects of climate change, but where these effects are highly impactful.	The authors greatly appreciate the reviewer's comment about the chapter and hope that the content was useful.
Michael	Kruk	140876	Text Region	27. Hawai'i and Pacific Islands		1233		15		Why is Wuebbles et al. 2017 (i.e., the latest NCA 4 Vol 1. CSSR report) cited as a resource supporting ENSO as the prevalent cause of climate variability in the Pacific? Having reviewed the CSSR, there is little information in there to support this claim.	The text was adjusted here and in the introduction (Box 27.1) to clarify the Wuebbles reference refers to ENSO's influence on global climate variability, while the Wyrtki reference refers specifically to that of the Pacific Islands.
Michael	Kruk	140877	Text Region	27. Hawai'i and Pacific Islands		1233	1233	18	21	Is it true that a "doubling in frequency of both El Nino and La Nina extremes" are to be expected in the future? Much of the literature really suggests an increase in the frequency of El Nino, or as compared to today's state of the ocean, a near permanent El Nino.	Future projections of El Nino (EN) and La Nina (LN) intensity and frequency are uncertain. Here, we mention recent findings from model studies in Nature Climate Change that point to a doubling in both EN and LN (Cai et al., 2014 and 2015). Detailed coverage of the future of ENSO is beyond the scope of this report, but readers are encouraged to read the cited literature, or Chapter 5 of the CSSR for more details.
Michael	Kruk	140878	Text Region	27. Hawai'i and Pacific Islands		1233	1233	26	27	Sentence, "Streamflow in Hawaii has declined.." This statement requires a reference/citation. If none can be provided, suggest deleting.	Bassiouni & Oki, 2013, has been added as a citation in this sentence, as it was accidentally omitted in the executive summary. In the full KM1 text that this sentence was pulled from, this citation was already present.
Michael	Kruk	140879	Figure	27. Hawai'i and Pacific Islands	27.2	1239				The figure caption (or accompanying text description) needs more explanation for each of the corresponding red and blue arrows in the diagram. For example, there is an up and down arrow for "Winds and Waves Changing" but no explanation as to what drives the direction of each arrow (in particular the downward blue arrow). Same goes for Ocean Chemistry and Extreme Events	Figure 27.2 is intended to be a cartoon showing some of the primary climate indicator variable and impacts in the Pacific Islands that are summarized in the entire chapter. Unfortunately, limited space prevents us from describing them in detail in the introduction. The bullet points in the text after the figure citation provide additional brief explanations of some of the main new trends and projections, which is meant to introduce findings that are discussed in detail throughout the chapter and in the Traceable Accounts. To clarify where the reader can get more detail on these indicators and impacts, we have added notes in the bullet points that designate the KM with more infomationa. For example, KM3 discusses the uncertainty in projections of future wind and wave intesnsities.
Michael	Kruk	140880	Text Region	27. Hawai'i and Pacific Islands		1240	1240	5	17	This block is essentially the description of Figure 27.2. However, additional information is needed. On the first bullet point, starting with "detailed temperature...", kindly provide more specificity to match the arrow descriptions in the figure. The word "detailed" is subjective. The second bullet point on line 7 states, "more refined estimates", but this is also subjective. Can something more robust or quantitative be said bout these estimates? Finally, lines 16-18, the last bullet point, the worst bleaching event that ever occurred is a singular event beyond the broad scope of Figure 27.2. Suggest refining the bullet point to fit the ocean chemistry arrow(s) and move the reference to a singular bad event elsewhere in the chapter.	Unfortunately, limited space prevents us from describing the climate variable indicators and impacts in great detail in the introduction. The bullet points in the text after the figure citation provide additional brief explanations of some of the main new trends and projections, which is meant to introduce findings that are discussed in detail throughout the chapter and in the Traceable Accounts. To clarify where the reader can get more detail on these indicators and impacts, we have added notes in the bullet points that designate the KM with more infomationa. For example, KM3 discusses the uncertainty in projections of future wind and wave intesnsities. Additionally, the author team has clarified some of the language in this block to be more descriptive and precise with regard to the suggestions, but the reader is still pointed towards specific KMs for more quantitative detail.
Michael	Kruk	140881	Text Region	27. Hawai'i and Pacific Islands		1242		9		remove the word "through"	The text was adjusted accordingly.
Michael	Kruk	140882	Text Region	27. Hawai'i and Pacific Islands		1242	1242	11	16	With respect to this paragraph, I ask "so what?" What is the significance of these efforts, particularly in relation to climate projections and the region?	This short section is meant to highlight that although there is and will always be uncertainty in future projections of both physical climate and socio-economic impacts, uncertainty is not a reason to put off taking action, either through adaptive policies or projects. Additional language has been inserted to clarify this, and to provide a few examples of ways in which these intiatives are building resilience to climate impacts.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	Kruk	140883	Text Region	27. Hawai'i and Pacific Islands		1242		29		"Severe droughts are common…", this statement needs a reference.	We have added the following reference: Meehl, G. (1996). Vulnerability of freshwater resources to climate change in the tropical pacific region. In L. Erda, W. Bolhofer, S. Huq, S. Lenhart, S. Mukherjee, J. Smith. & J. Wisniewski (Eds.), Climate change vulnerability and adaptation in Asia and the Pacific, (pp 203-213). Dordrecht: Kluwer.
Michael	Kruk	140884	Text Region	27. Hawai'i and Pacific Islands		1242	1242	29	38	The entire paragraph is fairly wordy and redundant. Suggest a simplification/shortening to convey the message more succinctly.	We appreciate the reviewer's comment. The text has been revised simplify/shorten the paragraph.
Curt	Storlazzi	140888	Text Region	27. Hawai'i and Pacific Islands		1240	1240	4	18	New regional findings include projected future changes to winds and waves due to climate change, which affects ecosystems, infrastructure, freshwater availability, and commerce. See: Shope, J.B., Storlazzi, C.D., Erikson, L.H., Hegermiller, C.A., 2016. â€œChanges to extreme wave climates of islands within the Western Tropical Pacific throughout the 21st century under RCP 4.5 and RCP 8.5, with implications for island vulnerabilityâ€ Global and Planetary Change, v. 141, p. 25-38. Storlazzi, C.D., Shope, J.B., Erikson, L.H., Hegermiller, C.A., and Barnard, P.L., 2015. Future Wave and Wind Projections for U.S. and U.S.-Affiliated Pacific Islands. U.S. Geological Survey Open-File Report 2015â€“1001, 426 p., http://dx.doi.org/10.3133/ofr20151001. DOI: 10.3133/ofr20151001	The text has been revised to incorporate this suggestion.
Michael	Kruk	141648	Text Region	27. Hawai'i and Pacific Islands		1243		6		remove the words in parenthesis "…such as changing rainfall patterns". Remove the word "is". Replace sentence with: "Compounding the direct effects of climate change are the impacts from sea level rise…"	We have made slight changes to improve the sentence's readability. After consideration of the first point in this comment, we have determined that the existing text is clear and accurate. Thus, we have kept "such as changing rainfall patterns" (without parantheses) because it is central to the point being made in the sentence.
Michael	Kruk	141649	Text Region	27. Hawai'i and Pacific Islands		1243		8		"shallow groundwater bodies" - the authors mean freshwater lenses, right?	We agree with this suggestion to rephrase and have changed the text to "shallow freshwater lenses."
Michael	Kruk	141650	Text Region	27. Hawai'i and Pacific Islands		1243		16		"2015 and 2016 were the warmest years on record." Is this a global statement, or only relative to Hawaii?	We have determined that the existing text is clear. The sentence begins with "In Hawai'i," identifying the geographic bounds of the statement. Thus, no changes to the text have been made.
Michael	Kruk	141651	Text Region	27. Hawai'i and Pacific Islands		1243		23		replace "after" with "following"	The text was adjusted accordingly.
Michael	Kruk	141652	Figure	27. Hawai'i and Pacific Islands	27.4	1244				"Based on a network of representative weather stations…" Please elaborate. What network and how many stations?	We thank the reviewer for the comment. The figure caption text has been revised to incorporate this suggestion.
Michael	Kruk	141653	Text Region	27. Hawai'i and Pacific Islands		1245		13		"Using global climate model results…" - please provide information in the text on which models were chosen and please defend the selection of RCP 4.5.	Due to the size of the topic and the page limit for the chapter, we focused on broad trends rather than providing such a level of specificity. In May 2015, the Principals of the Subcommittee on Global Change Research made the decision to use the full range of IPCC RCPs and CMIP5 products for physical climate science analyses in the NCA4. NCA4 will focus on RCP 8.5 as a high- end scenario and RCP 4.5 as a low-end scenario. The use of RCPs 8.5 and RCP 4.5 as core scenarios is generally consistent with the range of emission scenarios used in the Third National Climate Assessment (NCA3). For more detail on the selection of these report-wide scenarios, please see: https://scenarios.globalchange.gov/sites/default/files/External%20memo%20NCA4%20scenarios%20framing_20150506.pdf
Michael	Kruk	141654	Text Region	27. Hawai'i and Pacific Islands		1247	1247	1	9	Lots of issues in this paragraph at the top of page 1247. "Increasing both area for water capture…" on line 2 -- how? They are already limited in size geographically. Line 4 -what is the connection between loss of monitoring stations and climate change projections? Why is the ability to monitor weather/groundwater/etc., a "prerequisite" for adaptive capacity? Line 6 - "evaporation related climate variables" - please provide an example.	We appreciate this comment, but space is limited. Here we have provided some explanation in response to the multi-part comment. (1) Regarding water capture comment: Water harvesting is typically done with rooftop catchment systems. By fitting more buildings with such systems and using other impervious surfaces, the overall catchment area could be increased. No changes were made due to space limitations. (2) Regarding monitoring and projections: Observations are critically important for model calibration and testing. Also, without baseline climate information, projections of future climate are not as useful for adaptation planning purposes. No changes made due to space limitations. (3) Regarding monitoring and adaptive capacity: We have added an additional clarifying phrase. (4) Regarding evaporation-related variables: The variables were added as requested.
Michael	Kruk	141655	Text Region	27. Hawai'i and Pacific Islands		1248		21		"…the most severe impacts…" - assume this is related to climate change?	We appreciate this comment. The text was revised to clarify that the sentence refers to the impacts of sea level rise.
Michael	Kruk	141656	Text Region	27. Hawai'i and Pacific Islands		1251		18		"…discussions involving multiple stakeholders are underway". Great! Could the authors elaborate a bit on what this looks like?	Text was added to provide more context and incorporate this suggestion.
Michael	Kruk	141657	Text Region	27. Hawai'i and Pacific Islands		1251		32		"…has become very damaging in the region (see photo)". Instead of only showing one photo that is Hawaii-centric, I suggest a collage of photos that truly represent the entire region. There are no shortages of disaster images from the USAPI.	We appreciate the suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information/illustrations to include. The chapter has not been revised to address this comment.
Michael	Kruk	141658	Text Region	27. Hawai'i and Pacific Islands		1254	1254	8	9	Line 8, "Because they are dependent on restricted…" - maybe use the word 'variable' instead of restricted. Line 9 - "…and under-scaled catchment systems…" - please provide a source/reference for this statement. As it currently reads, it may be construed as opinion.	We thank the reviewer for the comment. The chapter text has been revised.
Michael	Kruk	141659	Text Region	27. Hawai'i and Pacific Islands		1255		4		"…coupled with damaging watershed and reef practices.." - please elaborate what is meant by 'damaging practices'. Careful here - sounds like opinion again.	After consideration of this point, we have determined that the existing text is adequately attributed.
Michael	Kruk	141660	Text Region	27. Hawai'i and Pacific Islands		1255		11		"…potentially growing in frequency and magnitude…" - what is growing? ENSO events? But ENSO has El Nino and La Nina. So which one of the phases is growing?	We thank the reviewer for the comment. The chapter text has been revised to indicate that El Nino and La Nina episodes have been projected to increase.
Michael	Kruk	141661	Text Region	27. Hawai'i and Pacific Islands		1255		15		"…indicate changing future wave conditions…" - OK, but please explain what it is changing FROM and then what it is expected to change TO.	We thank the reviewer for the comment. Model projections of changing future wave conditions indicate spatial and seasonal complexity. The text has been revised to reflect this.
Michael	Kruk	141662	Text Region	27. Hawai'i and Pacific Islands		1255		38		"storminess" - lots of context for this in the Pacific region, and term is used without references (Atkinson 2005; Marra et al. 2008; Kruk et al. 2015). Please define "storminess" as used in this context.	We thank the reviewer for the comment. The text has been revised to reflect a more detailed undertanding of changes in winds and tropical cyclones.
Michael	Kruk	141663	Text Region	27. Hawai'i and Pacific Islands		1256		4		Please (please) remove the words, "Pacific peoples resist the role of victims." Then place a comma after the word "threats", use lowercase M in "Many", and complete the sentence.	We thank the reviewer for the comment. The chapter text has been revised.
Michael	Kruk	141664	Text Region	27. Hawai'i and Pacific Islands		1256		31		"oxygen levels…have been declining." For the casual reader, this will zoom right over their heads. What is the importance of dissolved oxygen in context with the paragraph, climate change, and fisheries?	We appreciate this suggestion. We added text to the sentence to clarify the significance of oxygen to fish.
Michael	Kruk	141665	Text Region	27. Hawai'i and Pacific Islands		1257		6		"annual bleaching will begin in 2035…" - many in the Pacific region are already seeing and experiencing annual bleaching. How do the authors explain this, when the models suggest regular bleaching is still 15+ years out?	We thank the reviewer for this comment. As we state in lines 36-37 we have seen bleaching annually recently but we believe 2014-2016 were unusual. Based on downscaled model outputs, bleaching is projected to occur annually in about 15 years (Hooidonk et al 2016, see fig 27.8 in the text).
Michael	Kruk	141666	Figure	27. Hawai'i and Pacific Islands	27.8	1258				Source: NOAA. Vague. Please provide a document, website, or manuscript from NOAA that can be reviewed for more information.	We have revised the citation to incorporate this suggestion. This figure was created with data from Hooidonk et al. 2016
Michael	Kruk	141667	Text Region	27. Hawai'i and Pacific Islands		1260	1260	12	13	ERROR bookmark not defined?	This comment does not appear to connect with text in the document. It likely references a formatting error that has been resolved in the text.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Eugene	Takle	141668	Text Region	27. Hawai'i and Pacific Islands		1262	1262	6	7	Error bookmark not defined?	This comment does not appear to connect with text in the document. It likely references a formatting error that has been resolved in the text.
David	Wojick	141748	Text Region	27. Hawai'i and Pacific Islands		1242	1242	18	23	The present text says this: 18 Key Message 1: Dependable and safe water supplies for Pacific Island communities and 19 ecosystems are threatened by rising temperatures, sea level rise, and increased risk of 20 extreme drought and flooding. Islands, especially low atolls, already experience saltwater 21 contamination due to sea level rise, which could catastrophically impact food and water 22 security. Active monitoring and management of watersheds and freshwater systems could 23 increase resilience to future threats. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the author team's thorough assessment of the science. This statement represents the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 [Climate Science Special Report, the CSSR]; that volume provides the underlying scientific basis for the impacts analyses provided in Volume 2, and this Chapter and Key Message. The CSSR goes into extensive detail about the observations of past trends in climate, including severe weather events, and the projections of future changes in climate and the models used to make those projections. In turn, the global observations and models in the CSSR were used to drive the models in the Hawaii and Pacific Islands region, in conjunction with decades of observed data from weather stations and data used in studies on individual islands. Where appropriate, the author team has also included regionally observed impacts and case studies that detail how communities and ecosystems in the Pacific Islands are already being impacted by a changing climate, and how they are adapting or planning to adapt to those changes.
David	Wojick	141749	Text Region	27. Hawai'i and Pacific Islands		1248	1248	1	6	Present text: 1 Terrestrial habitats and the 2 goods and services they provide are threatened by rising temperatures, changes in rainfall, 3 increased storminess, and land-use change. These changes may both promote the spread of 4 invasive species and also reduce the ability of habitats to support protected species and 5 sustain human communities. Some species may become extinct and others may decline to the 6 point of requiring protection and costly management. Comment: This text falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the author team's thorough assessment of the science. This statement represents the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 [Climate Science Special Report, the CSSR]; that volume provides the underlying scientific basis for the impacts analyses provided in Volume 2, and this Chapter and Key Message. The CSSR goes into extensive detail about the observations of past trends in climate, including severe weather events, and the projections of future changes in climate and the models used to make those projections. In turn, the global observations and models in the CSSR were used to drive the models in the Hawaii and Pacific Islands region, in conjunction with decades of observed data from weather stations and data used in studies on individual islands. Where appropriate, the author team has also included regionally observed impacts and case studies that detail how communities and ecosystems in the Pacific Islands are already being impacted by a changing climate, and how they are adapting or planning to adapt to those changes.
David	Wojick	141750	Text Region	27. Hawai'i and Pacific Islands		1251	1251	23	30	Present text: 23 Key Message 3: Global sea level rise threatens critical assets such as ecosystems, cultural sites 24 and practices, economics, housing and energy, transportation, and other forms of 25 infrastructure. The rate of global average sea level rise has tripled since the 20th century, 26 threatening the food and freshwater supply of Pacific island populations and jeopardizing 27 the very existence of some communities. In general, Pacific Islands are isolated, under 28 resourced, and vulnerable to climate variability and increasing flood frequency. Future 29 global average sea level rise may exceed previous estimates, and is projected to be higher 30 than the global average in the U.S.-Affiliated Pacific Islands. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the author team's thorough assessment of the science. This statement represents the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 [Climate Science Special Report, the CSSR]; that volume provides the underlying scientific basis for the impacts analyses provided in Volume 2, and this Chapter and Key Message. The CSSR goes into extensive detail about the observations of past trends in climate, including severe weather events, and the projections of future changes in climate and the models used to make those projections. In turn, the global observations and models in the CSSR were used to drive the models in the Hawaii and Pacific Islands region, in conjunction with decades of observed data from weather stations and data used in studies on individual islands. Where appropriate, the author team has also included regionally observed impacts and case studies that detail how communities and ecosystems in the Pacific Islands are already being impacted by a changing climate, and how they are adapting or planning to adapt to those changes.
David	Wojick	141751	Text Region	27. Hawai'i and Pacific Islands		1256	1256	14	20	Present text: 14 Key Message 4: Fisheries and the livelihoods they support are threatened by warmer ocean 15 temperatures and ocean acidification. Widespread coral reef bleaching and mortality have 16 recently occurred in successive years, and by mid-century these events are projected to occur 17 annually. Bleaching and acidification will result in loss of reef structure, leading to lower 18 fisheries yields and loss of coastal protection and habitat. Declines in oceanic fishery 19 productivity of up to 15% and 50% of current levels are projected by mid-century and 2100, 20 respectively. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the author team's thorough assessment of the science. This statement represents the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 [Climate Science Special Report, the CSSR]; that volume provides the underlying scientific basis for the impacts analyses provided in Volume 2, and this Chapter and Key Message. The CSSR goes into extensive detail about the observations of past trends in climate, including severe weather events, and the projections of future changes in climate and the models used to make those projections. In turn, the global observations and models in the CSSR were used to drive the models in the Hawaii and Pacific Islands region, in conjunction with decades of observed data from weather stations and data used in studies on individual islands. Where appropriate, the author team has also included regionally observed impacts and case studies that detail how communities and ecosystems in the Pacific Islands are already being impacted by a changing climate, and how they are adapting or planning to adapt to those changes.
David	Wojick	141752	Text Region	27. Hawai'i and Pacific Islands		1259	1259	30	33	The present text says this: 30 Key Message 5: Indigenous peoples of the Pacific are threatened by rising sea levels, future 31 freshwater availability, and shifting ecosystem services, which imperil communitiesâ€™ health, 32 well-being, and modern livelihoods, as well as their familial relationships with lands, 33 territories, and resources. Comment: This text falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the author team's thorough assessment of the science. This statement represents the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 [Climate Science Special Report, the CSSR]; that volume provides the underlying scientific basis for the impacts analyses provided in Volume 2, and this Chapter and Key Message. The CSSR goes into extensive detail about the observations of past trends in climate, including severe weather events, and the projections of future changes in climate and the models used to make those projections. In turn, the global observations and models in the CSSR were used to drive the models in the Hawaii and Pacific Islands region, in conjunction with decades of observed data from weather stations and data used in studies on individual islands. Where appropriate, the author team has also included regionally observed impacts and case studies that detail how communities and ecosystems in the Pacific Islands are already being impacted by a changing climate, and how they are adapting or planning to adapt to those changes.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
David	Wojick	141753	Text Region	27. Hawai'i and Pacific Islands		1265	1265	13	19	This is the present text: 13 Key Message 6: Climate change impacts in the Pacific Islands are expected to amplify existing 14 risks and lead to compounding economic, environmental, social, and cultural costs. For 15 example, climate change impacts on ecological and social systems may result in severe 16 disruptions to livelihoods that increase the risk of human conflict or compel the need for 17 migration. Early interventions, already occurring in some places across the region, can 18 prevent costly and lengthy rebuilding of communities and livelihoods, and minimize 19 displacement and relocation. Comment: This entire message falsely states speculative projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	This comment is inconsistent with the author team's thorough assessment of the science. This statement represents the scientific understanding of climate change or the assessment of the peer-reviewed literature found in NCA4 Volume 1 [Climate Science Special Report, the CSSR]; that volume provides the underlying scientific basis for the impacts analyses provided in Volume 2, and this Chapter and Key Message. The CSSR goes into extensive detail about the observations of past trends in climate, including severe weather events, and the projections of future changes in climate and the models used to make those projections. In turn, the global observations and models in the CSSR were used to drive the models in the Hawaii and Pacific Islands region, in conjunction with decades of observed data from weather stations and data used in studies on individual islands. Where appropriate, the author team has also included regionally observed impacts and case studies that detail how communities and ecosystems in the Pacific Islands are already being impacted by a changing climate, and how they are adapting or planning to adapt to those changes.
Christen	Armstrong	141950	Text Region	27. Hawai'i and Pacific Islands		1232	1232	25	31	Reference to Chapter 9	We thank the reviwer for their comment. The text has been revised to include a citation to the Oceans Chapter in the first sentence of our Key Message text, as follows "The ocean around Hawai'i and the USAPI supports highly diverse marine ecosystems providing critical ecosystem services (Bell et al., 2013; for information about all ocean systems relevant to the United States, see Ch. 9: Oceans)"
Dave	White	141951	Text Region	27. Hawai'i and Pacific Islands		1259	1259	32	38	cross reference Chapter 15	We thank the reviewer for their comment. A reference to Chapter 15 has been added in the first paragraph of the Key Message narrative, in the sentence, " Climate change threatens this familial relationship with ancestral resources (Sproat, 2016) and is disrupting the continuity that is required for the health and well-being of these communities (experienced by many tribal and indigenous communities in the U.S.; see Chapter 15)."
Juanita	Constible	142440	Whole Chapter	27. Hawai'i and Pacific Islands						Suggest including recent Hawaiian Islands Climate Synthesis Project report and/or vulnerability assessment and adaptation planning products (Available at http://bit.ly/HawaiiClimate) Suggest including Tim Clark's Ofu Lagoon coral research May want to include National Marine Sanctuary of American Samoa vulnerability assessment and adaptation planning findings	(1) We have added the suggested HI Climate Synthesis Project report citation in the chapter, in KM6 (adaptation). (2) Space limitations currently limit us from adding additional case studies such as the Ofu Lagoon report. While the author team has chosen to not include this case study, we recommend contacting the PIRCA.org team to add it to the US National Climate Resilience Toolkit.
Michael	MacCracken	144651	Text Region	27. Hawai'i and Pacific Islands		1229	1230	17	84	This ought to be alphabetized by last name, I would think.	The text has been revised to incorporate this suggestion, Technical Contributors are now alphabetized by last name.
Michael	MacCracken	144652	Text Region	27. Hawai'i and Pacific Islands		1232	1232	6	6	I'd urge not using the words "could" and "may" in the chapter as they provide no indication of likelihood, for which the likelihood lexicon was developed. I'd suggest saying, "which on especially low-lying islands will Ã‰"	We thank the reviwer for their comment and suggested revision. The text has been revised here and throughout the chapter to eliminate weak future conditional words such as "may" or "could" and to use more specific language to improve the reader's ability to understand the report.
Michael	MacCracken	144653	Text Region	27. Hawai'i and Pacific Islands		1232	1232	7	8	Another "could" needing to be replaced, perhaps adding a phrase to indicate what has to happen to make something likely or unlikely.	We thank the reviwer for their comment. The text has been revised here and throughout the chapter to eliminate weak future conditional words such as "may" or "could" and to use more specific language to improve the reader's ability to understand the report.
Michael	MacCracken	144654	Text Region	27. Hawai'i and Pacific Islands		1232	1232	13	15	Here are three instances of "may" to be changed--using the lexicon. Good practice in assessment avoids words that can mean anything, even though it takes a bit of effort and may require adding a qualifying phrase. I'll try to avoid mentioning this too often in my comments--but the chapter needs to be scrubbed of words "may" and "could" in that literally anything could or may happen or could or may not happen--just not useful and informative word choices. Also line 23 on this page and line 4 on the next page, just looking at the Key Messages.	We thank the reviwer for their comment. The text has been revised here and throughout the chapter to eliminate weak future conditional words such as "may" or "could" and to use more specific language to improve the reader's ability to understand the report.
Michael	MacCracken	144655	Text Region	27. Hawai'i and Pacific Islands		1233	1233	18	18	Here, easy to change "may" to "is likely to"--so some places not at all hard to do.	We thank the reviwer for their comment. The text has been revised here and throughout the chapter to eliminate weak future conditional words such as "may" or "could" and use more specific language to improve the reader's ability to understand the report.
Michael	MacCracken	144656	Text Region	27. Hawai'i and Pacific Islands		1253	1253	9	17	It would also be appropriate, I'd suggest, to indicate that the rate of rise would continue into the 22nd century and beyond, and that the real uncertainty is not how much would occur in a particular year, but the range of years when it might be likely for these worst case levels to be reached. It is just not clear that having particular amounts of rise a few decades later really helps the situation very much--planning for that needs to begin now and become built into planning. So, I'd urge a bit of reworking of the point here to indicate that sea level begun a progressive upward trend and the main question is not whether the rise will be 1 or 2 meters in 2100 but when such rises will occur.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144657	Whole Chapter	27. Hawai'i and Pacific Islands						A wonderfully done chapter with lots of input and examples from the region--very interesting.	We greatly appreciate the reviewer's comment about the Pacific Islands chapter and hope the content is useful.
Sandra	Fatoric	140835	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						This whole chapter needs to focus more on cultural heritage or cultural resource adaptation sector. The National Park Service (NPS) estimated that over $40 billion dollars of coastal cultural resources and park infrastructure are at â€œhigh riskâ€ from sea level rise (Peek et al. 2015). There are increasing number of scientific studies in the U.S focusing on how to preserve these resources for current and future generations. Please provide more targeted focus on climate adaptation planning and implementation, for example the following scholars have been focused on developing novel approaches for designing climate adaptation planning for cultural resources (historic buildings, structures, landscapes) along the NC coastline: - FatoriÄ‡, S. & Seekamp, E. (2017). A measurement framework to increase transparency in historic preservation decision-making under changing climate conditions. Journal of Cultural Heritage, DOI: 10.1016/j.culher.2017.08.006. -FatoriÄ‡, S. & Seekamp, E. (2017). Evaluating a decision analytic approach to climate change adaptation of cultural resources along the Atlantic coast of the United States. Land Use Policy 68, 254-263. -FatoriÄ‡, S. & Seekamp, E. (2017). Are cultural heritage and resources threatened by climate change? A systematic literature review. Climatic Change 142(1), 227-254. - Peek, K.M., Young, R.S., Beavers, R.L., Hoffman, C.H., Diethorn, B.T., Norton, S., 2015. Adapting to climate change in coastal national parks: estimating the exposure of park assets to 1 m of sea-level rise. In: Natural Resource Report NPS/NRSS/GRD/NRR- 2015/961. NPS, Fort Collins, CO.	We now have more dicussion of the importance of cultural heritage. We thank the reviewer for the suggestion, and the useful literature
Sandra	Fatoric	140836	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	8	9	Please add cultural in the following sentence: "adjustments to natural and cultural resource management"	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Sandra	Fatoric	140837	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	1	1	Please add references (FatoriÄ‡ and Seekamp 2017a; FatoriÄ‡ and Seekamp 2017b) for cultural resource or heritage adaptation planning being developed across NC coastline (novel and robust scientific research) in the following sentence as: (FatoriÄ‡ and Seekamp 2017a, FatoriÄ‡ and Seekamp 2017b, Halofsky, Peterson et al. 2015, Leggett 2015, Ray and Grannis 2015, Wentz 2017) References: -FatoriÄ‡, S. & Seekamp, E. (2017a). Evaluating a decision analytic approach to climate change adaptation of cultural resources along the Atlantic coast of the United States. Land Use Policy 68, 254-263. - FatoriÄ‡, S. & Seekamp, E. (2017b). A measurement framework to increase transparency in historic preservation decision-making under changing climate conditions. Journal of Cultural Heritage, DOI: 10.1016/j.culher.2017.08.006.	We now cite this interesting work elsewhere in the chapter. Thanks for the suggestion
Sandra	Fatoric	140838	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1327	1327	9	10	Please first add word "social" before learning processes. Then please add additional reference before (Mimura, Pulwarty et al. 2014) as: FatoriÄ‡ and Seekamp, 2017 Reference: -FatoriÄ‡, S. & Seekamp, E. (2017). Evaluating a decision analytic approach to climate change adaptation of cultural resources along the Atlantic coast of the United States. Land Use Policy 68, 254-263.	We thank the reviewer for the suggestion. We now cite this work elsewhere in the chapter., but have chosen not to cite it again here.
Sandra	Fatoric	140839	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1325	1325	15	15	Please add following sentence in line 15 as: Another example is a comprehensive decision support tool that is driven by annual budget allocations, measures of risk from climate change, measures of historical significance and use potential, and treatment costs for various adaptation actions has been developed and tested using set of historic buildings at Cape Lookout National Seashore, North Carolina (FatoriÄ‡ and Seekamp 2017). Refrence: FatoriÄ‡, S. & Seekamp, E. (2017). A measurement framework to increase transparency in historic preservation decision-making under changing climate conditions. Journal of Cultural Heritage, DOI: 10.1016/j.culher.2017.08.006.	We thank the reviewer for the suggestion. We now cite this work elsewhere in the chapter., but have chosen not to cite it again here.
Sandra	Fatoric	140840	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1316	17	18	Then please add additional reference FatoriÄ‡ and Seekamp 2017 in the following sentence as: challenges (FatoriÄ‡ and Seekamp, 2017, Hess, McDowell et al. 2012, Jones, Patwardhan et al. 2014, Berrang-Ford, Pearce et al. 2015, Wigand, Ardito et al. 2017). Reference: FatoriÄ‡, S. & Seekamp, E. (2017). A measurement framework to increase transparency in historic preservation decision-making under changing climate conditions. Journal of Cultural Heritage, DOI: 10.1016/j.culher.2017.08.006.	Thank you. We have included this citation.
Sandra	Fatoric	140841	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1316	29	30	Please add "which can enhance transparency and foster defensible decision making (FatoriÄ‡ and Seekamp 2017)". The new sentence is: Such frameworks rely on and support participatory stakeholder processes, which can enhance transparency and foster defensible decision making (FatoriÄ‡ and Seekamp 2017). Reference: FatoriÄ‡, S. & Seekamp, E. (2017). Evaluating a decision analytic approach to climate change adaptation of cultural resources along the Atlantic coast of the United States. Land Use Policy 68, 254-263.	Thank you. We have included this phrase and its citation.
Elizaveta Barrett	Ristroph	140938	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						It could be helpful to add at least a paragraph explaining the relationship between adaptation and other frequently discussed concepts like vulnerability, adaptive capacity, and resilience. Here is a suggested paragraph: Adaptation can help reduce vulnerability to climate change impacts, where Â“vulnerability" is Â“a function of the character, magnitude, and rate of climate variations to which a system is exposed, its sensitivity, and its adaptive capacity" (Bierbaum et al. 2014, 672). Here, Â“adaptive capacity" means the Â“potential of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, take advantage of opportunities, and cope with the consequences." (Bierbaum et al. 2014, 672). Resilience can support successful adaptation and reduce long-term vulnerability. (Cutter et al. 2008, 600; Adger, Arnell, and Tompkins 2005, 79, 83; Nelson, Adger, and Brown 2007, 400). Resilience is the idea that a community can weather through and bounce back from adversity by having the right kind of resources or Â“capitals" and the flexibility to draw on those most readily available. (Norris et al. 2008, 136; Walker et al. 2006, 22; Nelson, Adger, and Brown 2007, 407; Cutter et al. 2008, 599; Magis 2010, 402). References: Adger, W. Neil, Nigel W. Arnell, and Emma L. Tompkins. 2005. Â“Successful Adaptation to Climate Change across Scales." Global Environmental Change, Adaptation to Climate Change: Perspectives Across Scales, 15 (2):77Â–86. https://doi.org/10.1016/j.gloenvcha.2004.12.005; Bierbaum, Rosina, Maria Blair, Independent Lynne M. Carter, F. Stuart Chapin III, Susan Ruffo, Shannon McNeeley, Missy Stults, and Emily Seyller. 2014. Â“Adaptation." Climate Change Impacts in the United States: The Third National Climate Assessment, 670Â–706; Cutter, Susan L., Lindsey Barnes, Melissa Berry, Christopher Burton, Elijah Evans, Eric Tate, and Jennifer Webb. 2008. Â“A Place-Based Model for Understanding Community Resilience to Natural Disasters." Global Environmental Change 18 (4):598Â–606. https://doi.org/10.1016/j.gloenvcha.2008.07.013; Magis, Kristen. 2010. Â“Community Resilience: An Indicator of Social Sustainability." Society & Natural Resources 23 (5):401Â–16. https://doi.org/10.1080/08941920903305674; Nelson, Donald R., W. Neil Adger, and Katrina Brown. 2007. Â“Adaptation to Environmental Change: Contributions of a Resilience Framework." Annual Review of Environment and Resources 32 (1):395Â–419. https://doi.org/10.1146/annurev.energy.32.051807.090348; Norris, Fran, Susan Stevens, Betty Pfefferbaum, Karen Wyche, and Rose Pfefferbaum. 2008. Â“Community Resilience as a Metaphor, Theory, Set of Capacities, and Strategy for Disaster Readiness." American Journal of Community Psychology 41 (1):127Â–150.	We have such a paragraph, under KM3, and have added these cites to it. We thank the reviewer for the suggestion
Elizaveta Barrett	Ristroph	140939	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1334	1334	4	4	Suggest adding another sentence at the end of this sentence along these lines: "What may appear to be an adaptation action expressed in a community plan may never actually be carried out."	Thank you for this comment. We have significantly rewriten this text

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Elizaveta Barrett	Ristroph	140940	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1334	1334	27	27	Suggest adding another sentence at the end of this sentence along these lines: "Only since 2015 has the Federal Emergency Management Agency encouraged state and local governments to consider climate change adaptation and resiliency in their planning and scoping efforts. Reference: FEMA, 2015. "Hazard Mitigation Assistance Program Digest." http://www.fema.gov/media-library-data/1444240033001-518cdc8d447ef79a136..., page 19	Thank you for this comment; we don't agree that this citation makes sense to support the issue of stationarity assumptions (though it is a useful citation elsewhere in the chapter).
Elizaveta Barrett	Ristroph	140941	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1335	1335	2	2	It seems that there is an over-emphasis on uncertainties that can stall adaptation measures currently available to state, local, and tribal decision-makers. I would suggest adding something along the lines that there is room for "no regrets" strategies that provide benefits despite uncertain outcomes (Hallegatte 2009, 244; Berke and Lyles 2013, 196). Also, scenario planning can provide alternative actions that can be carried out if different scenarios occur. (Boyd et al. 2015, S153; Berke and Lyles 2013, 196). References: Berke, Philip, and Ward Lyles. 2013. "Public Risks and the Challenges to Climate-Change Adaptation: A Proposed Framework for Planning in the Age of Uncertainty." Cityscape, 181Â–208; Boyd, Emily, BjÃ¶rn Nykvist, Sara BorgstrÃ¶m, and Izabela A. Stacewicz. 2015. "Anticipatory Governance for Social-Ecological Resilience." AMBIO 44 (S1): 149Â–61. doi:10.1007/s13280-014-0604-x; Hallegatte, StÃ©phane. 2009. "Strategies to Adapt to an Uncertain Climate Change." Global Environmental Change 19 (2): 240Â–47. doi:10.1016/j.gloenvcha.2008.12.003.	Thank you for this comment; we have included some of these points and cites in the text.
Elizaveta Barrett	Ristroph	140942	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						for key message 3, at the end of the message, I suggest adding something like "It is consistent with an incremental policy approach." As I suggest elsewhere, it is extremely difficult to imagine any sweeping change absent a catastrophe that personally affects decision-makers along the lines of Hurricane Sandy or 9-11. Changes are likely to be incremental and iterative, and this is consistent with the concept of adaptive management. Suggesting a sudden, large-scale change is more similar to the concept of transformation than near-term adaptation (the latter being the theme of this chapter)	We now try to address some of these themes in the dicussion of KM5
Elizaveta Barrett	Ristroph	140943	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						for key message 5, I think it would be helpful to acknowledge the political difficulty of implementing anything but incremental change. See, e.g., Hirokawa and Rosenbloom (2013, 347); Flatt (2012, 272); Moser and Ekstrom (2010, 22029). Large changes--like the establishment of the Department of Homeland Security of the 2013 Hurricane Sandy Act that reformed the Stafford Act--have happened only after disasters. To make Key Message 5 more consistent with Key Message 3 of this chapter, I suggest the following rewrite: "Many benefits of adaptation can be realized by integrating climate considerations into organizations' and government entities' current risk management activities (mainstreaming). While reducing climate-related risks over the long term may require a transformation beyond that of incremental changes, small-scale, iterative and incremental changes are far more political feasible absent catastrophe." Citations: Hirokawa, Keith H, and Jonathan Rosenbloom. 2013. "Climate Change Adaptation and Land Use Planning Law." In Research Handbook on Climate Change Adaptation Law, 325Â–54. Cheltenham, UK: Edward Elgar Pub; Flatt, Victor B. 2012a. "Adapting Laws for a Changing World: A Systemic Approach to Climate Change Adaptation." Fla. L. Rev. 64: 269; Moser, S. C., and J. A. Ekstrom. 2010. "A Framework to Diagnose Barriers to Climate Change Adaptation." Proceedings of the National Academy of Sciences 107 (51): 22026Â–31. doi:10.1073/pnas.1007887107.	We have added this point and cites to our revised "Beyond Incremental Change" section. Thank you!
Elizaveta Barrett	Ristroph	140944	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						use consistent spelling of "judgment" (as opposed to "judgement")	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Elizaveta Barrett	Ristroph	140945	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1337	1337	16	16	suggest adding to end of this line "and whether they actually lead to adaptive actions."	We have revised this sentences along the lines suggested by this comment
Elizaveta Barrett	Ristroph	140946	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						This is a really important chapter and great effort to tackle something so complex in a brief chapter. It might be helpful to include more citations after some of the assertions, especially on page 1314.	Thank you! We have included more citations throughout the chapter
Elizaveta Barrett	Ristroph	140947	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	31	31	suggest adding to end of "alternative adaptation actions" an additional phrase "that are difficult to quantify"	We appreciate this comment and modified the text to recognize this point.
Elizaveta Barrett	Ristroph	140948	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	13	13	the discussion of organizational adaptation also applies to government entities--maybe this is included in the term "organization" but it's not clear, so I suggest adding "and government entities" after the word "organizations"	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Elizaveta Barrett	Ristroph	140949	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	27	27	I would be cautious about adhering to this linear 5-step model for stages of adaptation. Many people, including Alaska Natives, have adapted for centuries and millennia without following the first 3 stages. I would change the second word in this sentence (has) to "may involve." I also think it's worth pointing out that US entities can sometimes overemphasize the assessment phase. A good citation for this is US climate change policy has relied primarily on more research to support future decision and action, deferring action on the knowledge that is already there Brunner and Lynch (2010, 63). Brunner and Lynch (2010, 18) note that out of ten Barrow residents who were interviewed for the 2004 Arctic Climate Assessment, only two were aware of the synthesis and none had read it. They suggest that Â"scientific excellence is no guarantee that an assessment of climate impacts will inform decisions on the ground. Conversely, a scientific assessment is not necessary for successful adaptations on the ground, though it can help." Another example is FEMA-sponsored hazard mitigation plans, which are rich with risk assessment, but, based on my research, not well implemented. Possible citations:Ristroph, E.B. 2017. Â"Presenting a Picture of Alaska Native Village Adaptation: A Method of Analysis." International Journal of Sociology and Anthropology 5(9): 762-775. Brunner, Ronald D., and Amanda H. Lynch. 2010. Adaptive Governance and Climate Change. American Meteorological Society.	We appreciate the reviewer's comments and agree with the point in the recommended citation that in some cases too many resources are spent on scientific assessments relative to adaptation implementation. That said, "assessment" is a broad term that goes beyond formal scientific studies. We doubt whether it is possible for humans to take deliberate actions to adapt to climate change (or any type of risk) without some type of assessment.
Elizaveta Barrett	Ristroph	140950	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1319	1319	1	1	suggest adding the word "tangible" before benefits. Particularly with Alaska Native Villages, it is hard for adaptation actions to meet cost-benefit analyses required for FEMA sponsored projects because of the difficulty of measuring the intangible values of the subsistence lifeway. This is likely true for non-indigenous, place-based communities around the world.	We thank the reviewer for this comment and have incorporated change to the text.
Elizaveta Barrett	Ristroph	140951	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1322	1322	3	3	suggest adding to end of "benefits" an additional phrase "that are difficult to quantify"	The text has been modified as suggested.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Elizaveta Barrett	Ristroph	140952	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1324	1324	11	11	add "/governmental" after "organizational"	We thank the reviewer for the comment. We have added text at the start of the paragraph to make clear this paragraph refers to both public and private sector organizations
Elizaveta Barrett	Ristroph	140953	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1324	1324	14	14	add "/government entity" or "agency" after "organization"	We thank the reviewer for the comment. We have added text at the start of the paragraph to make clear this paragraph refers to both public and private sector organizations
Richard	Feely	140954	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1324	1324	23	23	add "/government entity" or "agency" after "organization"	We thank the reviewer for the comment. We have added text at the start of the paragraph to make clear this paragraph refers to both public and private sector organizations
Robert	Kopp	141196	Table	28. Near-Term Adaptation Needs and Increased Resiliency	1	1319				Some of the benefit/cost ratios in this table are hard to interpret and merit closer scrutiny. In particular, the statement about wetlands restoration appears inconsistent with some of the discussion on page 1321. More generally, it is unclear what benefits are being included -- for example, property buyouts might appear more beneficial if inequality aversion is taken into account.	We deleted the table due to space constraints
Louis	Iverson	141581	Whole Page	28. Near-Term Adaptation Needs and Increased Resiliency		1321				Line 17, insert text after Forests): Coastal marsh restoration provides benefits of protection against rising sea levels, flood prevention, and increasing biodiversity. One such study underway involves restoring the river and surrounding lands of the Tidmarsh Wildlife Sanctuary in coastal Massachusetts, which was a former cranberry farm. The restoration project includes the installation and monitoring of cutting-edge environmental sensors to provide continuous data on marsh restoration, cranberry farm conversion, and climate change impacts and adaptation (http://www.livingobservatory.org). Line 30, Add text at end of line: Another example of co-benefits in adaptation and mitigation planning is eliminating ecologically sensitive areas from consideration while planning for wind energy development. Tools are available to help decision-makers and planners locate and consider areas of high wind energy potential located away from sensitive ecological sites, without incurring additional costs (e.g., Biodiversity and Wind Siting Mapping Tool, The Nature Conservancy, New York Chapter).	We thank the reviewer for this comment and have incorporated change to the text.
David	Wojick	141754	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	21	25	The present text says this: 21 Key Message 1: Adaptation planning and implementation activities are taking place across the 22 United States in both the public and private sectors. Since the Third National Climate 23 Assessment, implementation has significantly increased, but is not yet commonplace. Most 24 adaptation actions taken to date aim to address current variability, often in response to 25 recent extreme weather events. Fewer actions address future change. Comment: This entire message falsely assumes speculative projections of adverse impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. Adaptation to these speculations is unwarranted.	We thank the reviewer for the comment, but respectively disagree. Please refer to the climate science special report the accompanies the NCA
David	Wojick	141755	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	25	28	Present text: 25 Key Message 2: Successful adaptation has been hindered by the ongoing practice of implicitly or 26 explicitly assuming that current and future climate conditions will be similar to the historical 27 record. A significant challenge is finding alternatives for this assumption that work 28 effectively within societyâ€™s current expectations, rules, practices, and infrastructure. Comment: This entire message falsely assumes speculative projections of adverse impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. Adaptation to these speculations is unwarranted.	We thank the reviewer for their comments, but respectfully disagree. Please see the Climate Science Special Report.
David	Wojick	141756	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1316	6	12	Present text: 6 Key Message 3: Climate risk has and will continue to change. An iterative approach to risk 7 management provides an appropriate framework for assessing climate risks and 8 vulnerabilities, taking actions to reduce those risks, and learning over time. Iterative risk 9 management is consistent with and integrates other aspects of climate adaptation, such as 10 vulnerability assessment and adaptive management. It can help promote learning among 11 sectors and help mainstream adaptation because many organizations are familiar with risk 12 management approaches. Comment: This entire message falsely assumes speculative projections of adverse impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. Adaptation to these speculations is unwarranted.	Thank you. We disagree that the message rests on a false assumption. Climate change effects and impacts have been measured and the skill of nearer-term projections has been borne out as documented in NCA4 vol1, the Climate Science Special Report, 2018.
David	Wojick	141758	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	35	38	Present text: 35 Key Message 4: Many adaptation initiativesâ€"including changes to policies, business operations, 36 capital investments, and other stepsâ€"yield benefits in excess of their costs in the near-term, 37 as well as over the long-term. Direct and indirect benefits may include many aspects of well 38 being such as economic, ecological, health, social, and security improvements. Comment: This entire message falsely assumes speculative projections of adverse impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. Adaptation to these speculations is unwarranted and yields no benefits.	Thank you. And as above (141756): we disagree that the message rests on a false assumption. Climate change effects and impacts have been measured and the skill of nearer-term projections has been borne out as documented in NCA4 vol1, the Climate Science Special Report, 2018.
David	Wojick	141760	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1324	1324	2	5	2 Key Message 5: Many benefits of adaptation can be realized by integrating climate 3 considerations into organizationsâ€™ current risk management activities (mainstreaming). Over 4 the long term, reducing climate-related risks and taking advantage of the opportunities 5 derived from risk reduction requires moving beyond incremental changes. Comment: This entire message falsely assumes speculative projections of adverse impacts as established physical facts. These projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely. Adaptation to these speculations is unwarranted.	We respectfully diagree with this comment, and refer the reviewer to the Climate Science Specia Report associated with this NCA report.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Susanne	Moser	141795	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						The Adaptation chapter as a whole does not constitute an objective or well informed assessment. It reads more often like a textbook rather than an assessment; in many places it is vague - something the "may, can, could, or might police" in NCA3 was serious about avoiding - and therefore is unhelpful for researchers or decision-makers; and it includes a number of overt or hidden normative statements. What is its more serious flaw, however, is that it is dated, uninformed, does not provide adequate perspective, and is in many instances rosy-eyed and unsupported by evidence. I will provide a few sample passages where that is the case, but having just completed a serious assessment of the state of adaptation as a field of practice in the US, I find this chapter largely to be a document of wishful thinking. It is wholly inadequate as a definitive federal document reflecting the state of adaptation in the US. It simply and categorically does not. The traceable account suggests the author team did a "comprehensive" literature review and consulted experts, who are not named or counted, so this does not provide very convincing evidence that this search and consultation was thorough. For example, the current reference list consists of 109 references (it is incomplete, but I can only work with what is presented); more than half (!) of these references are pre-NCA3. So, a total of 52 references are post 2014. By comparison, a quick Web of Science search for these terms: yields 223 references. So, a first indication that the literature search was not comprehensive. More importantly, SO MUCH of what is going on in the adaptation arena is reflected in non-peer-reviewed journal articles, and yet often well researched and peer-reviewed. This body of work is generally termed "grey literature" but is permissible (and other chapters in the assessments rely on such references). That body of work is 100% missing from this assessment. It reads therefore like the authors simply do not know what is going on in America. I will make more specific comments separately to reflect how these omissions make this chapter essentially biased or useless. I am sorry to have to say this. I will send several documents to the review email and urge the author team to read those documents to sharpen the assessment.	We thank the reviewer for the comment. We have included more citations in our revised draft, have removed at least some of the "may, can, and woulds", and revised those sections that might have led the reviewer to consider us as "rosey-eyed." The chapter did and now eve more so draws heavily on the grey literature.
Susanne	Moser	141796	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1314	20	14	My comment pertains to KM 1 and the text that goes with it. This is a good example of how this chapter is biased and wholly unsupported by adequate evidence. The section claims early on that since NCA3 adaptation has "increased significantly" in scale and scope, which is graphically depicted in Figure 28.1. I want to know where the author team comes up with that conclusion. its PRIMARY reference given as evidence is the Bierbaum article which was commissioned PRIOR to 2014 for NCA3, and it concluded - see the title of the paper - that adaptation is progressing but not enough. its key take home message was tampered down even further by all the other evidence accumulated in all the chapters of NCA3 to the conclusion that Melillo et al 2014 came to, namely that we were not seeing many examples of implementation. So, one pre-NCA3 paper is given as evidence that we have progressed beyond the NCA3 statement? Several more paragraphs on p. 1313 claim there is evidence of progress, but provide not a single reference. Then at the top of p.1314, therre are several other references - one about progress of federal agencies - which was mandated under Obama and is now seriously curtailed and this is not in any way acknowledged; and then two legal papers and the tribal chapter. In the accompanying traceable account, the paper also refs to Vogel et al 2016 - a compilation of case studies expressely claiming NOT to be representative of the US and including case studies that do NOT consider anthropogenic climate change or forward-looking climate information; and a review paper by Stults and Meerow that explicitly says that implementation is seriously hindered. Nor does it include a broader set of references of barrier studies or reviews of case studies or other reviews that conclude just the opposite of the author team. How in the world can the authors claim that the country as a whole has moved into implementation? Because of maybe 2 or 3 dozen projects that have been successful in overcoming major funding and institutional hurdles? How can THAT become the story if hundreds, maybe more, communities can't get beyond the planning stage, and when thousands haven't even begun yet??? This comment exemplifies (and note, there are many more unsupported statements like this throughout the chapter) what I call wishful thinking, bias, and lack of groundedness in the reality of adaptation in the US. A better informed chapter would consider the long list of studies and reviews on barriers to adaptation; it would seriously consider a comprehensive review of the adaptation field just published by the Kresge Foundation (as	We thank the review for the comment, which we found very helpful. We have qualified our statements and added more current citations

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Rebecca	Ambresh	141797	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1316	24	4	This set of comments pertains to KM2. This message and supporting text and traceable account are bizarre to me. First the word "assumptions" - this suggests people's perceptions or choices, but it seems mostly what the authors want to convey here is about standards and similar institutional barriers that prevent decision-makers from taking forward-looking climate information into account. The section would be exceedingly clearer if the authors distinguished where people's perceptions and choices (where they have them) are the problem, and where existing institutional requirements are the problem. For the first dimension of this KM, there is absolutely no evidence brought to the table. But there is. Lots of people talk about "adapting" when really they just deal with a disaster and then build back to the pre-disaster status without looking to the future. New Jersey after Sandy is a good example and literature exists on this now; especially in comparison to New York, where the future was taken into account! The Vogel et al reference also includes examples of people doing that. There is literature on how there are still places in teh US you can't talk about climate change and so it gets ignored in hazard mitigation efforts. Where is any of this here? The second dimension of this KM, which is about codes, regulations and standards that prevent even the willing from building back better and be forward-looking is a type of institutional barrier and there is growing literature on that. The efforts of ASCE are misrepresented as "the engineering community is already overcoming this." FAR from it. The AsCE document offers a framework and makes very high-level recommendations about what SHOULD be done. But that is a far cry from doing it already. If the author team knew more about how difficult and lengthy it is to change codes and standards, such a lofty, rosy eyed statement would not be made. I have the entire chapter marked red because it makes so many generalized claims that are unsupported, I truly do not even know where to begin.	We thank the reviewer for the comment. We have revised the KM and give examples of the points made
Susanne	Moser	141800	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1318	5	28	This set of comments is about KM 3. I read this section as a piece from a text book. It simply reiterates what many have said, namely that adaptation is a form of iterative risk management and people should get on with it. The NCA3 said as much. So, what here is new or worth repeating or the novel insight? I don't see any. On p.1316, ln. 35-39, there is a moment of something interesting here, namely that this allegedly suitable iterative risk management framework would help connect to sectors (e.g., the private sector) where this type of thinking is already common. Well, an assessment that would have something useful and new to say, would assess to what extent this framework is being used (i.e. how widespread this thinking has become), and to what extend it does help with cross-sector integration and coordination. That said, i have a more fundamental problem with the claim. with all the emphasis on local adaptation, the typical leads on adaptation are local government planners, or maybe public works or environment or health department staff. Sometimes explicitly sustainability or resilience officers. NONE of them have been trained in risk management and are NOT at all familiar with this framework. I just recently had a conversation with one of the best local planners in California and he said, "we don't know how to do this risk assessment and management." So, one problematic part with this KM is that there is evidence that experts think this is the right framework, but there is no evidence that it has become that. And so, an assessment ought to dig up why that is the case and what hinders its adoption. Not just claim it's the way to go like a textbook or even advocacy piece might. And then finally, where is the critical perspective that a real assessment needs? Iterative risk assessment is inherently reactive to new risk information, and recommends courses of action (and iterative updating of action) based on the available information. This is clearly better than not taking into account risk and uncertainty, surely, but iterative risk assessment is only as good as it captures all parts of a system, the interactions of those systems, and enables trade-off and synergy analyses, and each one of these aspects is limited by the current state of science, the current state of sophistication of adaptation professionals, service providers and practitioners. And NONE of it takes account of the famous "unknown unknowns" and completely surprising discontinuities, which become increasingly likely, but no more predicatable (suitable for risk assessment) in a system that is pushed so hard as we currently are pushing climate change. So, iterative risk management has serious blind spots. And this text does not acknowledge a single one of them. Precautionary approaches do so	Thank you. We disagree with all the many and various claims in this comment. The utility of an adaptive management framework has been documented in the references already cited in this chapter. The capacity for adapting to surprise or unplanned-for events is expressly recognized in the emphasis on learning and revising within applications of the adaptive management framework as illustrated by the examples we include.
Susanne	Moser	141801	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1318	5	28	Note also, this entire section references almost exclusively pre-NCA3 papers, reinforcing the textbook nature of the text. The only reference offered Townsend et al 2015 is missing from the reference list and hence can't be evaluated for adequacy; but the point it is meant to support has nothing to do with the KM. The examples offered on p.1318 are either pre-NCA3 examples or do not support the points the are meant to exemplify. referencing is missing on almost every claim made. In NCA3 that was NEVER allowed!	Thank you. We have completed the reference citation to Townsend et al., 2015, and have added additional references to support our claims here. We disagree that references are missing on almost every claim we make.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Rebecca	Ambresh	141802	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1323	29	37	KM 4 is vague ("can exceed") and therefore not particularly helpful or powerful. Can't the team sharpen that? More problematic is that most of the text is text-bookish, rather than assessing the available information, how good it is, what therefore can be said and not said about cost-effectiveness; and it says practically nothing about the challenges local communities have making the economic case for adaptation, even if adaptation is cost-effective. I urge the author team to carefully read documents sent to the review email - one is a US-wide assessment of the adaptation field, where the difficulty of making the economic case was carefully addressed. And the second is a study of adaptation finance challenges experienced by local governments in CA. It includes an extensive literature review of the pertinent literature globally and the US, and shows - on the basis of a document analysis what adaptation really costs. It is by far more expensive than is typically claimed; many cost items of the adaptation process are not included; AND YET it is cost-effective, compared to the cost of inaction (which is also seriously lacking in how it is assessed. The point is, the author team could do a MUCH more thorough job of actually saying something serious, useful and reality-based. There are serious problems with Table 28.1, one being that most of the citations are pre-NCA3; furthermore the text contextualizes NOTHING about these studies (e.g., property buy-outs are not cost-effective given the underlying constraints on who CBA should be done, they often are absolutely cost effective if the full life cycle of a structure is considered, but the author team discusses none of this, which either illustrates lack of awareness or bias); all the items in black ink have no references at all; the message it sends therefore is truly problematic! The text should be searched systematically for all mentions of "can" or "could" or "appear to" or "may" etc. and be replaced with serious conditional statements as when something does or doesn't do x, y, z. Each should be be backed-up by literature. yet again, that type of language creates a textbook feeling, not an assessment. This chapter should have something serious to say about where, to what extent and under what circumstances adaptation has been shown to be cost effective. And the references should be mostly post NCA3. The ones cited here are mostly pre-2013. The section claims on p.1321 that there is "considerable literature on the cost of actions", but there is practically no evidence of that in this section. That cost is not exemplified; there is no discussion of how incomplete or	We have re-written the key message and deleted the Table
Susanne	Moser	141804	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1323	1330	38	12	The wording of the KM is vague to non-sensical. If best practices can't, what will? Should be try non-best practices? Besides this making no sense at all, the section fails to be an assessment one more time . Tell me three things that are best practices? Then shop it around and see if three more people agree with that list. The Kresge field assessment just released makes exceedingly clear that the field doesn't know what best practices are, and if anything, that would be useful to say in an assessment chapter, but then the chapter goes into a textbooking treatment (inadequate at that!) of mainstreaming and ultimately says it may not be enough. Well, that is so unhelpful. An assessment could assess how widespread mainstreaming is. It could assess how well that is going and what the outcomes of that approach is. It could assess whether there are drawbacks. It could assess up to what point that is a good idea and provide insights when it is not. And since it mentions that there is something beyond mainstreaming, it could actually draw on the growing transformational adaptation literature and say what that is about, why and when it's needed, and to what extent that has advanced since NCA3. This chapter fails on every single point. It does none of this. It also conflates mainstreaming with incremental change with illustrates that the authors are not familiar with the literature on mainstreaming or the literature on transformational change. Transformational change can begin very much in an incremental fashion, in fact, most transformations proceed that way. The chapter is also full of "can" and "may" statements; all of which should be replaced with hard-hitting conditional statements that explain when something does x,y,z and when it does not, and be followed by supporting references, i.e. evidence. In a series of instances these words just look like ridicuous attempts to avoid saying some hard truth (e.g., without GHG reductions we "may" have to do more extensive changes… an organization "may be" required to use historical climate information." - both of these are facts!!). This section seems to be an advocacy for mainstreaming without a single critical eye thrown on it. Really? My mark up of this section has it completely red - there are just so many details that are wrong, inappropriate or overstated, I just don't know where to begin. Melillo et al 2014 is not an appropriate reference for scenario planning, but there are fabulous ones and great examples of using it since NCA3. The "engineering community"	We revised this KM. Box 28.1 lists common attibutes of effective adaptation
Susanne	Moser	141805	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1330	1332	13	7	What is the purpose of this section? It is no associated with a KM, nor does it provide a comprehensive overview of available resources and networks, nor does it provide a critical assessment of whether: - what is there is useful and to whom - anything is missing - the available resources are equally good and judged by what criteria - maybe there is too much information and too many tools, in conflict with each other, or simply useless and overwhelming to users There is also no discussion that many resources are federal and have been either withdrawn or taken off websites or are actively defunded. So, the authors can't say that maybe, but then they need to work a lot harder to still say the truth to power. Avoidance of waning federal resources is disingenuous at best! The set of networks cited are extremely selective, not reflective of much of what is happening in the world of adaptation in this country; and yet, one of the federal networks (LCCs) is out of business, so why bother mentioning it?	Thank you for your comment. We have added a key message to support this section. We have also taken out the LCC example, indicated that the federal examples are from the last several years, and make a point about our list being non-exhaustive.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Susanne	Moser	141806	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1333	1337	1	26	I cannot comment on every paragraph as I have a day job. But this document is a wholly inadequate back-up to the claims. - referencing of claims is wholly inadequate here - just as it is in the chapter; studies and survey are mentioned but NONE are cited - the uncertainties mentioned in several KM sections have nothing to do with, or comprise only a partial list of the uncertainties pertaining to the KLM - the discussion of statistical significance of the evidence base for the first KM is completely ludicrous, given that there are three studies mentioned, none of which mention anything quantifiable. The references are pre-NCA3 and hence not supporting the statements made here at all; a meta analysis and a set of case studies, none of which claiming comprehensiveness or representativeness. The measure of "seriousness" for adaptation implementation taking place is "financial levels" (whatever that is?), and yet, there is not a single reference to a study in this entire chapter that would look at what kind of money has been spent on adaptation in the US. Not even a single reference to barrier studies that show that the lack of money for implementation is the biggest hurdle people face. So, not only is there no convincing evidence for this KM; the text here is just a lot of verbeage for no evidence at all. The text claims there has not been a "gap" analysis; which is not true (see Kresge-sponsored review of the US adaptation field, which does exactly that!). But the flaws all with standing, the authors rely on three studies to give them high confidence. is that just maybe a tad presumptuous? I find it dangerously misinformed. And then the medium confidence on judgments on outcome, where does it come from? There is no serious discussion of outcomes in the entire chapter, and the only thing that the authors say about it is that assessing adaptation effectiveness is in the early stage still, offering no judgment on outcomes at all - nowhere in the entire chapter!!! That, too, then would seem to be just a tad bit overconfident, doesn't it?	We have cited additional literature and expanded our discussion of adaptation financing. We thank the reviewer for the suggestion
Susanne	Moser	141807	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1334	1335	19	7	I have commented on text passages how the argument here is incomplete. The insufficiency in discussion continues in the Traceable Account. Only an evidence base for non-stationarity is offered, but no evidence base for how the non-recognition of that non-stationarity is hindering adaptation. That, however, is what the message is about. hard to justify when the argument in the chapter is unclear, and hence there is no reliance on relevant literature to back it up. The description of the confidence level relies on pre-NCA3 studies (and hence pre-NCA3 knowledge). Really? that is what this is based on? Seems dated and uninformed by relevant recent science.	We have added such a sentence
Susanne	Moser	141808	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1335	1335	8	34	There is medium confidence that many organizations are familiar with iterative risk management. Well, there is no evidence shown for that claim and the description of where the confidence comes from does not offer it either. It is moreover imprecise as no one knows how to interpret "many". But even so, let's just assume many do. Who will be expected to make most of the adaptation decisions? Well, often it is claimed that local governments have a lot to say about that. The question is, do THEY know what iterative risk management is? Are they skilled in doing it? And the answer is NO. So, once the imprecision here is taken care of, I wonder how much is left standing of the claim. Planners and climate resilience officers etc have barely a clue. You don't learn this stuff in planning school! I provided many other comments on the text already that questions the confidence and claims here. The Uncertainty section does not account for any of the uncertainties pertaining to the claims in the KM.	We have altered this statement. Thank you for the comment.
Susanne	Moser	141809	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1335	1336	35	26	The authors claim high confidence in this KM, and claim an extensive evidence base, but it is nowhere cited. Not here nor in the text. They also contradict their high confidence by describing the sample size as small making evaluation insufficient; also there are large acknowledged uncertainties in BC ratios. Earlier the authors claimed the literature is immature. So, all of this and yet "high confidence" - what am I missing. Seems disingenuous to me to claim that when our knowledge is so spotty! especially when there is no critical assessment anywhere in this chapter of the underlying assumptions, the differences in approaches, the things typically omitted from CBAs and so on.	We have rewritten this section. Thank you for the comments
Susanne	Moser	141810	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1336	1337	27	26	largely missing any supporting referencing! Unclear who agrees on the claim that mainstreaming can produce effective adaptation - especially when it is NEVER critically looked at what "effective: might mean. To whom? When? Effective is necessarily subjective and therefore will never be easily agreed by everyone. Who is excluded from this agreement may also disagree with your assessment. mainstreaming inherits the problems of the institutions into which climate change is being mainstreamed. Institutions that perpetuate institutionalized racism, resource exploitation, maladaptation and so. So, please, put on the thinking hats! And even if there was some group of people that thinks mainstreaming is a good idea, the authors' team's job is not to just be an echo chamber for it, but reflect the fact that academics tend to be far more skeptical of it. So, some balance would be warranted and appropriate!! The high confidence statement in the description of confidence does not adequately address the KM. And the major uncertainties paragraph has nothing to do with mainstreaming or transformational change.	We now provide a better-cited discussion of mainstreaming, and discuss some of the reasons for pursuing an alternative approach. We thank the reviewer for the suggestion
Susanne	Moser	141811	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1338	1345	1	28	The authors have to do a much better job with referencing - several references cited in the text are not here - referencing information per citation is incomplete in many instances - referencing format is uneven.	The formatting and presentation of references will be done in the final layout of the report development process.
Rebecca	Ambresh	141812	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						Are the authors aware that the Mitigation chapter includes a key message that essentially says, we don't need to worry so much about mitigation anymore because we can just adapt to whatever comes? You might want to have a conversation with them about that…. But even if you cannot dissuade them from that completely illusory statement, how would that bold claim affect what you want to say here? Would you feel quite so confident in progress with adaptation in this country? Would you insist on being quite so vague about the need for transformational change? Would you not want to look at the cost effectiveness of mitigation vs the cost of inaction or the cost of adaptation? It might open up some sharper thinking about adaptation, if the burden of America's future were all on adaptation! Just saying….	We have tried to address some of these comments in our revised discussion of KM5. We thank the reviewer for the suggestion

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
George	Backus	141849	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						This is a chapter on implementing adaptation efforts. The concept of resilience is only explored in one paragraph and only to the extent it relates to the adaptation process. Because the term resilience plays a very peripheral role in this important discussion of applying adaptation, it would seem that the title of the chapter as noted in this section should stay as is. Consequently, the title in the reportâ€™s Table of Contents (page iv) should have â€œand increased resilienceâ€ removed.	The text has been modified as suggested.
Erica	Brown	142043	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1321	1321	5	19	This section should include an example from the drinking water and wastewater sector. Such an example could include the loss of service and the cascading effects on other sectors.	We thank the reviewer for this comment and have incorporated change to the text.
Emily	Seyller	142386	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						1. Assessment of adaptation responses or climate impacts? I appreciate the team's attempt to assess the state of adaptation in the U.S. It's a tough job to do! However, as I read this chapter, I felt as though most of the chapter was focused on assessing the impacts and convincing the reader that there are risks and examples of why adaptation is needed versus what adaptation actions are being taken and assessing where we are in adapting to changes in climate and extreme weather events. I came away asking myself: Is the objective of this chapter to "assess adaptation responses" or "assess the impacts of climate change?" The way it's written in this current draft is more towards the latter. I wanted to see concrete examples of the "significant" adaptation actions being implemented across the U.S. at a variety of scales. Also the chapter title says: "Near-Term Adaptation Needs and Increased Resiliency" but when downloading the actual chapter, it's labeled as "Adaptation Responses." This is confusing in itself. 2. What does "significant" mean? In Key Message 1, you open up by stating that "implementation has significantly increased, but is not yet commonplace." Throughout the entire chapter, I really don't get a sense that "significant" implementation has occurred since the Third NCA. How do you quantify "significant"? What does "significant" mean to the chapter authors? And what data and information do you have to back that up? It wasn't clear to me through the minimal examples that were provided in the current draft. The term "significant" is used throughout the draft without evidence to back that up. If it's used, I would recommend adding in some concrete examples to support that statement. Having the traceable accounts is incredibly helpful as that backs it up with literature. But I wanted to see a quantifiable approach with the evidence illustrating that "significant" meant a certain number of on-the-ground projects, etc. 3. Include more concrete examples of adaptation being implemented at a variety of scales. Similar to my previous comment of the entire draft, I was looking for many more examples of adaptation actions being implemented throughout the U.S. (even just pulled out the actual text if they're embedded in there and put into call-out boxes). Given that this is supposed to be an assessment of adaptation responses and and increased resiliency, I would have hoped to have seen more examples. I would also recommend that you explain the difference between adaptation and resilience as these terms mean different things to different people, sectors, and organizations. 4. Diversify the images throughout. Most of the images captions were related to water and flooding. Try and	We have dropped "significant" from the language of KM1. We are assessing adaptation responses. Hopefully our revised chapter makes that clear.
Emily	Seyller	142387	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308		5		When you include the term "significant" in a key message, you need to back it up with evidence. It's not clear how you define significant and there aren't enough example throughout the chapter to support that statement. It's giving people a false sense of security that there's significant implementation on adaptation when there really isn't.	We thank the reviewer for the comment. We have removed the word significant.
Emily	Seyller	142388	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	28	37	The "Summary Overview" section does not actually summarize what's in the chapter. Is that the intent? It also doesn't create the sense of urgency that I think is truly needed for this chapter to open it up. The reader needs to understand why it's so critical to invest in adaptation actions now because we're ALREADY experiencing changes in our climate and extreme weather events. A "Summary Overview" should highlight the core components woven throughout the entire chapter instead of being a technical description of why we need to adapt. That can be put after the summary overview, and beef up the summary overview with reasons why this is so important and the urgency here to truly grab the readers attention from the start. The Summary Overview should also give the reader some hope illustrating how beneficial adaptation can be to people, places, and things - highlighting co-benefits to adaptation actions and the economic savings that go along with investing in adaptation now.	We have re-written the summary. We thank the reviewer for the suggestion.
Emily	Seyller	142389	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308		14		I would recommend using the phrase "continually improving" instead of "learning over time." The former phrase is more of an active statement than the latter.	Thank you for this comment. We revised Key Message 3
Emily	Seyller	142390	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1310	1	7	There is no citation associated with the statement "adaptation has five general stages: 1) awareness, 2) assessment, 3) planning, 4) implementation and monitoring, and 5) evaluation and response." It would help to have citations from a variety of different sources that helps the reader understand how you got to these 5 stages. In the Third NCA Adaptation chapter, there are a few examples that were provided so that the reader understood where the general steps originated for further transparency. It's also a little strange that monitoring and evaluation are separated…most adaptation processes I've seen combine those two. And what does "response" if adaptation itself is not a response? The figure on page 1310, line 3 also doesn't align with these 5 stages so it's confusing.	We appreciate these comments and modified the text and the graphic accordingly and added citations.
Emily	Seyller	142391	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309		5		The phrase "has increased significantly" gives the reader a false sense of security that implementation on adaptation is far underway and would insinuate that more is not necessarily needed - which is very much not the case.	Thank you for this comment; we removed the word "significantly".
Emily	Seyller	142392	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	9	11	The list of "important implications" should be framed as examples not a comprehensive list because it's very heavily focused on built infrastructure. I would suggest using the phase "to name a few" at the end of this list so the reader knows that the list is not exhaustive.	Thank you for this comment; we made this change.
Emily	Seyller	142393	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						I would recommend including a glossary of terms so that the reader can refer to those terms throughout the chapter - perhaps this is being compiled for the entire NCA4 draft. But some terms are defined throughout the chapter and others are not which could be confusing to the reader.	A glossary of terms is available on the USGCRP website.
Jim	Bouldin	142394	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						As I was reading through the chapter, I kept wanting to see more tangible examples across the board (public, private, NGO, foundation, etc.) to back up the key message statement that "significant" adaptation implementation is taking place. This was not the case in this current draft so I hope the next draft has a lot more examples for the reader to see that this phrase may be the case and that action is occurring.	We have tried to add more examples. We thank the reviewer for the suggestion

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Juanita	Constible	142745	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1314	34	34	It is worth noting some of the efforts that federal agencies have undertaken to get states and local communities to plan for and implement adaptation measures. HUD has overseen two efforts successful efforts in this regard: Rebuild By Design and the National Disaster Resilience Competition. Rebuild By Design was a design driven approach to create innovative local resilience solutions that was conducted in the aftermath of Superstorm Sandy. It was structured to connect local communities with some of the nation's leading design firms to collaboratively identify and solve problems and address vulnerabilities that were exposed by Superstorm Sandy. The design solutions for the winning proposals ranged in scope and scale -- from large-scale green infrastructure to small-scale residential resiliency retrofits. The competition process strengthened the understanding of regional interdependencies, fostering coordination and resilience both at the local level and across the U.S. Ultimately, nine projects were selected for implementation and received CDBG-DR funding totaling $930 million. Each of the seven winning projects are moving forward, undergoing engineering studies and environmental assessments, and will break ground in 2019. The program was such a success that HUD later used it as a model for the National Disaster Resilience Competition, which distributed nearly $1 billion in unallocated HUD CDBG-DR funds to fourteen projects throughout the United States. FEMA has also taken steps to get states to pro-actively address changing future conditions that result from climate change. In 2015 FEMA began requiring states to assess the impacts of climate change and how the frequency and magnitude of natural disasters may change in the future and what actions the state may take to reduce their communities risks and vulnerabilities to these natural disasters. More information on this policy change can be found here (https://www.nrdc.org/experts/becky-hammer/fema-finalizes-new-requirement…)	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Juanita	Constible	142746	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	24	38	In 2015 FEMA began requiring states to assess the impacts of climate change and how the frequency and magnitude of natural disasters may change in the future and what actions the state may take to reduce their communities risks and vulnerabilities to these natural disasters. More information on this policy change can be found here (https://www.nrdc.org/experts/becky-hammer/fema-finalizes-new-requirement…). If properly implemented by states and enforced by FEMA, states would examine the effects of climate change and determine how the potential for certain disasters (e.g. floods, coastal erosion, extreme weather, etc.) may change in the future and differ from the past, addressing the issue of non-stationarity.	We have revised the text to address this point. We thank the reviewer for the suggestion.
Juanita	Constible	142747	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	11	28	Some specific examples of where the assumption of climate stationarity is hampering adaptation efforts are flood maps produced by FEMA (also known as Flood Insurance Rate Maps). These maps are the primary tool that policy makers, developers, engineers, designers, local officials, and individuals use to determine their flood risk. But these maps do not account for changing future conditions, and are based entirely on past storms and current topography, bathymetry, etc. As such, our nation's primary risk communication tool for storms falls woefully short of what's needed to inform the public about future flood risks. New York City is a location where FEMA is working with the City to create more future oriented flood maps, which could serve as a model for other coastal areas of the country (see https://www.nrdc.org/experts/rob-moore/nyc-will-get-flood-maps-consider-…). New York State has adopted regulations that anticipate future sea level rise and different estimates over various timescales and probabilities. These are worth citing, as they are a good example of the types of policies governments at all levels should be incorporating into design standards for public buildings, facilities, and infrastructure (see https://www.nrdc.org/experts/rob-moore/nyc-will-get-flood-maps-consider-…). A similar standard was put in place by President Obama, known as the Federal Flood Risk Management Standard. This would have required all federal agencies to ensure that projects they fund incorporated an additional margin of safety for flood risk and, where it made sense, incorporate projections of future sea level rise (see https://www.nrdc.org/experts/rob-moore/president-raises-flood-protection…). Unfortunately, those standards were rescinded by the present administration just days before Hurricane Harvey made landfall (see https://www.nrdc.org/experts/joel-scata/trump-revoked-flood-protections-…).	Now included in text.
Juanita	Constible	142748	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1320	1320	17	28	HUD's National Disaster Resilience Competition required all applicants in the second phase to complete benefit-cost analyses that accounted for the benefits for co-benefits (i.e. benefits to the community beyond those associated with reducing future damages from natural disasters) including improved quality of life, additional economic development opportunities, and improvements to municipal infrastructure.	We thank the reviewer for this comment and have incorporated change to the text.
Juanita	Constible	142749	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1329	1329	24	26	Moody's recently released a series of reports on how climate change may influence future credit ratings of private and public entities seeking financing. These papers find that the future impacts of climate change will not be factored in prospectively, but will almost certainly be factored in as the impacts of climate change begin to affect a community's population, tax base, and infrastructure. See Moody's publications "Evaluating the impact of climate change on US state and local issuers" (Nov 2017) and "FAQ: Proposed FEMA cuts would have modest impact on state/local governments" (Aug 2017).	We now cite this Moody's publication. We thank the reviewer for the suggestion
Juanita	Constible	142750	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1330	1330	14	38	Other good sources for adaptation information include USEPA's Climate Ready Water Utilities (https://www.epa.gov/crwu) as well as USEPA's CREAT model, "a risk assessment application, which helps utilities in adapting to extreme weather events through a better understanding of current and long-term weather conditions." (see https://www.epa.gov/crwu/build-resilience-your-utility)	We now cite (see https://www.epa.gov/crwu/build-resilience-your-utility). Thank you for the suggestion
Tomi	Vest	142780	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						Have the time periods for near-term or long-term/longer-term been defined elsewhere in the NCA document? If not, it may be helpful to give estimates for these periods, even if they differ across sectors and actions.	What constitutes shorter and longer term does differ across sections and actions. We don't have the space to delve into this topic, so we have left the text as is.
Tomi	Vest	142781	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						The chapter uses "uncertainties" several times without defining whether these are planning uncertainties, scientific uncertainties, funding uncertainties, etc.	All of these are potentially relevant uncertainties. The discussion of KM3 now aims to make this clearer.
Tomi	Vest	142782	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						The first half of this chapter talks broadly about the number of cities, businesses, communities, etc that are taking adaptation actions without providing many specific examples. To give just one example, on page 1313 line 15-17, the authors mention types of agencies and broad categories of adaptation actions without offering an example of what those mean in practice. Are there examples of strategic adaptation goals or vulnerability assessments or mainstreaming that have been particularly well implemented?	We appreciate the reviewer's comment, but we were unable to delve into the important topic of evaluation in this chapter. We have tried to select examples we think are reasonably well implemented but unable to make any judgments on this important topic

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Tomi	Vest	142783	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						Suggest reviewing use of "some" through document. It often is unnecessary and/or not specific enough. For example, p 1314 line 34-37: "â€¦droughts much deeper and decades longer than reflected in some of the more recent data [this some could be removed without loss of clarity] heretofore used by some of the water management agencies." [Here, the some is not specific enough. "water management agencies in the region" may be clearer.]	Due to space constraints we dropped the sentence mentioned.
Tomi	Vest	142784	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	10	11	In this context, does infrastructure mean physical infrastructure or social/planning infrastructure (i.e., established processes). If the former, consider adding "planning frameworks or processes" or something similar.	Thank you for this request for clarification; we revised Key Message 2
Tomi	Vest	142785	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	31	31	Consider changing to frequency of heat waves. The definition of extreme heat has not changed over time, the incidence has.	Thank you for this comment. We revised the text to address this recommendation.
Tomi	Vest	142786	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	33	34	Confusing wording. Consider changing to "Because some GHGs reside in the atmosphere for decades or longer, many climate-influenced variables would continue to change through 2050 even if greenhouse gas emissions immediately stopped."	We thank the reviewer for this comment and revised this paragraph
Tomi	Vest	142787	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	9	9	Built human infrastructure seems redundant. Consider changing to built infrastructure.	We agree that this was redundant and changed this sentence.
Tomi	Vest	142788	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	30	31	Consider changing "alternative adaptation options" to "adaptation alternatives" or "adaptation options". In the first, it is not clear what adaptation is an alternative to. The proposed change seems to reflect the paragraph description.	Thank you for this recommendation; we revised this paragraph, and removed this phrase
Tomi	Vest	142789	Figure	28. Near-Term Adaptation Needs and Increased Resiliency	28.1	1310				Is there a reason why this figure does not align with the five steps mentioned on p. 1309, line 1-2 and p.1312 line 26-27?	We thank the reviewer for the comment. The figure has been revised to incorporate the suggestion and align with the text.
Tomi	Vest	142790	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	8	12	Suggest choosing one definition instead of offering two in order to avoid confusion.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Anne	Marsh	142791	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	21	21	Word missing.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Tomi	Vest	142792	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	28	29	Consider changing to frequency of heat waves. The definition of extreme heat has not changed over time, the incidence has.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Tomi	Vest	142794	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	1	2	Confusing wording. Consider changing to "Because some GHGs reside in the atmosphere for decades or longer, many climate-influenced variables would continue to change through 2050 even if greenhouse gas emissions immediately stopped."	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Anne	Marsh	142795	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	17	19	The sentence "Achieving the benefitsâ€¦deep uncertainties." seems to fit better in the paragraph above (line 7-12).	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Tomi	Vest	142796	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	36	36	Link appears to be broken.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Anne	Marsh	142798	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	38	38	Link appears to be broken.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Tomi	Vest	142799	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1313	1313	15	15	"Other actions" is vague. Consider specifying or deleting.	We thank the reviewer for this comment and have incorporated change to the text.
Anne	Marsh	142801	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	10	11	It would be great to have an example of other climate impacts that could be better integrated into coastal adaptation (e.g., extreme heat's effect on coastal tourism, ocean acidification impact on coastal fisheries).	We thank the reviewer for the comment, but were unable to add additional examples due to lack of space
Tomi	Vest	142802	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	27	28	In this context, does infrastructure mean physical infrastructure or social/planning infrastructure (i.e., established processes). If the former, consider adding "planning frameworks or processes" or something similar.	This text has been revised.
Tomi	Vest	142804	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1315	29	6	There are two distinct points that are could be better differentiated here. (1) there has been more natural variability over the last millennium than previously thought. [I.e., even absent climate change, our current models are wrong.] (2) climate change will push parameters oustide of the normal range EVEN correcting for an updated understanding of past variability. [I.e., our planning models will need to be dynamically updated to account for future variability]. Suggest splitting into two seperate paragraphs. In addition, the explanation of climate lags is clearer in the previous descriptions on pages 1308 and 1312. Suggest replacing with previous description or breaking up and clarifying p. 1315 line 14.	We thank the reviewer for the comment, and have rewritten the text to make our point clearer
Anne	Marsh	142806	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	12	12	Built human infrastructure seems redundant. Consider changing to built infrastructure.	Built infrastructure is a common term to differentiate to natural infrastructure.
Tomi	Vest	142807	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	14	21	Contradictory statements. Is risk management familiar or not familiar to decisionmakers, businesses, and communities? Suggest starting line 20 with "on the other hand, climate adaptation also is less familiarâ€¦" or something similar.	We thank the reviewer for the comment; modified text accordingly.
Anne	Marsh	142809	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1317	1317	5	15	Suggest adding examples for reduce sensitivity and increase adaptive capacity to match format of reduce exposure.	Thank you. Each of the three types is defined in the bullets as from the references in the citation. In addition, we provide and discuss examples in the paragraphs immediately below the bulleted list.
Tomi	Vest	142818	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1324	1324	19	24	May be worth mentioning a few of the models developed already so readers don't think they have to start from scratch.	We now make this mention.

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Tomi	Vest	142819	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1326	1326	30	32	May be worth mentioning Moody's November 2017 announcement that it will consider climate risk in state and local bonds.	We now do so. Thanks for the suggetion
Tomi	Vest	142820	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1327	1327	12	23	May be worth noting that these also factors of success for non-climate actions. In other words, adaptation is applying the same toolkit to new challenges.	We thank the reviwer for the suggestion but were unable to include it due to space constraints
Tomi	Vest	142821	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1329	1329	21	21	Consider deleting "in New York". Our colleagues in NJ and CT have also made adaptation strides since Sandy!	The text has been modified as suggested.
Tomi	Vest	142822	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1330	1330	33	34	Please capitalize Climate Resiliency Design Guidelines.	We have deleted this text.
Tomi	Vest	142823	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1331	1331	13	13	Second include not needed.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Tomi	Vest	142824	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1333	1333	36	36	It is not clear how to understand the line "The judgements are also consistent with how one would expect organizations to behave."	We have deleted this line
Tomi	Vest	142825	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						The specific examples throughout the chapter are especially useful but they are mostly just mentioned or referred to and could use a bit more context and background, for example more explanation around the examples listed in the benefit-cost ratio section	We have significantly expanded our use of adaptation examples. Due to space constraints, however, we were unable to add any such examples to the benefit cost section
Tomi	Vest	142826	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						Images are helpful but are only explained in captions and would be great if they were linked more directly to the concepts described in the text.	Unfortunately, due to space constraints we had to drop all our pictures
Mikko	McFeely	142827	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	7	10	Individuals are mentioned in list of who can take adaptation actions but there isn't any mention of what those actions might be.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142828	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1330	1330	33	36	Mention of New York City's climate resiliency design guidelines references wrong date (2014) - these were released in 2017. The climate projections reference the 2010 report, "Climate change adaptation in New York City" - the 2017 guidelines use the NPCC 2015 report projections, "Building the Knowledge for Climate Resiliency" http://onlinelibrary.wiley.com/doi/10.1111/nyas.2015.1336.issue-1/issuetoc	Thank you for this comment; the text has been updated accordingly
Mikko	McFeely	142968	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						Often investments in adaptation increase GHG footprint of organizations adapting to climate change. We recommend the authors note mitigation be considered in adaptation strategies.	We now mention co-benefits that can occur when an organization simultaneously plans for adaptation and mitigation
Mikko	McFeely	142969	Figure	28. Near-Term Adaptation Needs and Increased Resiliency	1	1310				These stages are not independent and build on each other. Same comment with use of figure on page 1313.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142970	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	6	14	There is value in examining the past, present, and future, especially for local scale assessments and investments	While the authors acknowledge this point, after consideration, the author team determined that the primary emphasis of this paragraph should remain on the importance of considering future climate impacts, since that is a less established practice than considering past conditions.
Mikko	McFeely	142971	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	31	32	The list of adaptation benefits should also be used to evaluate actions.	We appreciate this comment and added this concept to the text.
Mikko	McFeely	142972	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	19	19	deep uncertainty is jargon, please explain, or delete the word deep.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	142973	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1313	1313	9	13	A third is the experience of extreme events.	We thank the reviewer for this comment and have incorporated change to the text.
Mikko	McFeely	142974	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1313	1313	16	17	Please note that including climate change in planning practices in itselft is an adaptation action.	We thank the reviewer for this comment and have incorporated change to the text.
Mikko	McFeely	142975	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	6	8	Please explain what is meant by capacity building and land use changes.	We thank the reviewer for the comment and have incorporated into text
Mikko	McFeely	142976	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	24	24	We recommend modifying Key Message 2 to focus on uncertainty and lack of predictability as the big challenge instead of stationarity. Adaptation, hindered by assumptions of a stationary climate, is not the correct framing, especially in this influential report. Rather the uncertainty and lack of predictability of climate information is more important to articulate as a challenge. It is not smart planning to fully replace the observed and paleorecord with climate projections. All records should be considered in planning to get the full picture.	We thank the reviewer for the comment and agree that information about both historic and projected future climate is useful for adaptation. We left the KM with its current focus and address uncertainty in the dicussion of KM3.
Mikko	McFeely	142977	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	28	28	It is more than societal expectations and rules etc, it is also the state of climate science and deep uncertainty limiting adaptation.	We thank the reviewer for the comment. We haver re-written this text.
Mikko	McFeely	142978	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1316	3	4	Organizations do face a large number of climate projections, but this statement insinuates that the range is the correct and complete range an organization should plan for.	Thank you. We disagree that we have insinuated that numerical projections of climate-changed futures are in any sense correct. We have added the words "produced with myriad uncertainties" to emphasize our point of contrast the assumed observational stationarity.
Mikko	McFeely	142979	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1316	23	25	This sentence is confusing because all decisions are judgements at single points in time. Please reframe.	Thank you. We added "is strongly iterative and" to re-emphasize again that the point of this sentence is the set of decisions taken over time to adapt rather than a single decision in time.
Mikko	McFeely	142980	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1316	32	32	Climate vulnerability assessments are part of all the other frameworks, it is not its own framework.	Thank you. We have changed the sentence to make clear that vulnerability assessments are an element of the larger framework.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	142981	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1317	1317	8	11	Please consider combining reduce exposure and reduce sensitivity to reduce exposure and sensitivity. Though these concepts differ, they are very similar enough to combine for this document. This will help reduce confusion in table 28.1 as well.	Thank you. We disagree that combining exposure and sensitivity will help the meaning or transmission of meaning of our point here. In addition, these terms have very well defined meaning and use across a range of literature, as referenced in the assesment citations given. Additionally, we take your point about Figure 28.1 and have substantially revised it to enhance its legibility and coherence with the text discussion.
Mikko	McFeely	142982	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	7	7	Please reframe. We recommend changing, many decisionmakers do not appreciate.... to some decisionmakers do not... Many decisionmakers do appreciate the extent and are interested in taking action.	Thank you. We have changed "many decision-makers do" to "some decision-makers may".
Mikko	McFeely	142983	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	8	8	Add to sentence, and impact different decisionmaking processes (such as annual operations).	We thank the reviewer for this comment but were unable to add this text due to space constraints .
Mikko	McFeely	142984	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	33	33	Consider changing the word evidence to research.	We thank the reviewer for this comment and have incorporated change to the text.
Mikko	McFeely	142985	Table	28. Near-Term Adaptation Needs and Increased Resiliency	1	1318				Please consider combining reduce exposure and reduce sensitivity to reduce exposure and sensitiviy . Though these concepts differ, they are very similar enough to combine for this document. This will help reduce confusion between the difference in the table.	We had to delete the entire table due to space constraints.
Mikko	McFeely	142986	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1321	1321	9	9	Add and environmental following societal.	We thank the reviewer for this comment and have incorporated change to the text.
Mikko	McFeely	142987	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1323	1323	14	14	Add past before current and future . Past information should be part of the information considered.	The sentence is accurate as it. Planners should definitely use past information, but they should design for current and future conditions.
Mikko	McFeely	142988	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	1	2	Suggest mentioning the pioneering work of the water utility sector in adaptation planning by adding the following sentence to the end of this text section: The water sector is pioneering approaches in using different decision support systems for water utility adaptation. Reference is Kaatz, L., Raucher, K., Raucher, R. 2015. Embracing Uncertaintiy: a Case Study Examination of How Climate Change is Shifting Water Utility Planning. Water Utility Climate Alliance, American Water Works Association, Water Research Foundation, and the Associaton of Metropolitan Water Agencies.	THis work is now highlighted later in the chapter.
Mikko	McFeely	142989	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1323	1323	16	25	Suggest adding an additional sentence to the end of this text section to read: Other examples from the water sector illustrate how water utilities are planning for climate uncertainities using decision support approaches like scenario planning and decision scaling. Reference is Kaatz, L., Raucher, K., Raucher, R. 2015. Embracing Uncertaintiy: a Case Study Examination of How Climate Change is Shifting Water Utility Planning. Water Utility Climate Alliance, American Water Works Association, Water Research Foundation, and the Associaton of Metropolitan Water Agencies.	We now cite this document in the discussion of KM3.
Mikko	McFeely	142990	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1330	1330	14	14	This sentence could also mention other sectors. Suggest editing to read: Federal agencies, non governmental organizations, water utilities, engineering industry associations, transportation and public works departments, and private sector consultants...	Thank you for this comment; we have updated the text with additional examples.
Mikko	McFeely	143041	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						The mention of GHGs residing for decades is repeated, nearly verbatim, at least 3 to 4 times	We have reduced the number of mentions.
Mikko	McFeely	143042	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	6	7	I understand the point being made, but I don't know of any adaptation programs that aren't looking at future conditions and projections.	We thank the reviewer for this comment and revised Key Message 1.
Mikko	McFeely	143043	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	19	22	Iterative risk management is repeated in list of climate adaptation frameworks. Climate vulnerability assessments is not an adaptation framework, it is a process element under a climate adaptation framework. Risk governance should be added to the list.	Thank you for this comment; we revised the text to incorporate this recommendation.
Mikko	McFeely	143044	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	26	28	The authors must also be honest about the fact that adaptation will likely take substantial investment, which could be hard or prohibitive for certain communities. Could be framed as future loss savings	We agree with this comment and refocused this paragraph.
Mikko	McFeely	143045	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	26	30	Language here is very abstract. It would be helpful to give practical examples so the reader can better understand what those actions look like.	We have rewritten the summary to make it less abstract. The chapter also now has additional, concrete examples of adaptation actions
Mikko	McFeely	143046	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	35	36	If traditional planning is based on stationarity then it is not possible to mainstream or integrate climate change into a traditional planning process. Consider removing the word traditional so it simply says planning processes.	Thank you for this recommendation; we modified the text accordingly.
Mikko	McFeely	143047	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	35	36	Mainstreaming is a concept that has been used widely in many sectors and is often used in the context of international development and over the last years applied in the climate change field. However, there is no standard definition of mainstreaming in the context of climate change adaptation. Mainstreaming climate change adaptation goes beyond integration of it into planning processes. For example the United Nations define it as the iterative process of integrating considerations of climate change adaptation into policy making, budgeting, implementation and monitoring processes at national, sector and subnational levels. Suggest adding a definition of mainstreaming which addresses its holistic nature.	Thank you for this comment. We broadened the description of mainstreaming to be more comprehensive.
Mikko	McFeely	143048	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	4	5	Flooding has become more frequent also in non coastal areas.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	143049	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	12	14	Abstract language. Be more precise, give examples.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Mikko	McFeely	143050	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1313	1313	16	16	Mainstreaming is a concept that has been used widely in many sectors and is often used in the context of international development and over the last years applied in the climate change field. However, there is no standard definition of mainstreaming in the context of climate change adaptation. Mainstreaming climate change adaptation goes beyond integration of it into planning processes. For example the United Nations define it as the iterative process of integrating considerations of climate change adaptation into policy making, budgeting, implementation and monitoring processes at national, sector and subnational levels. Suggest adding a definition of mainstreaming.	Mainstreaming is now defined on p. 1320.
Mikko	McFeely	143051	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1313	1313	17	17	Please give an example where federal and state agencies integrate climate change in regulatory processes. The majority of regulatory instruments do not include climate change. Water utilities are not regulated to include climate change in their planning processes.	The discussion of KM5 now contains such examples
Mikko	McFeely	143052	Whole Page	28. Near-Term Adaptation Needs and Increased Resiliency		1313				This figure is repeated. We assume that one will be removed in the final version and the text will reference the single figure.	We agree with the reviewer that this is confusing. The summary includes a figure from the main text. In the final version of the document, the summary will not be so close to the main body of the text.
Mikko	McFeely	143053	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	25	28	This topic is complex and confusing. The challenge, in all cases, is not necessarily to find alternatives. Alternatives/ solutions exist. The challenge in some instances may be to change society's current expectations and rules. For example, with increased coastal flooding in the future it might be more cost efficient to relocate high risk communities instead of trying to protect them against flooding. This requires a significant shift of societal expectations.	We have revised the wording.
Mikko	McFeely	143054	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	4	5	Managing climate risk also requires the use of all information available. Past records, current climate and future climate projections. There is no doubt in the necessity of incorporating nonstationarity but it's critical to also note the importance of continuing to evaluate historic records in planning and decision making	Thank you. The text was altered to include the importance of historical and paleoclimate information.
Mikko	McFeely	143055	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	20	21	This sentence is very repetitive.	Thank you. We do not agree that this text is very repetitive so have left as is.
Mikko	McFeely	143056	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	20	22	Suggest paying more attention to the unfamiliarity of climate change datasets and concepts as it is an important constraint in climate change adaptation planning. Many planners, designers and decision makers have no or only limited knowledge how to use climate risk information in a proper way. Many engineering schools do not have curricula in climate change adaptation. Practitioners are ill equipped and prepared. This is capacity building and development issue.	Thank you. We have added language noting the need for ability and capacity building.
Mikko	McFeely	143057	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1316	27	27	This point about the timescales of climate change threats not aligning with politics and government is incredibly important. It seems a little odd that this point is in the section on nonstationarity. It may fit better in key message	Thank you. We have increased discussion of obstacles to adaptation throughout the chapter to include this one.
Mikko	McFeely	143058	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1317	1317	16	21	This is a really fantastic example! It's great when you can point to case studies or real world examples to illustrate your points.	Thank you.
Mikko	McFeely	143059	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	21	21	Suggest italicizing or putting the word resilience in quotes.	We thank the reviewer for this comment and have incorporated change to the text.
Mikko	McFeely	143060	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1323	1323	3	5	Mainstreaming is defined differently across this document. Use one definition which embraces other definitions used in this chapter	We have now tried to use one consistent definition.
Mikko	McFeely	143061	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1324	1324	12	18	This process differs from the process explained in Figure 28.1. Three different processes or stages of climate change adaption are mentioned in this chapter which is confusing. Three processes should be harmonized into one process. First step should be assessing vulnerabilities	We have deleted this text due to space constraints.
Mikko	McFeely	143062	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1327	1327	23	24	Given the underlying costs and required effort for local climate change adaptation and large scale mitigation (which is needed to keep CO2 emissions going down), there is an inevitable need for a substantial role of state/ federal government intervention to address these challenges in a succesful way (from creating incentives for mitigation to support financing adaptation). Cities or states with tight budgets rely on additional support to make climate change adapation (and mitigation) succesful on a nationwide scale. This should be acknowledged here.	We thank the reviewer for this important suggestion. We have added to our chapter a discussion of the challenges of financing adaptation actions.
Mikko	McFeely	143078	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1310	1310	1	2	move the, and, after near term to before the long term	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	143079	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	5	5	Fix the paranthesis used when citing references. Too many parantheses are used.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Mikko	McFeely	143080	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	21	21	Insert as after defined. The sentence should read, Risk is sometimes defined as the likelihood…..	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Casey	Thornbrugh	143094	Table	28. Near-Term Adaptation Needs and Increased Resiliency	28.1	1319				The National Institute of Building Sciences recently released cost-benefit estimates for federal disaster mitigation funding, including property buyouts in riverine areas, which may be useful for this table. Available at: http://www.nibs.org/page/mitigationsaves	We deleted the table due to space constraints, but do now include this cite in the text. Thanks!
Social Science	Coordinating Committee	143325	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						No listed author has major training in social sciences. This is a major gap for a chapter focusing on change in systems, nearly all of which are about or involve humans. This lack of attention to social sciences and human systems is apparent throughout the chapter. At least one, preferably more, social scientists should be added to the author team for this chapter.	We thank the reviewer for their comment. Our revised chapter now includes more discussion of the recent USGCRP reports on Social Science and climate change.
Social Science	Coordinating Committee	143326	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	8	12	Key message 2: social science is key for outlining current social expectations and identifying which components of society are critical. Per Adger et al. 2009 ("Are there social limits to adaptation?"), when adaptation is understood in terms of values and social connections, adaptation limits are much more mutable than when considered from perspective of material or physical sciences. This concept should be incorporated into this message and throughout this chapter.	Thank you for this comment; Adger et al's arguments are now highlighted in several parts of our chapter, in particular in the discussion of KM5.
Social Science	Coordinating Committee	143327	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	6	14	This paragraph seems to imply that understanding of climatic futures should change, but that decision-making processes (who, how, what time frame) themselves will stay the same. This implication that the key problem is the data and only the data should be examined more closely.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Social Science	Coordinating Committee	143328	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	31	34	This statement is missing the concept that all of these phenomena (calling out sense of place, safeguarding cultural resources and practices, social connectivity for example) are actually also components that enable effective adaptation. Cultural resources (again for example) should not be framed as solely "victims" of climate change that need to be protected by means of adaptation; rather, through the social connectivity, sense of place, scientific data they provide, they are in fact part of societyÂ's means of adapting. Starting reference for this: National Park Service Cultural Resources Climate Change Strategy (https://www.nps.gov/subjects/climatechange/culturalresourcesstrategy.htm)	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Social Science	Coordinating Committee	143329	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	8	8	Add cultural resources management to 'natural resources management.'	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Social Science	Coordinating Committee	143330	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	25	28	As noted above, this key message is missing self-reflection about the flexibility of human systems/human components of systems.	The socio-economic aspects of the system are addressed later in the chapter.
Social Science	Coordinating Committee	143331	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	1	1	Addendum to "range of recent recorded natural variability': 1. archaeological and paleoenvironmental records extend recorded variability substantially in many places. This should be recognized here. 2. What is key for understanding the adaptiveness of human systems is not the length of human records, but the rate and amplitude of change to which given systems respond. In some cases, relevant variability may fit well within historically recorded changes. In other cases, relevant variability may require longer time frames.	Thank you. We have made clearer that not all current climate change effects and impacts are outside the range of measured historical climate variability in all places.
Social Science	Coordinating Committee	143332	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	14	19	This statement implies that many organizations that deal with weather-related phenomena currently do that well. Given stresses such as the recent drought in California and the infrastructure and community sensitivities shown in Texas, Florida, and Puerto Rico during the recent 2017 hurricane season -- this implication should be demonstrated with several examples, rather than assumed to be true.	Thank you. We disagree that the sentence makes that implication because we do not agree with that implication. The sentence says only that organizations manage now for events which are in some cases the same events to be expected under climate-changed futures (though frequencies, intensities, and durations can be different), thereby setting up the discussion of things which are new and which are not new for adaptation efforts.
Social Science	Coordinating Committee	143333	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1316	1	4	This section is completely missing discussion of what is meant by society's expectations and rules, as set out in the key message.	Thank you. We disagree that the point of this Key Message is to articulate the existing social rules and expectations, and we have included in this discussion how some of those expectations - for stationary environmental conditions, e.g. - hinder progressive adaptation.
Social Science	Coordinating Committee	143334	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1316	21	22	This is a blase treatment of risk communication. For risk communication to be effective, it must be clearly established to whom communication is directed, from whom, what is being requested, by a trusted messenger, in forms and formats that incorporate the language and knowledge and access of the target community. Without these, risk communication is likely to fail. Additional discussion and relevant sources needed here.	Thank you. Although this is not the sole mention or discussion of risk communication in the chapter, and this is not a chapter devoted to risk communication even only about climate change, we have adjusted the langugage to include a few of the details you provided.
Social Science	Coordinating Committee	143335	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1317	1317	16	26	Strongly recommend rewriting this with reference to US Global Change Research Program Social Science Coordinating Committee white paper on vulnerability, which provides a well-grounded interdisciplinary social science approach to vulnerability: the diverse historical and social forces that shape community vulnerability, community capacity to respond.	Thank you. Although this comment does not provide a citation, we think that the reference to the USGCRP white paper is outside the bounds of literature to be assessed in this report.
Social Science	Coordinating Committee	143336	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	3	28	This chapter uses a mechanistic review of adaptation, but does not provide an assessment of where the US is in terms of efforts to adapt- this distinction should be discussed. I appreciate recognition of the concerns about handling current variability, but this concern should translate to a broader discussion of how and why current methods and management aren't designed for the presentÂ—why CAN'T modern systems handle current variability. Our modern systems didn't spring out of nowhere Â– they're developments from previous systems that came together at certain times and certain places. This section misses components of social systems such as power, inequality, capitalist economic values, and social memory of change. I strongly recommend reconsideration of this section using Adger et al. 2009 ('Are there social limits to adaptation') as a starting point.	We now discuss some of these issues and, in particular the points made by Adger et al, in the discussion fo KM5.
Social Science	Coordinating Committee	143337	Table	28. Near-Term Adaptation Needs and Increased Resiliency	1	1319				Strongly recommend rewriting this with reference to US Global Change Research Program Social Science Coordinating Committee white paper on vulnerability, which provides a well-grounded interdisciplinary social science approach to vulnerability, particularly the diverse historical and social forces that shape community vulnerability, community capacity to respond.	We thank the reviewer for the comment and have incorporated the findings of the recommended study into our chapter.
Social Science	Coordinating Committee	143338	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1319	1319	16	18	Need to unpack/qualify statements here about social cohesion. As written here, this appears to assume a single community in which members are equal. Please see the US Global Change Research Program Social Science Coordinating Committee white paper on vulnerability, which provides a well-grounded interdisciplinary social science approach to vulnerability, particularly the diverse historical and social forces that shape community vulnerability, community capacity to respond. It includes several examples about social networks.	Thank you for the suggestion. We now cite this report and discuss its findings.
Social Science	Coordinating Committee	143339	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1322	1322	1	11	This section is inadequate in describing the deficiencies that come from describing adaptation in terms of cost-benefits or a single monetary signal. Adaptation and change are deeply social constructs, and success-failure requires navigating the intersecting values, cultures, communities, histories involved. Again, strongly recommend reworking these sections, beginning with Adger et al. 2009 ('Are there social limits to adaptation') and the USGCRP Social Science white paper on vulnerability as starting points for concepts and sources.	Agreed. We now discuss Adger et al in our Beyond Incremental Change section and the USGCRP Social Science white paper on vulnerability later in this section.
Social Science	Coordinating Committee	143340	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1322	1322	26	28	Cross-reference this section with the US Global Change Research Program Social Science Coordinating Committee white paper on vulnerability.	Agreed. We now discuss the USGCRP Social Science white paper on vulnerability later in this section.
Social Science	Coordinating Committee	143341	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1324	1324	12	24	This section emphasizes/prioritizes "getting the data right" Â– does not capture system interdependencies and constraints on taking action/determining what action to take. Strongly recommend connecting this section to NCA4 chapt. 17.	Our revised chapter has many cites to NCA Chapter 17. In this section we refer to previously discussed Chap 17 ideas, but don't cite it here.
Social Science	Coordinating Committee	143342	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1325	1325	29	30	This section also appears to prioritize getting the right models and data- without recognition of the system and social complexities of determining what to do and being able to do something about the data. Recommend reworking this section in accordance with NCA4 chapt. 17.	We have re-written this text. KM3 in Chapter 17 echos the points made here.
Social Science	Coordinating Committee	143343	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1328	1328	1	7	The example used here emphasizes engineering components of a road- but completely misses the social implications of the road. What is its location (exposure), what access does it allow and encourage (if road exists, will people build along it, depend on it), if access is lost, who suffers? These social implications should be incorporated here.	The social implications of the road are of course vital, but are not relevant to the point of this example, which is focused on the extent to which road engineers need to consider future climate conditions in choosing the material with which to resurface their roads. If the engineers are doing their job properly, the broader social implications will be insensitive to this particular design choice.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Social Science	Coordinating Committee	143344	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1333	1333	3	13	As noted per cover page of this chapter, social sciences are not represented as principal training of any of the authors listed. The resulting lack of attention to social sciences and social systems is evident in the organization and discussion of this chapter. This gap should be addressed by adding social scientists to the writing team for revision of this chapter.	Thank you for your comment. We are not able to add additional authors at this time but have consulted a wide range of experts beyond those included as authors when writing this chapter.
Social Science	Coordinating Committee	143345	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1333	1333	36	37	Please clarify: whose judgements about organizations?	Thanks for this comment; we attempted to clarify this section.
Social Science	Coordinating Committee	143346	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1334	1334	33	35	Please clarify- new techniques for what by whom? This section notes in a very passive fashion that ways of understanding how a society can deal with uncertainty and variability are behind recognition that assumptions of environmental consistency no longer work. This is actually a call for more social science and improved integration of social science with adaptation planning. Please be clear about this. It's not clear from the reference listed that the authors are creating these social science approaches.	We have revised this section. We agree that social science needs to be more extensively integrated into adaptation planning, a point which is reflected in topics covered in the chapters. However this is also not the place in the chapter to recommend research needs.
Social Science	Coordinating Committee	143347	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1337	1337	4	5	There is an extensive literature about identifying and understanding transformative change in societies -- it is found in archaeology, regarding the development of complex societies and civilizations, and the challenges these societies and civilizations have faced due to environmental change, and how to understand these developments and challenges through modeling and evolutionary theory. Experts in these topics should be brought in to work on this chapt.	We thank the reviewer for the comment.
Social Science	Coordinating Committee	143348	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1337	1337	12	16	Strongly recommend rewriting this with reference to US Global Change Research Program Social Science Coordinating Committee white paper on vulnerability, which provides a well-grounded interdisciplinary social science approach to vulnerability, particularly the diverse historical and social forces that shape community vulnerability, community capacity to respond.	We now cite this work. Thank you for the suggestion.
Social Science	Coordinating Committee	143371	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						Since NCA3, there has been progress made in interdisciplinary research to enhance understanding of drivers and social vulnerabilities of climate change and responses. As an example, in March 2017, the USGCRP Social Science Coordinating Committee organized a workshop "Social Science Perspectives on Climate Change", that brought together federal researchers and managers as well as academic social scientists to discuss understanding of drivers, vulnerability of and responses to climate change from four disciplines - anthropology, archaeology, geography and sociology. The workshop resulted in three USGCRP white papers Social Science Perspectives on Climate Change (USGCRP 2018, Part 1, 2 & 3 - upcoming), each on (1) social vulnerability under climate change; (2) drivers of and responses to climate change; and (3) innovative methods and tools to evaluate coupled natural and human systems. Paper (1) "Social Vulnerability" synthesizes the recent social science research and discusses key factors (e.g., resource access, culture, governance, and information) that influence vulnerabilities within and across communities as well as insights for effective adaptation. Paper (2) discusses the underlying drivers of climate change and how these factors interact dynamically over space and time. These white papers collectively highlight the importance to consider social, cultural, political, and economic factors and past decisions for understanding drivers and vulnerability of climate change, and the need for multi-scaled, multi-dimensional approaches and governance structures for mitigation and adaptation responses. Discussions in this chapter can be enhanced by incorporating key insights from the white papers.	We now cite this work. Thank you for the suggestion.
Social Science	Coordinating Committee	143372	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1318	5	28	Key Message 3: This section can be enhanced by incorporating key insights from the USGCRP white papers Social Science Perspectives on Climate Change (USGCRP 2018, part 1, 2 & 3 - upcoming), each on (1) social vulnerability under climate change; (2) drivers of and responses to climate change; and (3) innovative methods and tools to evaluate coupled natural and human systems. See comment above for more details.	Thank you. We now have citations to this helpful literature throughout the chapter.
Allison	Crimmins	143473	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						This chapter needs a lot of work. Unfortunately, it is well behind the progress of most other chapters I've read. It is incredibly repetitive and full of jargon. It reads like policy wonks wrote a brochure for other policy wonks, not like scientists assessed the literature and synthesized it for a pubic audience. It is agonizing to read and way too long, though because of redundancies it could easily be chopped in half. There is one figure and one table in this chapter and both are very poorly conceived. Most frustrating was the number of lists in this chapter (many of which repeated themselves) and in some cases lists within lists. There were so many different frameworks touted: first five steps, then a different five steps in Figure 1, then iterative framework, then a framework of exposure, sensitivity, adaptive capacity, then a table of current and future changes that was incomprehensible, then another list of climate adaptation processes beginning on page 1324 (with a separate numbered list within the first bullet of this list), then mainstreaming (as a verb), then another framework of helpful factors of an adaptation plan.... I've completely lost how many frameworks there are. I'm not even sure why this chapter focuses on all these different types of frameworks instead of just defining and describing what adaptation is and why it is needed. Most readers will not care what conceptual framework is better than another- that isn't the role of a scientific assessment. This chapter could be used for more, and better, purposes. It would also benefit from more quantitative descriptions and especially descriptions of whether the numerous examples (almost all in NYC, California, or Florida) have been effective. I suggest the authors revisit their key messages and give careful thought to the messages they want to convey to this audience based on the literature assessed. It may be as simple as 1) adaptation is needed 2) adaptation is cost effective 3) there are examples of this being done that have been shown to be effective. Save the frameworks for other, more appropriate, reports.	We thank the reviewer for their comments and note that it differs from other feedback we have received, such as that by the National Academy of Sciences review panel. That said, we have taken steps to reduce redundancies, focus our key messages, and reduce the use of jargon.
Allison	Crimmins	143474	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	3	26	These key messages need a complete revision, most of all to combine and simplify them down to three messages that are key. They are also a bit wordy and in too academic language. The authors may also want to revisit the guidance on risk framing, and rewriting these with those in mind (e.g. what is the risk of not adapting? what is the risk of adapting only to current climate conditions?)	Thank you for this suggestion. After consideration, the author team determined that each of the Key Messages provide important content. Additionally, we carefully reviewed and refined each of the Key Messages.
Allison	Crimmins	143475	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	6	6	Variability of what?	We thank the reviewer for this comment and revised Key Message 1.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	143476	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	8	11	You say over and over and over again in this chapter that people are adapting to current conditions instead of future climate impacts, but you never say "so what". So what? In other words, are you trying to say that current climate adaptations are not enough, that they won't work, that they will be a waste of money, that people should do more? "Successful adaptation is hindered" is a stilted way to hint at this- I suggest boldly stating what you mean in plain language. For example: "Adaptation that only considers current climate conditions will fall short in protecting people from future risks." Or: "Adaptations made to current climate conditions will quickly become outdated, requiring additional capital to re-adapt to changing conditions". On line 9, does the words "similar to" in fact mean "within the range of"? The second sentence of this key message is not needed and confusing. You could delete the word "current", as it is not needed. But also, it seems odd for the authors to be talking about trying to find an alternative assumption (what?) that will fit into society's current expectations/rules/practices when most of the chapter discusses that we should be CHANGING expectations/rules/practices, not trying to fit a square peg in a round hole. Suggest deleting this sentence. Since the first sentence is already in Key Message 1 and the second sentence is not needed, this entire key message could be dropped.	We agree that this was confusing and revised Key Messages 1 and 2.
Allison	Crimmins	143477	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	12	12	Delete first sentence. You do not need to repeat CSSR findings here.	Thank you for this comment; we removed this sentence from Key Message 3.
Allison	Crimmins	143478	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	12	18	This key message, and the underlying text, is walking tenuously close to policy advocacy, as the authors (and therefore the federal government) is endorsing one type of adaptation approach. I cringed at "appropriate framework" as this is straight out advocacy (are other frameworks therefore inappropriate?). It is a frustrating message, since earlier messages talk about thinking ahead to consider future ranges of climate change so that adaptation decisions can be made that last. Now, the authors are saying something different, that people should take smaller iterative steps. Most of all, I don't understand why this is a key message. There are likely many frameworks out there that would work for different people, places, and things. Why is knowing about one of them so key as to rise to a key message? If the authors had taken the approach of explaining how adaptation practices are something that no one does once and is done, but rather is something that communities need to forever plan for, that would be more interesting.	Thank you for this comment. We have revised Key Message 3.
Allison	Crimmins	143479	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	24	26	Again, this last sentence of key message 5 seems to contradict key message 3. KM3 says to be iterative, KM5 says incremental changes aren't enough (though it doesn't explain why it isn't enough or what "beyond incremental changes" entails). Very confusing to the reader.	Thank you for this comment noting the apparent confusion between these two key messages. We revised both key messages.
Allison	Crimmins	143480	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						It is disappointing that all the adaptation actions discussed in this chapter, and all the examples, are being done by federal, state/local, or maybe businesses. There is no discussion of what an individual should or could do to protect themselves or their family. Most people reading this chapter will not see anything of themselves or their own lives in here- just big actions like seawalls that are beyond one person or one family or often one community's reach. That leaves an entire branch of adaptation options off the table.	We have now included a box suggesting what actions individuals can take. We thank the reviewer for the suggestion.
Allison	Crimmins	143481	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	30	36	Delete these sentences and just cite the CSSR	Thank you for this comment. AFter consideration, the author team revised this section but also retained some details reflective of the CSSR in order to provide context for the adaptation summary.
Allison	Crimmins	143482	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	36	36	The "Thus" here does not make sense. It does not follow for the reader why there would be a thus or a therefore to connect these thoughts.	Thank you for this comment. We revised this paragraph and no longer required this sentence.
Allison	Crimmins	143483	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	1	1	This is not a hard and fast established framework that everyone must follow. Maybe the CDC or others use this, if it is helpful, but there are a million other ways that this could be done and other ideas may work better for other people/places/times. Why this endorsement? And why are these 5 stages different from the 5 stages in Figure 1?	We thank the reviewer for this comment; we revised the text to note that these are common steps, but that specific terms and processes may differ.
Allison	Crimmins	143484	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	3	3	This states stages were "underway throughout the United States". By whom? Also, how is a stage underway?	We thank the reviewer for this comment; the text has been revised. For additional information, we refer the reviewer to the Supporting Evidence in NCA3, Key Message 1
Allison	Crimmins	143485	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	6	8	This is better phrased than in the key message.	We have retained and expanded on this language, and revised Key Message 2.
Allison	Crimmins	143486	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	11	14	Not sure I'm following this. Are you saying people already know how to adapt? This seems anathema to the rest of your key messages. This is so vague as to be rather useless- suggest deleting or else explaining what attributes you mean.	We thank the reviewer for this comment; the text has been revised to be more clear.
Allison	Crimmins	143487	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	15	25	This paragraph is too long and too confusing. It is also filled with cliche buzzwords. Suggest getting rid of all the "frameworks", for example "comprehensive framework" on line 22 which is an empty phrase. Delete sentence on lines 17-19. If you must, just use this paragraph to define what you mean by iterative risk management, though I'm not sure why this framework is being touted above all the rest (until you get to key message 5) or why this is important to the audience. Also, people will understand what the word iterative means.	We thank the reviewer for this comment; the text has been revised to be more clear, concise, and less prescriptive.
Allison	Crimmins	143488	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	26	34	Suggest cutting this paragraph down too. At least drop the sentence on lines 30-31.	Thank you for this comment. The author team revised this paragraph, but retained cost-benefit analysis as one method to consider in evaluating adaptation action effectiveness.
Allison	Crimmins	143489	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	35	39	Must you use mainstreaming as a verb? It is painful to read, sounds like a policy-world cliche, and in most places could be completely removed. For instance, on line 35, deleting " "mainstreaming," that is," could all be deleted without losing meaning of the sentence. The term is defined here, so why is it in the key message where people reading it won't understand what it means? Suggest using plain language suited to the audience.	We appreciate the viewer's comment, and modified the text accordingly. Because this remains a prevalent concept and term among adaptation practitioners, we did retain it in some places.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	143490	Figure	28. Near-Term Adaptation Needs and Increased Resiliency	1	1310				This figure needs replacing with something more useful to the chapter's audience, or at least a lot of revision. As the only figure in this chapter, it is unfortunate that this figure is focused on yet another framework, one that differs from the one just discussed in the text and from the CDC BRACE framework and from the next 3-5 frameworks discussed in this chapter. What about an image of a home with suggested examples of ways an individual or family could take adaptation steps in their own home/neighborhood? What about a map with successful adaptation measures marked on it? How about a graph or map showing how many cities and states have adaptation plans? Anything but another conceptual diagram with boxes and arrows. This figure is confusing, not least because every project, everywhere would have a different mix and order of these stages and they would all be at different stages (in other words, not every adaptation action is at the implementation stage now). So how can you say where NCA3 or NCA4 fall? This figure was already in NCA3 and in the 2014 NAS, which will be 4 or 5 years old by the time this report is released. I think the authors can do better and be more creative than recycling this old conceptual diagram for each other. Beyond that, if the authors feel they must keep this diagram, there are many issues to work on. First, these are not the same five stages outlined in the text. Second, the text says that we saw the first three stages occurring in NCA3, but here it only shows two. Third, the dotted dark blue arrow seems to imply that we have not made it any further than NCA3 with NCA4. Is this the author's assessment of all the analyses of national adaptation actions writ large? If so, where are those citations? Fourth, why are the light blue arrows bi-directional? Fifth, what does the stakeholder thing with the hands mean and why is it the middle and who are these "stakeholders" (another policy wonk buzzword)? Lastly, all the verbs in the blue circles are different tenses.	We have revised the figure to make it more accessible and rewritten the supporting text to make the meaning clearer.
Allison	Crimmins	143491	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	2	7	Delete this paragraph, It is not needed.	We have shortened this paragraph and focused it more on the chapter's main themes.
Allison	Crimmins	143492	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	15	15	May want to also cite the EPA 2017 report (CIRA) and not just the mitigation chapter.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Allison	Crimmins	143493	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	20	26	Delete this paragraph, It is not needed. Just use the existing NCA glossary which already has this term.	The text now incorporates the definition as part of a larger exposition on the benefits of climate risk management.
Allison	Crimmins	143494	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	1	6	This is better phrased than in the executive summary	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Allison	Crimmins	143495	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	7	19	Suggest deleting both these paragraphs. Not sure what "civil society" is supposed to mean, nor why schools and communities were left of this list (line 7). None of the examples listed were relevant to individuals. The second paragraph is redundant to multiple instances of this text elsewhere in the chapter.	We have revised this text.
Allison	Crimmins	143496	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	26	27	Suggest deleting this sentence and avoid endorsing this one framework. This is also redundant to the previous section and at the same time contradicts Figure 28.1.	After consideration of this point, we have determined that the framework is helpful to understand the process of adaptation.
Allison	Crimmins	143497	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	31	31	This sentence starts with "Since then" as is "since NCA3", but the references listed here are all from 2013, which is BEFORE NCA3.	We have revised the references.
Allison	Crimmins	143498	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	34	38	Delete text and just provide the references. This is also redundant to text in the key message 5 section, so not sure it needs to be said twice.	We thank the reviewer for this comment and have modified the text accordingly.
Allison	Crimmins	143499	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	38	39	I'm not sure this statement is true. Most of the chapters I've read include adaption actions, examples of implementation, and even evaluations of how effective those actions have been. Suggest reviewing other chapters.	We thank the reviewer for this comment and have modified the text accordingly.
Allison	Crimmins	143500	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1313	1313	10	12	Suggest deleting "1) awareness …. And 2)" and just having the sentence read: "Adaptation actions in the United States have increased in part due to growing recognition that investing in adaptation provides economic and social benefits that exceed costs.". This assertion needs citations to support it. Please provide citations that adaptation action have increased as well as citations that show the cause of this to be awareness and recognition of cost benefits.	All three reasons are important. We have added a citation.
Allison	Crimmins	143501	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	3	14	On line 4, the text says there are "studies". What studies? How many studies were assessed to come to these conclusions? Please provide citations. This entire paragraph needs better referencing. This paragraph is also full of vague amounts, like "many" (line 9), "few" (line 11), and "often" (line 13. Where are the citations for these and can you be more specific?	We moved the Vogel citation to make the source for this paragraph clear.
Allison	Crimmins	143502	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	18	18	This reference is quite old- does it still stand true for NCA4? Where are the other citations for this section? Also why is this paragraph above the Key Message?	Yes, this citation still holds. The point it makes now seems relevant for the remainder of the Antropocene.
Allison	Crimmins	143503	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1315	30	25	There are zero citations for more than an entire page. Please provide citations of the literature the authors assessed to come to these conclusions.	Citations provided.
Allison	Crimmins	143504	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	30	30	The phrase "no longer reliably" should be deleted. This was true in NCA3 either, so this is not a new thing.	The phrase is true and needed. In some cases stationarity turns out to be a reasonable assumption (e.g. the current best science suggests the average annual rainfall in Los Angeles will stay constant at its historical calues over the next decades). But the stationarity assumption is not reliably true in general.
Allison	Crimmins	143505	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	33	33	Citation needed	Citations provided.
Allison	Crimmins	143506	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	37	37	Citation needed	Citation added.
Allison	Crimmins	143507	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	1	1	Citation needed	Thank you. We have added reference to the relevant chapters in NCA4 vol1, the Climate Science Special Report.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	143508	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	4	6	This could be punchier. Maybe replace "incorporating the assumption of" with "that assumes". The whole chapter could use a once-over to replaces this policy jargon language with straightforward simple language.	Thank you. We have tightened language throughout the chapter including this sentence.
Allison	Crimmins	143509	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	13	21	This section is very confusing. The text seems to first say that people don't assume stationarity. Then starting on line 22, it seems to say that they do assume stationarity. Which one is it?	Thank you. The text correctly says that the stationarity assumption has been commonly used in the past and must be changed now to prepare properly for climate-changed futures. We have tightened text throughout the chapter including to make this point more directly; see comments and resolution 143507-09.
Allison	Crimmins	143510	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	14	21	Suggest deleting all of this. It is long and redundant.	Thank you. We disagree that this paragraph is long and redundant in that it sets up discussion of the difference between long- and short-term planning and the experience inside organizations with the climate-affected weather events for which they plan.
Allison	Crimmins	143511	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	26	26	Suggest using a different word than "slow"- that doesn't seem exactly accurate.	Thank you. We changed this part of that sentence to say "some current and future changes in climate will be slow to accumulate but will take even longer in time to reverse for the changes which are reversible".
Allison	Crimmins	143512	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1316	5	7	This subheading seems to contradict the text in the key message itself. Adaptation is a form of iterative management, or iterative management is one form of adaptation? Which is it?	Thank you. We have re-written the Key Message and its discussion to make clearer that neither is a necessary form of the other but that an iterative management approach can be helpful to executing sucessful climate adaptative since climate changes themselves can be iterative.
Allison	Crimmins	143513	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1316	13	30	This paragraph is long and full of jargon. It would be more helpful to the reader to just explain what iterative risk management is, and not why you want to marry it. Suggest deleting lines 18-22 and 22-26. Also, who are the "stakeholders" you are referring to on line 29?	Thank you. We disagree that the paragraph is jargon-laden and long. Nonetheless we have re-written sentences within it to make our points more succinctly, and we have defined the improvements to stakeholder processes more completely here and given a citation.
Allison	Crimmins	143514	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1316	1316	31	39	Again this paragraph is full of jargon (commonalities??) and is more about why this one approach is so great, but the text has not yet explained what this approach IS. The first half is confusing and lines 36-39 can be deleted.	Thank you. We disagree that the paragraph is jargon-laden and long and that we have not defined what iterative managment means in the climate adaptation context. We disagree that lines 36-39 can be deleted without doing violence to our message that taking an iterative management approach can be useful for communities and organizations undertaking climate adaptation because many of those communities and organizations understand and use iterative management for many other actions already.
Allison	Crimmins	143515	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1317	1317	8	15	This is yet another framework, but at least one that is easier to digest and more familiar, as it was defined in the US climate and health assessment (suggest citing that here). Also, delete the example on lines 9-10, as it is way too specific here in this list .	Thank you. We have removed the hyper-specific example of stream temperature effects. And we have added a citation to the 2016 USGCRP report on human health effects.
Allison	Crimmins	143516	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1317	1317	16	21	This is a great few sentences that really help the reader digest and relate to the three types of action. It just needs some citations!	Thank you. We have added additional citations to the section on effects in NYC.
Allison	Crimmins	143517	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1317	1317	22	26	This section is a little awkward and it is unclear why all the emphasis is just on the third adaptation action (adaptive capacity). Also, why the quote?	Thank you. We included additional detail on adaptive capacity because it is the least commonly known of the three elements and often the most difficult to define. The included quote is there to say most succinctly what we want to use from the cited reference.
Allison	Crimmins	143518	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1317	1318	27	2	Please delete all these cliche buzzwords, starting from "holistic, multisector, and multijurisdictional…". This whole paragraph can be deleted and the point about doing all three actions can be added to the previous paragraph. Please remember the NCA audience when revising the language of this chapter.	Thank you. We removed this paragraph.
Allison	Crimmins	143519	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	4	4	This sentence refers to "Adaptation literature". Where is that literature? Please provide citations.	Adaptation literature refers to much of the literature already cited in this chapter. We do not believe we need to repeat all those cites here
Allison	Crimmins	143520	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	4	8	Here is yet another numbered list.	Noted
Allison	Crimmins	143521	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	8	14	So, there is no stationarity assumption? This seems to contradict earlier statements.	This examplar case has overcome the stationarity assumption, as have most of the examplary cases mentioned in this chapter
Allison	Crimmins	143522	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	14	14	Citation needed	Cite now provided
Allison	Crimmins	143523	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	15	15	What does "revetment" mean? I don't think this is a commonly known word.	We thank the reviewer for this comment and have incorporated change to the text.
Allison	Crimmins	143524	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	21	25	Delete these sentence. They are all inside baseball.	We thank the reviewer for this comment and have incorporated change to the text.
Allison	Crimmins	143525	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	30	31	I'm not sure this statement is true, nor why the only citation listed here is from 2014.	Added a more recent citation
Allison	Crimmins	143526	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	31	31	This sentence refers to "a growing body of literature". Where is that literature? Please provide citations.	We thank the reviewer for this comment and have incorporated change to the text.
Allison	Crimmins	143527	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	32	33	This is a very troubling statement. If there is not yet sufficient evidence, how can the authors possibly assert the key message that directly follows this statement? Suggest deleting and/or deleting this entire paragraph.	We thank the reviewer for this comment and have incorporated change to the text.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	143528	Table	28. Near-Term Adaptation Needs and Increased Resiliency	1	1319				Strongly suggest deleting this entire table. It is very confusing and not helpful to the reader. It introduces yet another framework (actually one framework is the rows and another framework is the columns!). How the authors determined what falls in each box is unclear. The caption says that the green text holds true for every single global location, which can not be true. Are the authors suggesting that these adaptation steps be taken and the red ones should not be taken? For instance, the authors are suggesting we should NOT restore wetlands? The black text says there is no US estimates, but the red and green text legend suggest these are on a global scale. Other bullet points seem to just be random words like "sandbags". While some bullets have meaningless phrases like "bolster human capital" (what on earth is that?) There are no red or green text in the bottom section, and it is very unclear why the adaptive capacity row also has bullets that span both categories (I guess these don't fit the framework? But there are no examples like this for exposure or sensitivity?). Even the citations listed are limited, with almost all of the bullets coming from 2 or 3 sources primarily from 2009 and 2010. Most importantly, this table takes up a large amount of room in the chapter without contributing anything the comprehension of the message and potentially introducing many errors and contentions about whether an adaptation action has higher benefits than costs in all places and all times. Suggest replacing with any number of figures that would enhance the readers understanding of the types of adaptation options out there (e.g. maps with examples of actions taken around the US, graphs of cities or states with adaptation plans, the table from the EPA CIRA report that quantifies adaptation costs for infrastructure in the US, etc.)	We deleted the table due to space constraints
Allison	Crimmins	143529	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1319	1319	8	18	Drop this entire paragraph and move the first sentence somewhere more appropriate. The authors have already provided multiple examples of this. This will allow for dropping the subheading on line 6 as well as the subheadings on page 1320 line 6 and line 16. The subheading on page 1320 line 16 is what this entire section is meant to be about.	We deleted this paragrah
Allison	Crimmins	143530	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1320	1320	7	7	In the last paragraph, it said "many action" and here it says "in some cases", which seems rather contradictory.	We thank the reviewer for this comment and have incorporated change to the text.
Allison	Crimmins	143531	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1320	1320	19	19	This says there is "literature" Where is it? Citations are needed at the end of line 19, after "precipitation flooding" on line 20, and after "farm level" on line 20.	We have signifcantly rewritten this section
Allison	Crimmins	143532	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1320	1320	23	28	The authors need to explain what they mean by "sandbags". Explain what sandbags are used for and how they are adaptation tools. Also, please explain why there is a discrepancy in benefit-cost ratios in these areas. The citations provided one lines 24-25 seem to be favorites of the authors, but they are also very old. Do these values still hold true with current events? What was the ratio in Florida for Irma? In the Gulf for Maria? On line 28, the text says climate adaptation is extremely local in nature for both risks and responses. I agree with this, but it begs the question why is Figure 28.1 in this chapter then?	We deleted the table due to space constraints, but explain whaat we mean by sandbags in the text
Allison	Crimmins	143533	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1321	1321	5	5	This sentence says there is "considerable literature". Where is this literature? Please provide citations.	We thank the reviewer for this comment and have incorporated change to the text.
Allison	Crimmins	143534	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1321	1321	20	22	This sentence directly contradicts the sentences at the beginning of the previous paragraph (lines 5-8). For example, you say action addressing health risks have not received extensive consideration here, but above you say there is considerable literature for responding to extreme heat events and cite the human health chapter.	We thank the reviewer for this comment and have incorporated change to the text.
Allison	Crimmins	143535	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1321	1321	23	24	Please replace jargon like "mulitresource integrated adaptation planning" and "multiple partners and jurisdictions" with plainer language.	We thank the reviewer for this comment and have incorporated change to the text.
Allison	Crimmins	143536	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1321	1321	30	30	Citation needed	We deleted this sentence
Allison	Crimmins	143537	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1322	1322	7	7	Suggest including citation to the EPA CIRA 2017 report	Done. Thanks for the suggestion
Allison	Crimmins	143538	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1322	1322	9	11	The two examples in this sentence are too disparate to include together in one sentence. Suggest dropping "equity and" and "distributional justice and". Including this example also makes the sentence sound too judgmental. This topic is better covered by the paragraph on lines 24-38.	You are correct that there are two separate ideas here, but both are important to exemplify the overall point being made. We thus broke this single sentence into two
Allison	Crimmins	143539	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1322	1322	12	23	Delete this entire paragraph. Especially the jargon phrase "multiobjective or multicriteria analysis". This paragraph does not add to the narrative and lack enough citations.	We respectfully disagree. The literature is emphatic on the importance of participatory engagement. Analysis that makes different types of outcomes explicit, rather than rolling them up into a single measure, is important for participatory engagement. Thus we believe this paragraph is important. The technical terms multi-objective and multi-criteria are important to mention in order to be respectful to the full range of readers of this chapter. We have added some cites, and made eits to try to addres your concerns.
Allison	Crimmins	143540	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1322	1322	24	24	Delete "As one … multiobjective approach". This part of the sentence is not needed and another word that starts with "multi" is really not needed.	We reworded the sentence to avoid starting with the more technical work, but retaining the important connection among the different ideas.
Allison	Crimmins	143541	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1322	1322	29	38	There are not citations in this paragraph. Citations are needed at the end of the sentences on line 32, 33, and 34.	We have added a citation that addresses these points
Allison	Crimmins	143542	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1322	1322	34	38	The last (exceptionally long) sentence here is controversial. Is this the message the authors really want to make? That you have to choose between climate adaptation actions and social equity? Suggest dropping this.	We thank the reviewer for the comment. While there are often synergies in investing towards social goals, there are also tradeoffs. The point is worth mentioning.
Allison	Crimmins	143543	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1323	1323	5	5	By "resources" do you mean water?	No, we meant financial. We have edited the text to make clear.
Allison	Crimmins	143544	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1323	1323	7	15	This text makes it sound like this already happens, so who is this advice aimed towards?	This text describes norms and expectations that currenly exist in other sectors and suggests that climate adaptation would be advanced if these norms and expectations come include adaptation as well. This text is not focused on any particular actor.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	143545	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1324	1324	1	24	There are zero citations on this page. Please provide citations of the literature the authors assessed to come to these conclusions.	We have re-written this text, which now includes many cites
Allison	Crimmins	143546	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1323	1324	39	1	This subheading (in bold) is way too long.	We thank the reviewer for the comment. We have shortened the key message
Allison	Crimmins	143547	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1324	1324	6	6	The word mainstreaming is defined here in the text, so it should not be used in the key message since readers won't know what it is. I would suggest not even using this jargon-y word.	We thank the reviewer for the comment. We have taken the word mainstreaming out of the KM, but included in in the KM summary. We have adopted a consistent definition of this term across the chapter.
Allison	Crimmins	143548	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1324	1325	13	15	Here we have another list (framework??) and even a list within a list (lines 13-18).	This text has been revised
Allison	Crimmins	143549	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1325	1325	1	30	Both these paragraphs can be completely deleted. They repeat information already in the chapter. The first paragraph starts out with "Second, " but it is redundant, not second. The second paragraph has yet another list. Overall, these two paragraphs did not contribute to the understanding of this message.	These paragraphs have been moved and re-written to better focus on the important information they contain, while reducing any redundancy.
Allison	Crimmins	143550	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1326	1326	1	39	These were all really good examples. I wonder if they would be better serves as individual text boxes spread throughout the chapter? Also, as much as possible, please note whether these adaptation actions worked. Were they effective?	Thank you. We have added more examples , including several text boxes. Evaluating the extent to which adaptation actions worked is non-trivial, and we were unaable to do so in this chapter.
Allison	Crimmins	143551	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1327	1327	8	11	And another list	Agreed. We thank the reviewer for the comment
Allison	Crimmins	143552	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1327	1327	13	24	And another list	Agreed. We thank the reviewer for the comment
Allison	Crimmins	143553	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1327	1327	14	14	Strongly suggest deleting this bullet point. This seems very much like policy advocacy. Why must it be approved by elected officials? Yikes. If the authors must keep it in, at least change "professional staff" to "dedicated staff" so it doesn't sound so elitist. This bullet point really drives homes that the adaptation actions listed in this chapter are not relevant to individuals or families, but can only be made by larger organizations or governments.	We thank the reviewer for the comment. We have added the phrase "by public sector organizations" to make clear that these statements are focused on those types of entities. re: elected officials, see Madison et. al. 1787, Article I
Allison	Crimmins	143554	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1327	1327	31	36	This must be at least the 8th times I've read this exact sentence in this chapter. The second sentence is also repetitive. Delete both.	We re-wrote this paragraph
Allison	Crimmins	143555	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1328	1328	1	7	This entire paragraph is redundant to other text in the chapter. Drop it.	We re-wrote it
Allison	Crimmins	143556	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1328	1328	8	21	Curious that the examples here are from other countries. It seems like the Southwest would have ample drought examples that could be used in place of Australia. And the Mississippi river area would have plenty of actions to highlight instead of the Rhine. Almost all the examples in this chapter are California, New York, or Florida. Suggest the authors do more research to find literature in other parts of the country.	We dropped the Dutch example. The Australian example appears to be one of the most dramatic in terms of consolidating jurisdictions to address cliamte-related impacts. We have added examples to the chapter from all over the country
Allison	Crimmins	143557	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1328	1329	22	16	This section is long and somewhat repetitive to other parts of the chapter. Please look for ways to cut down on length.	We have re-written this section
Allison	Crimmins	143558	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1329	1329	21	22	Please provide the years when Sandy and Katrina happened. This may be fresh in the mind of east-coasters, but not people in the west.	The text has been modified as suggested.
Allison	Crimmins	143559	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1329	1329	22	26	Delete- repetitive.	We have shortened this discussion.
Allison	Crimmins	143560	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1330	1330	9	12	Delete- irrelevant.	Thank you for this comment - we agree this sentence was not necessary to the paragraph and have deleted it.
Allison	Crimmins	143561	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1330	1330	26	36	Delete- not needed.	Thank you for this comment; we disagree and believe these examples are useful to illustrate the point.
Allison	Crimmins	143562	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1331	1331	6	6	This sentence talks about "long-standing research". Where is this research? Please provide citations at the end of the sentence on line 8.	We have deleted this text due to space constraints
Allison	Crimmins	143563	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1331	1331	12	13	I'm not sure "federal, state, tribal, local, private, and academia" are "interests".	We have deleted this text due to space constraints
Allison	Crimmins	143564	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1331	1331	13	13	Grammar- two "include"s	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Allison	Crimmins	143565	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1333	1333	29	37	Citation needed. The text mentions "surveys" but citations for those surveys are absent. Delete lines 34-37, which is already in the Uncertainty section. That last sentence in particular is a rather wild assertion with no citations.	We have re-written this section
Allison	Crimmins	143566	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1334	1334	20	23	Confidence and likelihood rankings are not provided here- please add.	Thanks for your comment; we did include confidence rankings for key message 2 in the "description of confidence and likelihood" section.
Allison	Crimmins	143567	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1334	1334	25	31	Delete lines 25-27 and 30-31. They don't belong in this section. The middle sentence says there is "strong" evidence, but only one citation is provided. Please provide citations for this strong evidence.	Thank you for this comment. We feel the explanatory sentences on the stationarity assumption are necessary to ground this section.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Allison	Crimmins	143568	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1334	1335	36	2	Delete- this text is not appropriate for the Uncertainties section. This can be moved to the Description of evidence section.	We have deleted this text
Allison	Crimmins	143569	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1335	1335	5	5	agreement about what?	Thanks for this comment; fixed in the text.
Allison	Crimmins	143570	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1335	1335	17	17	This sentence says there is a "large body of literature and observations". Where? Please provide citations for this large body of literature. This section needs to be expanded to include DESCRIPTIONs of the evidence. Not just that the literature exists, but whether it is consensus or contentious, old or new, emerging or established, etc. etc.	Thanks for this comment; edited text to clarify that citations are just a few of those in the literature. We aren't able to provide detailed descriptions of each reference in this chapter but we relied on sources we believe are credible.
Allison	Crimmins	143571	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1335	1335	22	26	None of this is relevant to the Uncertainties section. Move or delete.	Thank you for this comment; edited text to clarify meaning.
Allison	Crimmins	143572	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1335	1335	30	30	The phrase "appropriate conceptual approach" is an outright endorsement and advocacy by the federal government for this approach, which is not appropriate for a scientific assessment.	Thank you for the comment; text edited to clarify meaning.
Allison	Crimmins	143573	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1335	1335	30	34	The first and second sentence in this paragraph completely contradict one another. There is high confidence that this approach is appropriate (sentence 1) and also medium confidence that this approach is appropriate (sentence 2). None of this is describing the reasons behind the confidence rankings given. Please revisit this TA and the rest of the TAs and revise according to NCA guidelines.	Thank you for the comment; text edited to clarify meaning.
Allison	Crimmins	143574	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1336	1336	8	14	There are 4 uses of the word "judgments" in this section, though it is unclear why, or what judgements are being referred to. Judgments also seems like the wrong word choice- are you trying to say (for the first time here in the TA) that decisions should be made using cost-benefit assessments?	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Allison	Crimmins	143575	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1336	1336	14	17	This text is not appropriate for the Uncertainties section.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Allison	Crimmins	143576	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1337	1337	1	1	Citations needed for these "studies"	Section re-written and citations added
Allison	Crimmins	143577	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1337	1337	5	5	Citations needed for this "literature"	Section re-written and citations added
Allison	Crimmins	143578	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1337	1337	6	6	Citations needed for this "literature"	Section re-written and citations added
Allison	Crimmins	143579	Traceable Account	28. Near-Term Adaptation Needs and Increased Resiliency		1337	1337	18	22	This paragraph should be moved to the Description of Evidence section.	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Allison	Crimmins	143581	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						Please be judicious with the pictures and use only ones that help explain or show adaptation actions.	Unfortunately, due to space constraints we had to drop all our pictures
Allison	Crimmins	143582	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						Suggest the review editor take a close look at this chapter to ensure the authors have completed a thorough literature review. It is not clear that all the citations are relevant, and there are large sections missing citations. There also seems to be a lot more recent literature that has not been cited in this chapter.	We thank for the reviewer for the comment. We have tried to increae the recent literature cited in the chapter.
Allison	Crimmins	143583	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						Strongly suggest the authors step back and think about what the most important messages the NCA4 audience should take away from this chapter on adaptation. My guess is that none of them would have to do with frameworks. This is an important opportunity to set the precedent for the adaptation chapter and there is much more that the authors can do to further this important area of research than to endorse an array of frameworks.	We thank the reviewer for the comment. We believe, however, that emphasizing that adaptation is a form of risk management is an important message from this chapter. The National Academy of Sciences review panel concurs in this assessment.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
John	Fleming	143636	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						Adaptation efforts will ultimately be essential if we are to protect valuable infrastructure, homes, businesses, natural spaces, and individual livelihoods from climate change impacts. In order to deploy these efforts, substantial commitments to both capital investments and â€œmainstreamingâ€ of adaptation strategies must occur. Such is already discussed in the Adaptation Response chapter. However, of great importance, but not discussed in the chapter, is who should be held responsible for deploying adaptation strategies. Considering the amount of investment that will be required, there will ultimately be disagreement over who should supply capital. Should it be those who will be most impacted if they do not adapt, or should it be those who bear the responsibility for worsening climate change and therefore created the need for adaptation? The issue with placing the burden on the people most impacted is that those individuals may not have the means to effectively adapt. As discussed throughout the draft NCA, the people who will be most impacted are likely to be the most disadvantaged, including the poor, the elderly, and communities of color. It would be wrong to place the burden of adaptation on those most vulnerable to climate change. The burden should therefore be placed on those who are most responsible for bringing about climate change. A study that analyzed emissions primarily from companies that produce fossil fuels found that 63 percent of global industrial CO2 and methane emissions between 1751 and 2010 came from just 90 international entities. These entities included 56 crude oil and natural gas producers, 37 coal extractors, and 7 cement producers (Heede, R., Tracing anthropogenic carbon dioxide and methane emissions to fossil fuel and cement producers, 1854-2010, 122 Climatic Change 229 (2014)). Based on historical data and climate modeling, emissions from these 90 fossil fuel entities have contributed an estimated 57 percent to the observed rise in atmospheric CO2, approximately 50 percent to the rise in global mean surface temperature, and approximately 32 percent to global mean sea level rise between 1751 and 2010 (Ekwurzel, B. et al., The rise in global atmospheric CO2, surface temperature, and sea level from emissions traced to major carbon producers, 144 Climatic Change 579 (2017)). A separate study attributed 71 percent of global industrial greenhouse gas emissions since 1988 to just 100 fossil fuel producers, with 51 percent of emissions since 1988 attributed to just 25 corporate and state producers, including ExxonMobil, Shell, BP, Chevron, and Peabody (CDP and Climate Accountability Institute, The Carbon Majors Database, CDP Carbon Majors Report 2017, July 2017). Therefore, fossil fuel companies can be directly linked to climate change based on their extraction and distribution of fossil fuel resources.	We agree. This is one reason why we included the section on Broader Measures of Well-Being under KM4. We have also increased our discussion of equity issues throughout the chapter. We thank the reviewer for the suggestion.
Carole	LeBlanc	143931	Whole Chapter	28. Near-Term Adaptation Needs and Increased Resiliency						Respectfully request your consideration for inclusion: Quantifying Climate Risk through Time, in which Dr. Terry Thompson describes how detailed climate projections can be used to quantify specific climate impacts on human and economic resources, and how the magnitude of these impacts evolves through time. This temporal aspect, essential to performing cost-benefit analysis for the many elements of adaptation plans for climate change, has been unavailable until now and represents a marked improvement in modeling.	Thank you for this suggestion. However, we are unable to cite all the valueable literature in our chapter.
Andrea	Galinski	143963	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1318	1318	3	28	This section discusses adapting to future conditions; consider incorporating the Coastal Protection and Restoration Authority and 2017 Coastal Master Plan as example of planning for future conditions of sea level rise over the next 50 years. The planning process includes the consideration of three environmental scenarios that reflect a range of variables over the next 50 years including: sea level rise, subsidence, hurricane frequency, average hurricane intensity, precipitation, and evapotranspiration.	We thank the reviewer for this comment and have incorporated change to the text.
Andrea	Galinski	143964	Table	28. Near-Term Adaptation Needs and Increased Resiliency	28.1	1319				2017 Coastal Master Plan could be added to both the 1) reduce exposure, and 2) reduce sensitivity. For instance, the Master Plan includes a suite of restoration projects (marsh creation, sediment diversions, shoreline protection, ridge restoration, barrier island restoration and more), structural protection (levees and floodgates), and nonstructural projects (residential voluntary acquisition) to reduce exposure. Additionally, the Master Plan also reduces sensitivity through residential elevation and nonresidential floodproofing.	We deleted this paragrah but discuss the Master Plan elsewhere
Andrea	Galinski	143965	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1322	1322	16	23	CPRA/Coastal Master Plan is mentioned in terms of the planâ€™s consideration of five objectives, which is good.	Thank you!
Andrea	Galinski	143966	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1330	1330	13	21	May suggest highlighting various resources and climate adaptation plans being developed and implemented at the state, county, and/or metropolitan scale. Often these more local planning activities have the most profound impact on communities as they are tailored to the local environment, governmental institutions, and community input. For example, CPRA offers the Master Plan Data Viewer, as a resources for citizens, planners, and other local governmental officials to learn more about how land loss and flood risk will change in the future (http://cims.coastal.la.gov/masterplan/).	Thanks for this comment; we included this resource as an example of more local and targeted resources available.
Michael	MacCracken	144660	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	13	26	Very nice set of Key Messages	We greatly appreciate the reviewer's comment
Michael	MacCracken	144661	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	21	21	Really best practice to not use the word "may" as it can mean anything. Words from the lexicon can be used. Here, the word "may can just be deleted--the statement is true on its face without that. Chapter (and entire report) should be scrubbed for meaningless and uninformative words like "may" and "could"	Thank you for the comment. We revised Key Message 4 accordingly, and minimized use of these words throughout the document.
Michael	MacCracken	144662	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	29	29	Actions are not taken just to reduce risks, but to reduce actual damage and impacts (I'll presume somewhere in chapter the issue of proactive versus reactive adaptation will be explained--it does come up in some of the chapters).	We appreciate this comment and revised the text accordingly.
Michael	MacCracken	144663	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	34	34	This needs to be rephrased to make clear that the types of changes that are already evident will actually be getting worse and that such worsening is what is largely unalterable out through mid-century. Tis seems to just say we'll have to endure the present extent of changes until 2050, instead of indicating that they will substantially worsen. And it should be noted, sea level rise will continue for much longer.	Thank you for this comment. We revised the text to include these points.
Michael	MacCracken	144664	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1308	1308	36	36	No, this suggests we won't be experiencing more and more risk over the next several decades, becoming more and more likely to be exceeding the variations that have been expereinced and accounted for in past actions. The situation will be worsening.	Thank you for this comment. We revised the text to include this point.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144665	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	1	2	This can be the case for proactive adaptation. For reactive adaptation, the impact occurs first and then the struggle to figure out what to do to keep from being whacked again and again. Basically proactive adaptation is picking up a safety vest before one goes into waters with a storm coming one's way, or choosing not to go in the water at all, and reactive adaptation is yelling for help when was is trapped in a rip tide. I'd encourage describing the difference--and noting that many regions in US are trying to do the former, and the putting off truly facing the issue through denial and turning away is doing the latter--and imposing this on the whole population to the extent it can (except for this assessment trying to bring sense to national policymakers).	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144666	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1309	1309	7	7	That this assumption is no longer true as a point first made at the Villach meeting in 1985, if not before. The phrasing here makes this seem a recent finding. I'd urge referencing the Villach WMO/UNEP/ICSU report regarding this point, just to give a nod to the extensive efforts to get this point across.	The chapter text (Section 28.2) has adequate referencees on this point, which also show that this is not a recent finding. We nonetheless thank the reviewer for the comment and interesting cite.
Michael	MacCracken	144667	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	3	4	I think a clarification is needed here about how "extreme" conditions can become more common--it seems to imply the bell curve is simply flattening instead of shifting (and maybe also flattening--and this needs to be made very clear to readers). NOAA's practice is to each decade update its normal to the past three decades, and this has the effect of understating the intensity of the extreme for those aspects of society and the environment (e.g., city location with respect to sea level and mix of trees in the forest, respectively) that have time horizons longer than three decades. If one looks at the Hansen et al. shifting bell curves, one get a good sense of this--looking at the current decade compared to the mid-20th century normal he used (actually 1951-80), we are now experiencing five and even six sigma events (in his case, summer average temperature anomaly for land areas in the NH)--those deviations imply one in several million likelihood--very rare and very impactful on ecosystems, etc. that were established in the mid-20th century (so after World War II when much of developed nation infrastructure was built) and before (when most ecosystems became established). Indeed, Hansen et al. results indicate that warm extremes that were 1 in 1000 likelihood in the mid-20th century are now occurring 10% of the time. I make this point here because I think it is important to, especialy here and in this context, to give some explanation of what "extreme" means and how it is that communities can be having, for example, 100-year storms in successive years (basically, the statistical analysis for flooding was based on mid-20th century, and the bell curve has shifted such that it is now not at all unlikely to have years with successive or even multiple occurrences of what was once rare--especially given that until at least a few years ago it was required practice by civil engineers to only use past data in their analyses and building/bridge designs--not to look ahead. I guess my main point here is that the discussion, at least so far in the chapter, is quite idealistic and what I think is needed is some real discussion of reality and the situation we are now in.	We deleted this sentence since the point it makes is better covered elsewhere in teh NCA report
Michael	MacCracken	144668	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	6	6	Somehow, saying "from climate change" does not seem right; what is happening is an increase in the amount of annual losses due to climate change--it was not as if there were not losses before. And it likely needs to be said (to give a bit of hope, even if over-optimistic) that adaptation has the potential to moderate this, so this sentence is, I presume, assuming no adapttion (or is it?).	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144669	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	13	13	Need to rephrase to use lexicon and not "may"--and do throughout the chapter (so I'll not raise issue in every instance)	We thank the reviewer for the comment. We have reduced the use of 'may' throughout the chapter
Michael	MacCracken	144670	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	21	22	Change to "defined as the" on line 21 and "it" to "its" on line 22	We thank the reviewer for the comment. The chapter text has been revised to incorporate the suggestion.
Michael	MacCracken	144671	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1311	1311	25	25	But some of what we know is certain (e.g., sea level will rise) and adaptation includes preparing for certain consequences (I agree that amount by exactly when is a bit uncertain, but one could also say it is certain that sea level rise is going to rise 1 foot, then 2 feet, and the uncertainty is when that will occur, so I am a bit concerned about the definition.	We thank the reviewer for the comment, and agree that there are many aspects of the climate change challenge that are known with confidence. That said, the literature is overwhelming in the point that climate change adaptation is a risk management challenge because there are many important uncertainties. Uncertainty is no barrier to action, but neglecting it can be a barrier to understanding.
Michael	MacCracken	144672	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	1	2	Needs to be said more carefully for CO2 to make sure deniers don't expound on the point. For CO2, what has a long lifetime is the perturbation created, not the persistence of particular molecules of CO2 in the atmosphere.	We thank the reviewer for this comment; have modified sentence to reflect input
Michael	MacCracken	144674	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	2	2	Partly true--cutting emissions of short-lived species can start to have an effect well before 2050 if we would only do it (and stop using GWP-100 as a way to combine the effects of GHGs). Is there any way to insert a footnote about what "largely unalterable" means and indicate that short-lived gas emissions reductions can make a difference. And then, of course, there is climate intervention, which could make an early difference. I'd suggest adding s qualifying phrase at the end of the sentence ending on line 2. I'll agree, however, on the conclusion on line 5, and then on line 6 urge mention of both carbon dioxide removal and climate intervention.	We thank the reviewer for this comment; have modified sentence to reflect input.
Michael	MacCracken	144675	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	7	12	Don't you need to indicate that there is also the potential for mitigation here, and indicate the difference?	We thank the reviewer for this comment but the suggestion is outside the scope of this chapter
Michael	MacCracken	144676	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1312	1312	33	34	Regarding the phrase "successful adaptation measures"--in general, what has been accomplished is to temporarily (so mabe for one to a few decades) put off the problem. I'd be cautious calling these "successful" unless one adds some sort of qualification.	We rewrote this paragraph, which no longer includes the phrase mentioned here
Michael	MacCracken	144677	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1313	1313	9	13	And also because impacts are being felt--for example, in Newport News, raising road height is a response to flooding, etc. I think it needs to be made clearer that impacts requiring responses are already occurring--reactive adaptation, primarily.	The chapter has been revised to emphasize that implemention is occuring in response to observed
Michael	MacCracken	144678	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	19	19	Regarding "may use", in addition to getting rid of "may", the real problem has been that using past datas is required good practice in the particular professional field. Hopefully, this is changing.	Agreed that this is a problem. We too hope it is changing, as discussed on p. 1317/18 & 1321/22

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144679	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1314	1314	30	33	What is the reference for this and over what term is being mentioned. I've not seen indications of this--Hansen et al.'s shifting of the bell curve shows that one can get much more variability due to small shifts in the bell curve and so it might seem this way, but I don't know of indications that the width of the bell curve in the past was much wider than in the mid-20th century. Yes, in the more distant past there were different average temperatures due to various causal factors, but what is the evidence tht the bell curve is broadening due to other than human activity? OKAY, I read the rest of the paragraph to get a sense of what you were talking about--but these are regional fluctuations, not of the whole climate system. Thus, I'd suggest on line 32 changing it to read "that the natural variability on regional scales has been larger than previously understood" (given the climatic conditions are sort of on a knife edge, even what seems like a small shift can have rather large consequences--and this might be a point to make instead of saying it is the climatic conditions that make the large change--it is, I'd suggest the system that is sensitive to small changes, and that is something to keep in mind; indeed, look at the state of changing land ice, with small changes in climate causing quite large changes).	We now say regional scales
Michael	MacCracken	144680	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	1	1	Another indication that even what seem small changes in the climate (in this case in the forcing) can cause quite large responses.	Thank you. We have changed this sentence to include reference to NCA4 vol1 where the science of the effects of carbon forcings are described in close detail.
Michael	MacCracken	144681	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1315	1315	1	2	Well, no--see earlier comment	Thank you. We do not completely understand this comment and disagree with the part of it that appears to suggest that changes are not outside the range of measured variability in some locations.
Michael	MacCracken	144682	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1317	1317	12	12	Should not "climate impacts" here by "changes in climate"--it is the system that suffers the impacts that we want to reduce?	Thank you. We do not entirely understand this comment but think our use of "climate impacts" is the correct representation of changes in climate affecting human and natural systems we seek to adapt.
Michael	MacCracken	144683	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1319	1319	13	16	Would it not be better for the insurer to set rates looking ahead to future risks--which might help keep future risks down?	we deleted this paragraph
Michael	MacCracken	144684	Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1320	1320	28	28	Indeed. Somewhere I think it would be helpful to be making more of a point about the time horizon--find to build a gazebo on the beach as its time horizon is short; building a sewage treatment plant to be there many decades at sea level is bad planning, especially as that can set the parameters for depths ob burying pipes, etc. for whole neighborhoods/cities so the sewage will keep flowing.	We thank the reviewer for the comment. We discuss time horizons in several places in this chapter, in particular in the section on "Adapting to Current Variability and Preparing for Future Change"
Rachel	Cleetus		Text Region	28. Near-Term Adaptation Needs and Increased Resiliency		1323	1323	12	12	Just "20 to 30 years"--pretty short-sighted, though easier to fix water supply than sewage.	20 or 30 years is the legal requirement in various states. But professional standards may vary. Our edits have now made the language more general.
Kate	Larsen	140833	Table	29. Mitigation: Avoiding and Reducing Long-Term Risks	29.1	1353				I am one of the members of the Climate Impact Lab and authors of the ACP and other related publications. Our team wanted to make sure the references to our project are correct. The name of our Project (column 1) should be: American Climate Prospectus (ACP) The Organization/References should read: Climate Impact Lab (link: impactlab.org) (Houser et al. 2015; Hsiang et al. 2017).	These changes to the content of Table 29.1 have been made.
Richard	Wright	140889	Whole Chapter	29. Mitigation: Avoiding and Reducing Long-Term Risks						I have read the whole document and find it good. I have one major comment relative to Chapter 29. There is no reference in the whole document to the UN Sustainable Development Goals (UNSDG). Their achievement worldwide would contribute strongly to Mitigation. The UN SDG may be accessed at http://www.un.org/sustainabledevelopment/sustainable-development-goals/	While common themes between the UN Sustainable Development Goals and this chapter may exist, it is beyond the scope of this assessment (per the Congressional mandate of the NCA) and the focus of this chapter to characterize the content in the context of the SDG. No change has been made to the chapter text.
Sonya	Ziaja	140899	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1357	1360	26	11	This section could be bolstered by a discussion of more recent work assessing and quantifying the co-benefits of mitigation at different scales. This section would also benefit from further investigation of co-effects of mitigation actions to human health. To address these suggestions, the section should add analysis of Zhang and others' 2017 article "Co-benefits of global, domestic, and sectoral greenhouse gas mitigation of US air quality and human health in 2050" published in v. 12 no. 11 of Environmental Research Letters. A key importance of this article is that it examines the impacts of coordinated activities rather than considering mitigation in isolation. The link the article is: http://iopscience.iop.org/article/10.1088/1748-9326/aa8f76	We agree with the commenter regarding the importance of co-benefits to climate change mitigation. In the Mitigation Chapter, our focus is on the presentation of co-effects, which include effects beyond health (e.g., energy security). We also note that health co-benefits are discussed in greater detail in the AIr Quality and Health chapters, as well as a number of the regional chapters. However, in response to this comment we have included additional references to the co-benefits literature, including the study referenced by the reviewer.
Robert	Kopp	141197	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1347	1347	32	33	Throughout the report, the document refers to results from the American Climate Prospectus or the Risky Business Report, cited alternatively as Gordon, 2014; Risky Business, 2014; Houser et al. 2014; and Houser et al. 2015. The American Climate Prospectus is the peer-reviewed technical analysis, whereas the Risky Business Report is a summary for policymakers; I would therefore suggest citing the ACP instead of the Risky Business Report. The final version of the ACP was published in 2015 by Columbia University Press; the 2014 version is a Rhodium Group report. Citations should be to Houser et al. 2015: T. Houser, S. Hsiang, R. Kopp, K. Larsen and others (2015). Economic Risks of Climate Change: An American Prospectus. New York: Columbia University Press, 384 pp.	The change to the reference has been made.
Robert	Kopp	141198	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	4	7	I suggest citing the analysis of Kopp et al 2017 (doi: 10.1002/2017EF000663) regarding the sea-level impacts of Deconto and Pollard 2016. More generally, chapter 15 of the CSSR as an extensive discussion of critical thresholds.	The CSSR chapter 15 reference has been added earlier in this paragraph where the potential for climate surprises is mentioned, and the Kopp et al. 2017 sea-level impact reference has been added to the sea-level sentence.
Robert	Kopp	141199	Table	29. Mitigation: Avoiding and Reducing Long-Term Risks	1	1353				Throughout the report, the document refers to results from the American Climate Prospectus or the Risky Business Report, cited alternatively as Gordon, 2014; Risky Business, 2014; Houser et al. 2014; and Houser et al. 2015. The American Climate Prospectus is the peer-reviewed technical analysis, whereas the Risky Business Report is a summary for policymakers; I would therefore suggest citing the ACP instead of the Risky Business Report. The final version of the ACP was published in 2015 by Columbia University Press; the 2014 version is a Rhodium Group report. Citations should be to Houser et al. 2015: T. Houser, S. Hsiang, R. Kopp, K. Larsen and others (2015). Economic Risks of Climate Change: An American Prospectus. New York: Columbia University Press, 384 pp.	The change to the reference has been made.
Robert	Kopp	141200	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1355	1355	36	38	See also Kopp et al 2017 (doi: 10.1002/2017EF000663) regarding the sea-level impacts of Deconto and Pollard 2016.	We have added the suggested citation to the chapter assessment.
Robert	Kopp	141201	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1357	1357	3	4	Properly, the "National Academies of Sciences, Engineering and Medicine"	We have made this change to the citation.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Robert	Kopp	141202	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1361	1361	3	6	See also chapter 15 of the CSSR	We have reviewed Chapter 15 of the CSSR and have included it as a citation.
Kaveh	Rashidi Ghadi	141280	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1359	1359	29	29	You might add following sentence to the last part of chapter 29.5.1: Full valuations of these co-benefits will make low carbon investments bankable and financially attractive to the investors (Rashidi et al., 2017). Reference: Rashidi, K., Stadelmann, M., & Patt, A. (2017). Valuing co-benefits to make low-carbon investments in cities bankable: the case of waste and transportation projects. Sustainable Cities and Society, 34, 69-78. http://doi.org/10.1016/j.scs.2017.06.003	Since the suggested paper is about the situation in Indonesia, Kenya, and Sri Lanka, we feel that it is not directly applicable to the USA. However, since there is a large literature about economic co-benefits of GHG mitigation actions, we added a note making this point.
Kaveh	Rashidi Ghadi	141281	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1359		22		You might further add the first paragraph of 29.5.1: In the waste sector, mitigation projects such as decentralised waste treatment systems, not only reduces GHG emissions but leads to a significant reduction in local air pollution and improved local health quality (Rashidi et al, 2017). Rashidi, K., Stadelmann, M., & Patt, A. (2017). Valuing co-benefits to make low-carbon investments in cities bankable: the case of waste and transportation projects. Sustainable Cities and Society, 34, 69-78. http://doi.org/10.1016/j.scs.2017.06.003	Thank you very much for this comment. However, since the paper is about the situation in Indonesia, Kenya, and Sri Lanka, we feel that it is not directly applicable to this assessment of US risks.
Kaveh	Rashidi Ghadi	141282	Whole Chapter	29. Mitigation: Avoiding and Reducing Long-Term Risks						In my perspective, much stronger emphasis is required on the concept of co-benefits of climate mitigation policies. Co-benefits are key drivers of climate policy adoptions and urban governments find it attractive (K. Rashidi & Patt, 2017). This makes their work much easier when dealing with public for GHG reduction projects. In the absence of national/federal supports or commitments, these are the cities who should take the lead. This actually what is happen in the US right now. Reference: Rashidi, K., & Patt, A. (2017). Subsistence over symbolism: the role of transnational municipal networks on cities: climate policy innovation and adoption. Mitigation and Adaptation Strategies for Global Change. http://doi.org/10.1007/s11027-017-9747-y	We agree with the commenter regarding the importance of co-benefits to climate change mitigation. This discussion is presentated in 29.5.1, where we take a broader focus on "Co-effects of Mitigation Actions", and include effects beyond health (e.g., energy security). We believe the current coverage of co-effects is appropriate in the context of the different issues presented in the chapter and overall space constaints. However, in response to this comment we have included additional references to the co-benefits literature. We also note that health co-benefits are discussed in greater detail in the AIr Quality and Health chapters, as well as a number of the regional chapters.
David	Wojick	141761	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1353	1353	3	9	Here is the present text: 3 Key Message 1: Recent scientific advances in impact quantification demonstrate that climate 4 change under a high emissions scenario and without adaptation will impose substantial 5 physical and economic damages on the United States. economy, human health, and the 6 environment, with the potential for annual losses in some sectors reaching hundreds of 7 billions of dollars by the end of the century. Some impacts, such as sea level rise from ice 8 sheet disintegration, will be irreversible for thousands of years, while others, such as species 9 extinction, will be permanent. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	After careful consideration of this point, we have determined that the content of this key message is fully supported by the peer-reviewed literature described and cited in the main text and traceable account. We note that the commenter did not provide any literature, documentation, or additional detail to support the assertions made, and therefore the author team is unable to substantiate the points. No changes have been made to the key message in response to this comment.
David	Wojick	141762	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1355	1355	2	4	The present text says this: 2 Key Message 2: Substantial global-scale greenhouse gas emissions reductions are shown to 3 significantly reduce climate change impacts and economic damages across the United States, 4 though the magnitude and timing of avoided risks varies by sector and region. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	After careful consideration of this point, we have determined that the content of this key message is fully supported by the peer-reviewed literature described and cited in the main text and traceable account. We note that the commenter did not provide any literature, documentation, or additional detail to support the assertions made, and therefore the author team is unable to substantiate the points. No changes have been made to the key message in response to this comment.
Frank	Richards	141763	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1357	1357	30	35	Present text: 30 Key Message 3: Adaptation can complement mitigation due to already committed climate 31 change from past and present emissions and the inability to avoid all climate risks. 32 Adaptation can reduce exposure and vulnerability to the impacts of climate change in the 33 United States in a variety of sectors. Recent studies have made advancements in capturing 34 complex interactions between mitigation and adaptation including both benefits and adverse 35 consequences. Comment: This entire message falsely states speculative attributions and projections of impacts as established physical facts. These attributions, projections and risks appear to be based primarily on the use of questionable computer models. That climate change will have negative impacts has yet to be determined and appears increasingly unlikely.	After careful consideration of this point, we have determined that the content of this key message is fully supported by the peer-reviewed literature described and cited in the main text and traceable account. We note that the commenter did not provide any literature, documentation, or additional detail to support the assertions made, and therefore the author team is unable to substantiate the points. No changes have been made to the key message in response to this comment.
Rebecca	Ambresh	141818	Figure	29. Mitigation: Avoiding and Reducing Long-Term Risks	29.2	1348				This is an excellent figure. Highlights the cost of damage while providing the amount saved under a better scenario.	The authors are grateful for this positive comment. No changes made to the chapter.
Susanne	Moser	141819	Whole Chapter	29. Mitigation: Avoiding and Reducing Long-Term Risks						This was a very well written chapter. It was very concise in addressing its key points while providing evidence, examples and solutions.	The authors are grateful for this positive comment. No changes made to the chapter.
Andrew	Pershing	141870	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1355	1355	24	29	Are there any US efforts to reduce population or help it stabilize in developing countries which are experiencing massive growth like China and India? It might be beneficial to list them (or list efforts by other countries) and what impacts it will have on climate change.	While some Federal agencies support family planning programs, we are not aware of any such programs being part of a climate program or having an explicit climate linkage. As a result, we have not revised the text to address this comment.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Sarah	Davidson	142010	Whole Chapter	29. Mitigation: Avoiding and Reducing Long-Term Risks						Consider adding a general overview of types of mitigation to this chapter, not with the intent to evaluate or recommend but to introduce the topic sufficiently for readers not already knowledgeable about the range of emissions mitigation options and to ensure that the chapter covers "current trends in global change" (see Front Matter p1) that pertain to mitigation. This could be done e.g. by expanding the "call out box" on p.1349. This overview could list and briefly define types of mitigation that are widely discussed in scientific literature and policy efforts. In this draft chapter, mitigation strategies are referred to sporadically as examples of existing initiatives (e.g. regulatory and incentive programs, Section 29.3.2), examples of interacting adaptation-mitigation strategies (e.g. reforestation, Section 29.5.0), as their own section without existing examples (geoengineering, Section 29.5.2), or excluded altogether (e.g. direct carbon pricing or taxes). A statement on "emissions outsourcing" would also be useful here to clarify that the impact of a given emissions strategy on climate change mitigation is dependent on the resulting net reduction in emissions (e.g. Kanemoto et al. 2014, doi:10.1016/j.gloenvcha.2013.09.008).	Thank you for this comment, which was thoroghly considered by the author team. In response, we have substantially expanded the call-out box to describe the broad types of mitigation options (zero- and low-carbon emitting energy including renewables, nuclear, and carbon capture and storage; energy efficiency) as well as carbon dioxide removal meassures such as direct carbon dioxide removal from the air and bioenergy with carbon capture and storage. The call-out box also mentions the range of policy options that have been discussed in the literature including standards, emission caps with trading, and emissions pricing. To address the commenter's final point, we have addressed the concept of emissions leakage in section 29.3.2.
Sarah	Davidson	142011	Whole Chapter	29. Mitigation: Avoiding and Reducing Long-Term Risks						Consider adding a discussion of carbon pricing, including direct carbon taxes or fees, as a type of mitigation and current and projected trend relevant to global change in the US (see Front Matter). The relevance of carbon pricing as a way to mitigate climate change impacts on the US is evidenced by e.g. (1) reference in the literature (e.g. IPCC 2014 Synthesis Report p86; Luderer et al. 2016, doi:10.1007/s10584-013-0899-9; Rockstram et al. 2017, doi:10.1126/science.aah3443; Schnellnhuber et al. 2016, doi: 10.1038/nclimate3013; Xu and Ramanathan 2017, doi:10.1073/pnas.1618481114); (2) a recent US Dept of the Treasury Office of Tax Analysis report (Horowitz et al. 2017) "Carbon taxes have been sufficiently widely discussed that a technical assessment of the issues involved was warranted." https://www.treasury.gov/resource-center/tax-policy/tax-analysis/Documen…); (3) nationwide carbon pricing that will be in place in Canada in 2018 and includes carbon levys (e.g. https://www.canada.ca/content/dam/eccc/documents/pdf/20170518-2-en.pdf)	Thank you for this comment. We have included the example of carbon pricing through taxes and cap and trade in the expanded call-out box on mitigation. However, we note that a longer discussion of the efficacy and implementation of these measures and inclusion of the citations provided is beyond the scope of this chapter, which focuses on the consequences of mitigation. Furthermore, the chapter title has been changed from "Mitigation: Avoiding and Reducing Long-term Risks" to "Reducing Risks through Emissions Mitigation" for two reasons: 1) to better inform readers' expectations about the chapter focus being on the consequence of mitigation (e.g., the potential for risk reduction) rather than the mitigation undertaking, and 2) to clarify "emissions mitigation" as distinct from other uses of the word mitigation in the the risk management community.
Sarah	Davidson	142012	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1347	1347	9	11	Consider modifying Key Message 2 or creating a separate key message to clarify the importance of the timing of emissions reductions in impacting future impacts. A large number of studies share a general conclusion that (1) the long-term impact of emissions reductions declines with time from the present and (2) reductions in line with lower-emissions scenarios require significant mitigation efforts to begin during this decade. See section 29.2 of this draft report, Figueres et al. (2017, doi:10.1038/546593a), Xu and Ramanathan (2017, doi:10.1073/pnas.1618481114), Hansen et al. (2017, doi:10.5194/esd-8-577-2017), Rockstram et al. (2017 doi:10.1126/science.aah3443), IPCC 2014 Synthesis Report p28-3, DeAngelo et al. (2017 doi:10.7930/J0M32SZG).	In response to this comment and other comments raised during public review, the following sentence has been added to the end of Key Message #2. "In general, the difference in climate impact outcomes between emission scenarios is more modest through the first half of the century, and the effect of near-term mitigation in avoiding damages increases substantially in magnitude after 2050." The other topics raised by the reviewer regarding the timing of emission reductions are too specific for use in the key message.
Sarah	Davidson	142013	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1347	1347	29	35	Please briefly mention here the timing of GHG reductions, discussed elsewhere in the chapter but not in this executive summary. It is critical for decision makers to understand that in general, actions in 2020 will reduce US climate impacts more than if the same actions are delayed to 2030 or 2040. A large number of studies conclude that (1) the long-term impact of emissions reductions declines with time from the present and (2) reductions in line with lower-emissions scenarios require significant mitigation efforts to begin during this decade. See Xu and Ramanathan (2017, doi:10.1073/pnas.1618481114), Hansen et al. (2017, doi:10.5194/esd-8-577-2017), RockstrÃ§m et al. (2017 doi:10.1126/science.aah3443), IPCC 2014 Synthesis Report p28-3, DeAngelo et al. (2017 doi:10.7930/J0M32SZG), Figueres et al. (2017, doi:10.1038/546593a).	The following sentence has been added to the Executive Summary in response to this comment. "Research supports that early and substantial mitigation offers a greater chance of avoiding these adverse impacts."
Sarah	Davidson	142014	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1349	1349	27	30	As written this sentence ("Large reductions….") could be read to mean that the reductions in emissions themselves are necessary only after 1-2 decades. Consider this slight rewording to clarify: "….but are necessary to achieve any objective of preventing warming of any desired magnitude in the long term."	The authors have clarified the text to address this comment: "Large reductions in present-day emissions of the long-lived GHGs are estimated to have modest temperature effects in the near term (over the next couple decades), but these emission reductions are necessary to achieve any long-term objective of preventing warming of any desired magnitude (DeAngelo et al. 2017)."
Sarah	Davidson	142015	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1349	1350	37	7	Consider rewording this sentence ("Early and substantial mitigation may offer….") to express less uncertainty given the large body of supporting evidence. Also see e.g. Figueres et al. (2017, doi:10.1038/546593a), Friedrich et al. (2016, doi:10.1126/sciadv.1501923), Hansen et al. (2016, doi:10.5194/acp-16-3761-2016), Hansen et al. (2017, doi:10.5194/esd-8-577-2017), Knutti et al. (2017, doi:10.1038/NGEO3017), Millar et al. (2017, doi:10.1038/NGEO3031)	The authors have removed the word "may" so that it reads: "Early and substantial mitigation offers a greater chance for achieving a long-term goal, …"
Sarah	Davidson	142016	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	12	22	To help readers understand the why the Paris Agreement is included here, it could be helpful to include the number and proportion of countries that are currently parties to the Paris Agreement and the number that have announced targets. As written it is unclear e.g. whether the Paris Agreement is global or regional or whether other developed countries are parties to it. See http://unfccc.int/paris_agreement/items/9485.php	We have included the number of parties who have ratified the Agreement as well as the percent of global emissions from these countries.
Ross	McKitrick	142017	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1355	1357	1	25	Please include in the discussion of Key Message 2 information about the timing of GHG reductions as it pertains to the avoided or reduced impacts of mitigation. Discussion here of RCPs 4.5 and 8.5 should be put in the context of the emissions mitigation pathways for these scenarios and goals described in 29.3.1 (which are for a lower-emissions future than RCP4.5). A large number of studies conclude that (1) the long-term impact of emissions reductions declines with time from the present and (2) reductions in line with lower-emissions scenarios require significant mitigation efforts to begin during this decade. See section 29.2 of this draft report, Figueres et al. (2017, doi:10.1038/546593a), Xu and Ramanathan (2017, doi:10.1073/pnas.1618481114), Hansen et al. (2017, doi:10.5194/esd-8-577-2017), Rockstram et al. (2017 doi:10.1126/science.aah3443), IPCC 2014 Synthesis Report p28-3, DeAngelo et al. (2017 doi:10.7930/J0M32SZG).	Thank you for the comment. The text of Key Message 2 has been further expanded to address the general timing and magnitude of avoided impacts with respect to alternate mitigation scenarios, related to the commenter's point. We appreciate the additional citations and note that it is beyond the intent and scope of Key Message 2 to discuss the timing of GHG reductions themselves, but rather focus on the timing of (avoided) impacts and associated damages.
Erica	Brown	142042	Whole Chapter	29. Mitigation: Avoiding and Reducing Long-Term Risks						This chapter should distinguish between mitigating contributions to climate change and mitigating the potential impacts of climate change. Mitigation of potential impacts should mention flooding, storm surge, wildfires and other threats to infrastructure.	This comment relates to the distinction between mitigation and adpatation, terminology that is defined in the glossary of the NCA and concepts that are covered in detail in Ch 29 and 28, respectively. We note that the commenter's latter point is the focus of Ch 28: Adaptation. Furthermore, the chapter title has been changed from "Mitigation: Avoiding and Reducing Long-term Risks" to "Reducing Risks through Emissions Mitigation" for two reasons: 1) to better inform readers' expectations about the chapter focus being on the consequence of mitigation (e.g., the potential for risk reduction) rather than the mitigation undertaking, and 2) to clarify "emissions mitigation" as distinct from other uses of the word mitigation in the the risk management community.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Erica	Brown	142044	Whole Chapter	29. Mitigation: Avoiding and Reducing Long-Term Risks						Municipal and Industrial Water Supply is given as an example sector in 29.2 on page 1348 but is not specifically discussed despite Chapter 3's discussion of the need for adaptation and mitigation in the water sector.	While it is correct that mitigation and adaptation actions are important to the water sector, it is beyond the scope of the chapter to provide very detailed information specific to this particular sector (as this chapter is looking across all impact sectors). The author team has deliberated and agreed on the most relevant information to include. That said, the Mitigation chapter does discuss specific impacts to parts of the water resource sector (e.g., flooding, water quality, winter recreation), including interactions between the agriculture and water sectors. In response to this comment, we have inserted text in the Traceable Accounts citing the Water chapter for more information about additional impacts in the water sector.
Juanita	Constible	142751	Whole Chapter	29. Mitigation: Avoiding and Reducing Long-Term Risks						For the entire Key Message sections 1 & 2, recommend adding examples and more specific numbers. For example, on page 1353 line 18-19, what are some "societal and cultural resources". For Key Message 2, it would be great to provide a range with actual numbers rather than "thousands to tens of thousands" (pg. 1355, line 12) or "hundreds to thousands" (line 13-14) or "tens to hundreds of billions" (line 17). Would also recommend providing a range with actual numbers for statements like "can substantially reduce damages to the U.S. economy" - what is "substantially reduce" mean in economic terms?	While we appreciate the desire and impact of using specific numbers, we note that these key messages draw on our assessment of the literature base of multi-sector climate impacts studies, each with different sectoral results and with differences in study design that prevent direct comparison of results (e.g., uncertainty representation, input assumptions, static versus dynamic population change). As such, the author team decided that the semi-quantitative language (e.g., "tens to hundreds of billions") was most appropriate for use in the key messages. However, the specific numbers are provided in the main text, figures, and traceable accounts, along with the underlying studies that are cited throughout the chapter.
Juanita	Constible	142752	Figure	29. Mitigation: Avoiding and Reducing Long-Term Risks	2	1348				Citation should be to EPA 2015, not EPA 2017.	The citation is correct as is, no change made.
Juanita	Constible	142753	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	19	22	Should include reference to official ratification of the Paris Agreement. E.g. "came into force on November 4, 2016, following ratification by more than 55 parties to the Convention accounting for at least a55 % of the total global greenhouse gas emissions"	We have included the number of parties who have ratified the Agreement as well as the percent of global emissions this represents.
Juanita	Constible	142754	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	28	30	Should include "waste" in the list of sources of emissions that account for the remainder of U.S. GHG emissions.	We have added waste to the list.
Juanita	Constible	142755	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	34	35	Recommend adding "voluntary programs" to federal measures (to account for programs like DOE's Better Buildings and Better Plants, EPA's Natural Gas STAR program, ENERGY STAR, DOE's SEP program, etc.)	We have added voluntary programs to the list of federal measures.
Juanita	Constible	142756	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1351	1351	8	10	Since the figure shows both binding standards and non-binding renewable goals, authors should strike the use of "mandates" in text about Figure 29.1. Should instead replace with "have adopted targets".	The text has been modified as suggested.
Juanita	Constible	142757	Figure	29. Mitigation: Avoiding and Reducing Long-Term Risks	1	1351				NH has a EERS (listed as only having a RPS) - approved via settlement in 2016 (http://energypolicyupdate.blogspot.com/2016/08/nh-adopts-energy-efficien…)	The figure has been modified and revised to reflect the change in NH policy.
Juanita	Constible	142758	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1351	1351	15	16	Recommend replacing or adding sentence about local GHG efforts with more recent 2017/2018 climate mayor efforts. As of Jan. 16, 2018, 391 mayors have pledged to uphold, adopt, and honor the goals of the Paris agreement. May also want to update Figure 29.1. Full list is at https://medium.com/@ClimateMayors/climate-mayors-commit-to-adopt-honor-a….	The text and figure have been updated to reflect cities' commitments to adopt emission reduction goals as contained in the U.S. Climate Mayors and We Are Still In.
Juanita	Constible	142759	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1352	1352	15	27	Should update to 2016 (or 2017 figures if updated after March 2018). EIA releases electric generation end of year data in February Electric Power Monthly (https://www.eia.gov/electricity/monthly/) and emissions end of year data in March Monthly Energy Review https://www.eia.gov/totalenergy/data/monthly/). In 2016, u's emissions were at lowest level since 1992 (https://www.eia.gov/totalenergy/data/monthly/pdf/sec12_3.pdf). Power sector saw a 25% decline in emissions from 2005 to 2016 (https://www.eia.gov/totalenergy/data/monthly/pdf/sec12_9.pdf). the share of generation from natural gas was 34% in 2016 (i.e. over 30 percent) (https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_1_01). Generation from wind and solar grew to 6.5% in 2016 (last link & https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_1_01_a)	We have updated the numbers using the latest available report from EPA (2018 US Inventory of GHG Emissions and Sinks), which are consistent with the numbers cited in the comment.
Social Science	Coordinating Committee	143240	Whole Chapter	29. Mitigation: Avoiding and Reducing Long-Term Risks						Given the large uncertainties regarding global and domestic commitments to reducing GHG, this chapter should do more to talk about the potential for adaptation and resilience planning to alleviate the risks from climate change under varying scenarios for GHG reduction. While it is good to describe how adaptation can address committed climate change and 'residual risk' even after GHG mitigation, it is also important for policy makers to understand the consequences of taking an 'adaptation only' or 'mostly adaptation' approach to managing climate risks, as opposed to a 'mitigation first, adaptation complementary' approach.	Chapter 28 of the NCA is focused entirely on adaptation, so it is beyond the scope of this chapter to treat adaptation in depth. We note, however, that this chapter addresses the role of adaptation in reducing risk in a paragraph starting on page 1357, line 36 (which also directs the reader to Chapter 28 for more information). It addresses the interactions between mitigation and adaptation in text from page 1358, line 15, through page 1359, line 10. The authors have decided not to make further additions to the text on this topic.
Social Science	Coordinating Committee	143241	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1348	1348	1	10	Please include text acknowledging the limitations in how current modeling systems address social and economic adaptation to climate change. Most modeling systems address some types of population migration, however, the social, cultural, and economic consequences of the potentially large projected climate impacts will likely have broad ranging impacts on how and where population live, work, recreate, and engage in other social activities, as well as impacting vulnerabilities to climate change related risks. This has implications both for total societal impacts, and also for the types of adaptation behaviors that governments, communities, and individuals will undertake. A good reference for this is C P Weaver et al 2017 Reframing climate change assessments around risk: recommendations for the US National Climate Assessment. Environ. Res. Lett. 12 080201	The current text, on line 8, acknowledges that there are uncertainties in understanding and quantifying the role of adaptation in modifying risk. In a short Executive Summary statement such as this, the author team believes this is the appropriate level of detail, though the topic is paid more attention in the main text and the uncertainties sector of the final three key messages. We also refer the reader to sections 29.6.2 and 29.6.3 addressing direction for future research, both of which refer to the need for advancements in the understanding of adaptation potential. The suggested Weaver et al reference has useful suggestions for improving assessment processes, but does not appear to be directly relevant to uncertainties in modeling of adaptation.
Social Science	Coordinating Committee	143242	Figure	29. Mitigation: Avoiding and Reducing Long-Term Risks	2	1348				This figure should be referenced in all of the other impact chapters that present quantified impact information. For example the air quality (chap 13) and human health (chap 14) chapters reference quantified damages for their sectors but do not cross reference this figure. Also, why is the wildfire damage estimate negative? That does not seem consistent with the statements in chapter 13 about the increasing risks of wildfires and the air quality and property damages that would result.	Many of the other NCA4 chapters, including Air Quality and Health, cite results from the EPA 2017b report (upon which this Figure 29.2 is based). We defer to those author teams as to whether they prefer to cite the report or reference Figure 29.2, however we have coordinated with them regarding this comment. Also, many chapters already refer the reader to the Mitigation chapter for more information on economic impacts across sectors, which accomplishes a similar objective. In response to the comment regarding the results for wildfires, we note that this modeling is based on the U.S. Forest Service's MC2 dynamic vegetation model, which under these scenarios, projects large-scale shifts to vegetation with longer-fire return intervals (i.e., more frequent fires in the near-term lead to changes in forest composition, resulting in fewer fires over time). We've included a brief description of this in the caption for the figure, as well as the traceable account for Key Message #1. We also refer the reader to the Forests chapter for more detail regarding what the weight of evidence shows across the literature.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Social Science	Coordinating Committee	143243	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1353	1353	3	20	For this key message section, it would be very helpful to cite back to the individual sector chapters, e.g. for air quality health impacts, cite back to chapter 13, for extreme heath impacts, cite to chapter 14, etc.	Citations to the Air Quality and Human Health chapters have been inserted into this section.
Social Science	Coordinating Committee	143244	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1354	1354	6	7	The wildfire results and explanation seem inconsistent with the statements in Chapter 13 that wildfires will be increasing and cause damages through worsening air quality. The statements may be consistent, but if so, more explanation is needed.	These results are based on modeling using the U.S. Forest Service's MC2 dynamic vegetation model, which under these scenarios, projects large-scale shifts to vegetation with longer-fire return intervals (i.e., more frequent fires in the near-term lead to changes in forest composition, resulting in fewer fires over time). So while this particular result is inconsistent with other studies cited in the Forests chapter, we note that the Forests chapter does discuss these uncertainties associated with vegetative composition. We've included a brief description of the context behind these results in the caption for Figure 29.2, as well as the traceable account for Key Message #1. In both locations, we also refer the reader to the Forests chapter for more detail regarding what the weight of evidence shows across the literature.
Social Science	Coordinating Committee	143245	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1355	1355	2	19	Please link these statements back to the sector chapters, which also have discussions of the benefits of mitigation strategies.	We have inserted references to other NCA4 chapters (from both Volumes I and II) throughout our chapter.
Social Science	Coordinating Committee	143246	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1358	1358	1	14	The cited reductions in damages through adaptation are for what projected climate scenario? Does adaptation reduce damages significantly for all of the potential future scearios, e.g. RCP8.5, RCP4.5, etc.?	Regarding these adaptation estimates, EPA (2017b) estimated adaptation relative to both RCP8.5 and RCP4.5, as did Diaz (2016), while Houser et al. (2014) estimated it for RCP8.5. In the EPA study, benefits of adaptation were similar in proportional terms across both scenarios. We have added text to indicate that conclusions reflect results across both scenarios.
Social Science	Coordinating Committee	143247	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1361	1361	12	15	I recommend a citation to C P Weaver et al 2017 Reframing climate change assessments around risk: recommendations for the US National Climate Assessment. Environ. Res. Lett. 12 080201	The suggested Weaver et al reference has useful suggestions for improving the assessment process from the perspective of a decision-maker's information needs, but does not appear to be directly relevant to the message of the current chapter text, which addresses the underlying research enterprise of improving analytical approaches for decision-making under uncertainty. No changes made.
Social Science	Coordinating Committee	143373	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1360	1360	28	38	Since NCA3, there has been progress made in interdisciplinary research to enhance understanding of drivers and social vulnerabilities of climate change and responses. As an example, in March 2017, the USGCRP Social Science Coordinating Committee organized a workshop "Social Science Perspectives on Climate Change", that brought together federal researchers and managers as well as academic social scientists to discuss understanding of drivers, vulnerability of and responses to climate change from four disciplines - anthropology, archaeology, geography and sociology. The workshop resulted in three USGCRP white papers Social Science Perspectives on Climate Change (USGCRP 2018, Part 1, 2 & 3 - upcoming), each on (1) social vulnerability to climate change; (2) drivers of and responses to climate change; and (3) innovative methods and tools to evaluate coupled natural and human systems. Paper (2) discusses the underlying drivers of climate change, including demography, economy, politics, social stratification and inequality, technology, infrastructure, and land use, and how these factors interact dynamically over space and time. In addition, the white papers collectively highlight the importance to consider social, cultural, political, and economic factors and past decisions for understanding drivers and vulnerability of climate change, and the need for multi-scaled, multi-dimensional approaches and governance structures for mitigation and adaptation responses. Discussions in Section 29.6.2 can be enhanced by referencing the white papers.	We agree with the commenter regarding the significant progress that has been made in understanding the nature of these climate vulnerabilities. The current text, page 1352 line 29, acknowledges these advances and offers an array of supporting examples in Table 29.1 with references. However, we also note that this discussion does not emphasize the interdisciplinary nature of these advances, and in response we have added additional text to line 29. We appreciate the suggested USGCRP white paper citations and have added them to the chapter assessment.
Social Science	Coordinating Committee	143374	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1361	1361	34	38	Discussion in Section 29.6.3 can reference the USGCRP white papers Social Science Perspectives on Climate Change (USGCRP 2018, Part 1, 2 & 3 - upcoming), each on (1) social vulnerability to climate change; (2) drivers of and responses to climate change; and (3) innovative methods and tools to evaluate coupled natural and human systems. These papers are developed from interdisciplinary research and synthesis which highlight recent advances in innovative methods and tools for understanding coupled human and natural systems. Each of the three papers also identify research needs and future directions for interdisciplinary research which can be relevant in this section.	We appreciate the suggested USGCRP white paper citations and have added them to the relevant sections of the discussion in 29.6.3.
Shaye	Wolf	143629	Whole Chapter	29. Mitigation: Avoiding and Reducing Long-Term Risks						Executive Summary. Figure 2.9.2: While we support this figure and its general message, the figure and accompanying table should also compare the damages associated with the RCP 2.6 emissions scenario, which is the only RCP scenario consistent with keeping global temperature rise below 2C and in the ballpark of being consistent with the Paris Agreement target of "well below 2C." Showing the avoided damages associated with the RCP 2.6 pathway is critical for informing the public about the real-world benefits of strong, urgent climate action. By omitting information about the benefits of the RCP 2.6 pathway, the NCA is doing a disservice to the American public and decision-makers since we should be striving for this pathway (or an even more ambitious 1.5C pathway).	We agree that the presentation of results for RCP2.6 would provide useful information for this chapter, however, the author team was limited to the availability of results in the literature. Figure 29.2 is based on the findings from the CIRA2.0 modeling project and Technical Report (EPA 2017b), which were developed to inform NCA4. Consistent with NCA4 guidance developed by the USGCRP Scenarios Working Group, CIRA2.0 focused on RCP8.5 and RCP4.5 as the two forcing scenarios. In addition, the statistical downscaling dataset recommended for use in NCA4, and used in CIRA2.0, did not simulate RCP2.6. However, we note that Figure 29.3, which is based on a different study, includes values for RCP2.6. No changes made to the text or figures.
Shaye	Wolf	143631	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1347	1347	2	8	Key Message 1 is misleading in stating that climate change only under a high emissions scenario and without adaptation will impose substantial damages. The other chapters of the NCA make clear that the current atmospheric levels of GHGs and 1C of warming are already imposing substantial damages, and moreover that damages will be substantial even under the lower RCP 2.6 emissions scenario (which would result in ~2C of warming). The key message must be changed to reflect the current state of scientific understanding, for example: "…Recent scientific advances in impact quantification demonstrate that climate change is already imposing substantial physical and economic damages on the United States economy, human health, and the environment, and that these damages will become extreme under the higher emissions scenarios, with the potential for many more lost lives and annual economic losses in some sectors reaching hundreds of billions of dollars by the end of the century…"	The key message has been changed in response to this comment. The revised langugage reads: "Without significant global mitigation, climate change will impose substantial damages on the United States economy, human health, and the environment. Annual losses in some sectors, assuming high emissions and no adaptation, are projected to *grow to* [emphasis added] hundreds of billions of dollars by the end of the century. Some impacts, such as sea level rise from ice sheet disintegration, will be irreversible for thousands of years, while others, such as species extinction, will be permanent." Furthermore, the suporting main text has additional text to reinforce this point: "Moreover, the impacts and costs of climate change are already being felt in the U.S."
Shaye	Wolf	143632	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1347	1347	24	24	The Executive Summary states that , "Climate change is projected to significantly affect human health, the economy, and the environment in the United States, particularly in futures with high greenhouse gas emissions." The verb "affect" is misleading. As stated in Key Message 1, climate change is projected to significantly "damage" human health, the economy and the environment. "Affect" makes the changes sound neutral, and should be changed to "harm," "damage," "negatively affect," or "adversely affect."	In response to this comment and to be consistent with the language used in the rest of the chapter, the executive summary sentence has been revised to use the word "damage" instead of "affect".

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Shaye	Wolf	143634	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1349	1359	5	8	The Chapter states that "This chapter does not evaluate technology options, costs, or the adequacy of existing or planned mitigation efforts relative to meeting specific policy targets as those topics have been the subject of domestic (for example, Executive Office of the President 2016; CCSP 2007) and international analyses (for example, Fawcett et al. 2015 and Clarke et al. 2014)." Omitting discussion of these important and highly relevant topics does a disservice to the American public and decision-makers. The fact that other analyses have discussed these topics is no excuse for not discussing them in the NCA. Furthermore, none of these cited references provides an updated overview of the adequacy of existing or planned mitigation efforts relative to meet specific climate targets. This should a key job of the Mitigation chapter. Americans need to know that current U.S. climate policy is inadequate to keep global temperature rise well below 2C and avoid the worst dangers of climate change. U.S. federal climate policy has been ranked as "critically insufficient" to meet the Paris Agreement climate targets by an international team of climate policy experts and climate scientists. These experts concluded regarding the Trump administration's climate policy actions: "These steps represent a severe backwards move and an abrogation of the United States' responsibility as the world's second largest emitter at a time when more, not less, commitment is needed from all governments to avert the worst impacts of climate change." (See Climate Action Tracker, USA (last updated 6 November 2017), http://climateactiontracker.org/countries/usa.) The inadequacy of U.S. policy to keep temperature rise well below 2°C is also evident from a carbon budget perspective. The average U.S. carbon budget from 2010 to 2100 for a 50 percent chance of limiting temperature rise to 1.5°C was estimated at 57 GtCO2eq (see Robiou du Pont, Yann et al., Equitable mitigation to achieve the Paris Agreement goals, 7 Nature Climate Change 38 (2017)). Because of inadequate climate policy, the U.S. has been rapidly expending its remaining carbon budget: in 2016, U.S. greenhouse gas emissions totaled 5.3 GtCO2. Future reductions in U.S. greenhouse gas emissions are projected to stall under the Trump administration (see Climate Action Tracker, Action by China and India slows emissions growth, President Trump's policies likely to cause US emissions to flatten (May 15, 2017)). Furthermore, to meet the carbon budget for keeping temperature rise well below 2°C, most U.S. and global fossil	Thank you for this comment. We note that the chapter title has been changed from "Mitigation: Avoiding and Reducing Long-term Risks" to "Reducing Risks through Emissions Mitigation" in order to better inform readers' expectations about the chapter focus being on the consequence of mitigation (e.g., the potential for risk reduction) rather than the mitigation undertaking. Furthermore, the chapter now cites projections of US GHG emissions and places them in the context of the U.S. INDC that was submitted in the lead up to the 2015 Paris Agreement meeting. It is beyond the scope of the chapter to evaluate the climate policies of the US or other countries.
Shaye	Wolf	143635	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1349	1349	2	12	This section should provide the critical context of the U.S.'s dominant contribution to global climate change, and in parallel, its responsibility for taking strong climate action. The U.S. is the world's biggest cumulative emitter of greenhouse gas pollution, responsible for 27 percent of cumulative global CO2 emissions since 1850, and the U.S. is currently the world's second highest emitter on an annual and per capita basis.	It is beyond the scope and mandate of the NCA to prescibe any particular policy action, or to suggest the magnitude of the role the US should play in global-scale mitigation.
Shaye	Wolf	143638	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1349	1349	16	38	A key purpose of the Mitigation chapter should be to clearly spell out the mitigation pathways needed to achieve specific climate change targets, most notably staying "well below 2C" temperature rise to avoid the worst dangers of climate change, as required by the Paris Agreement, to which the US is still legally bound. Two common and useful ways to do this are to (1) describe the emissions pathways for staying well below 2C and (2) describe the carbon budget needed for a reasonable probability of meeting this temperature target, including both the global carbon budget and U.S. carbon budget. This section must do a better job of including clear information on pathways and carbon budgets, to illustrate the urgency of action and the strength of the action that is needed. In regard to emissions pathways, this section should provide more information on the timing and magnitude of carbon pollution cuts that need to made to stay "well below 2C" to avoid the worst harms of climate change, including the year range when emission must peak, the year range for reaching net zero emissions, and the reductions needed at near-term and longer-term time steps (2020, 2030, 2040, 2050 and so forth). There are numerous resources that describe these characteristics for 1.5C and 2C pathways, for example: Rogelj, Joeri et al., Energy system transformations for limiting end-of-century warming to below 1.5°C, 5 Nature Climate Change 519 (2015); Schleussner, Carl-Friedrich et al. Science and policy characteristics of the Paris Agreement temperature goal, 6 Nature Climate Change 827 (2016); the annual United Nations Emissions Gap reports; and the IPCC Fifth Assessment Mitigation chapters. In regard to the carbon budget, the Mitigation chapter should provide a review of estimates of both the global and US carbon budget. The IPCC Fifth Assessment Report estimated the global carbon budget - the total amount of carbon that can be burned while maintaining some probability of staying below a given temperature target. According to the IPCC, total cumulative anthropogenic emissions of CO2 must remain below about 1,000 GtCO2 from 2011 onward for a 66 percent probability of limiting warming to 2°C above pre-industrial levels, and to 400 GtCO2 from 2011 onward for a 66 percent probability of limiting warming to 1.5°C. These carbon budgets have been reduced to 850 GtCO2 and 240 GtCO2, respectively, from 2015 onward. See IPCC [Intergovernmental Panel on Climate Change], 2013: Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F. et al. (eds.)], Cambridge University Press (2013) at	We note that the chapter title has been changed from "Mitigation: Avoiding and Reducing Long-term Risks" to "Reducing Risks through Emissions Mitigation" in order to better inform readers' expectations about the chapter focus being on the consequence of mitigation (e.g., the potential for risk reduction) rather than the mitigation undertaking. Information on the global carbon budget and emission pathways has been incorporated into section 29.3.1 on Long-Term Temperature Goals and the Paris Agreement. We aslo refer readers to Chapter 14 of the CSSR which provides more detail about pathways and global cumulative net CO2 emissions commensurate with 2C of global warming above pre-industrial levels. A discussion of the U.S. carbon budget relative to that of other countries is a normative policy question that is outside the scope of this chapter and report.
Shaye	Wolf	143640	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1349	1349	22	24	This section briefly mentions "negative emissions" in the first paragraph as playing a potential role in future mitigation strategies. In doing so, the section should also acknowledge (even if briefly) the critiques and limitations of "negative emissions" approaches. Important resources include the following studies: Heck, Vera et al. Biomass-based negative emissions difficult to reconcile with planetary boundaries, 8 Nature Climate Change (2018), doi:10.1038/s41558-017-0064-y Larkin, Alice et al. What if negative emission technologies fail at scale? Implications of the Paris Agreement for big emitting nations. Climate Policy (2017), https://doi.org/10.1080/14693062.2017.1346498 Anderson, Kevin and Glen Peters, The trouble with negative emissions, 354 Science 182 (2016).	We note that text in that section states the following: "Studies point to the risks of reaching the limits of available land, water, or biogeochemical requirements of biomass-based approaches at scale sufficient to offset large emissions (Anderson et al., 2016; Larkin et al., 2017; Heck et al., 2018; SOCCR-2)." We also add the following later in the chapter where net negative CO2 emissions are mentioned again, borrowing from CSSR: "relying on as yet unproven technologies to remove GHGs from the atmosphere".

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Shaye	Wolf	143645	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	8	38	The State of Mitigation section should acknowledge the need to phase out fossil fuel use as an essential part of mitigation action. The National Climate Assessment identifies the primary cause of climate change as GHG emissions coming from the burning of fossil fuels. Therefore, it is an unacceptable omission for the mitigation chapter to not recognize the necessity of keeping most of the world's fossil fuels in the ground and unburned to avoid the worst dangers of climate change. There is an important body of scientific literature on this issue that this section should review and discuss. For example, the IPCC Fifth Assessment estimates that global fossil fuel reserves exceed the remaining 275 GtC carbon budget (from 2011 onward) for staying below 2°C by 4 to 7 times, while fossil fuel resources exceed the carbon budget for 2°C by 31 to 50 times. [See Bruckner, Thomas et al., 2014: Energy Systems. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press (2014), http://ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter7.pdf at Table 7.2.] Studies estimate that 68 to 80 percent of global fossil fuel reserves must not be extracted and burned to limit temperature rise to 2°C, based on a 1,000 GtCO2 carbon budget. For a 50 percent chance of limiting temperature rise to 1.5°C, 85 percent of known fossil fuel reserves must stay in the ground. [To limit temperature rise to 2°C based on a 1,000 GtCO2 carbon budget from 2011 onward, studies indicate variously that 80 percent (Carbon Tracker Initiative, Unburnable Carbon 2013), 76 percent (Raupach, Michael et al. 2014), and 68 percent (Oil Change International, The Sky's Limit 2016) of global fossil fuel reserves must stay in the ground. See Carbon Tracker Initiative, Unburnable Carbon: Are the world's financial markets carrying a carbon bubble? (2013), http://www.carbontracker.org/wp-content/uploads/2014/09/Unburnable-Carbon-Full-rev2-1.pdf; Raupach, Michael et al., Sharing a quota on cumulative carbon emissions, 4 Nature Climate Change 873 (2014); Oil Change International, The Sky's Limit: Why the Paris Climate Goals Require a Managed Decline of Fossil Fuel Production (September 2016), http://priceofoil.org/2016/09/22/the-skys-limit-report/.] Effectively, fossil fuel emissions must be phased out globally within the next few decades to keep global temperature rise well below 2°C. Rogelj et al. (2015) estimated that a reasonable likelihood of limiting warming to 1.5° or 2°C requires global CO2 emissions to be phased out by mid-century and likely as early as 2040-2045. Rogelj, Joeri et al., Energy system	Text has been added to section 29.3.1 to indicate the implications for global emissions reductions of the Paris Agreement temperature targets. It is beyond the scope of the NCA to prescibe any particular mitigation action (e.g., phase out of fossil fuels) that would achieve those emissions reductions.
Shaye	Wolf	143646	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	8	38	This section should describe key actions that must be taken to reduce GHGs emissions to meet a "well below 2C" target and avoid the worst dangers of climate change. A large body of scientific research has identified key climate change actions, including two recent studies: Xu, Yangyang and Veerabhadran Ramanathan, Well below 2C: Mitigation strategies for avoiding dangerous to catastrophic climate changes, PNAS (2017), https://doi.org/10.1073/pnas.1618481114 Kuramochi, Takeshi et al., Ten key short-term sectoral benchmarks to limit warming to 1.5C, Climate Policy (2017), https://doi.org/10.1080/14693062.2017.1397495 For example, Kuramochi et al. (2017) identifies and quantifies the 10 most important benchmarks for climate action to be taken by 2020/2025 to keep the window open for a 1.5°C-consistent GHG emission pathway. The identified benchmarks include: â€¢ Sustain the current growth rate of renewables and other zero and low-carbon power generation until 2025 to reach 100% share by 2050; â€¢ No new coal power plants, reduce emissions from existing coal fleet by 30% by 2025; â€¢ Last fossil fuel passenger car sold by 2035â€“2050; â€¢ Develop and agree on a 1.5Â°C-consistent vision for aviation and shipping; â€¢ All new buildings fossil-free and near-zero energy by 2020; â€¢ Increase building renovation rates from less than 1% in 2015 to 5% by 2020; â€¢ All new installations in emissions-intensive sectors low-carbon after 2020, maximize material efficiency; â€¢ Reduce emissions from forestry and other land use to 95% below 2010 levels by 2030, stop net deforestation by 2025; â€¢ Keep agriculture emissions at or below current levels, establish and disseminate regional best practice, ramp up research; â€¢ Accelerate research and planning for negative emission technology deployment.	It is beyond the scope and not within the mandate of the NCA to make such policy prescriptions. As such, the authors cannot list "actions that must be taken." Text has been added to section 29.3.1, however, to indicate the emissions reductions that would be necessary to achieve the Paris Agreement temperature goals.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Shaye	Wolf	143647	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	11	22	The section on the Paris Agreement must recognize the global significance of the agreement, which was adopted by most of the world's countries, and should recognize the significance of its climate targets. Under the Paris Agreement, mos of the world's countries committed to the climate change target of holding the long-term global average temperature "…to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels." On December 12, 2015, 197 nation-state and supra-national organization parties meeting in Paris at the 2015 United Nations Framework Convention on Climate Change Conference of the Parties consented to the Paris Agreement committing its parties to take action so as to avoid dangerous climate change. The United States signed the Paris Agreement on April 22, 2016 as a legally binding instrument through executive agreement, and the treaty entered into force on November 4, 2016. The Paris Agreement codifies the international consensus that climate change is an "urgent threat" of global concern, stating that "climate change represents an urgent and potentially irreversible threat to human societies and the planet and thus requires the widest possible cooperation by all countries, and their participation in an effective and appropriate international response, with a view to accelerating the reduction of global greenhouse gas emissions." See Recitals of the Paris Agreement: http://unfccc.int/resource/docs/2015/cop21/eng/l09.pdf The Agreement requires net zero emissions globally by mid-century, "…so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty." See Article 4 of the Paris Agreement. The Agreement requires a "well below 2°C" climate target because 2°C of warming is no longer considered a safe guardrail for avoiding catastrophic climate impacts and runaway climate change. See for example: Anderson, Kevin & Alice Bows, Beyond "dangerous" climate change: emission scenarios for a new world, 369 Philosophical Transactions of the Royal Society 20 (2011) Hansen, James et al., Assessing "dangerous climate change": Required reduction of carbon emissions to protect young people, future, generations and nature, 8 PLoS ONE e81648 (2013). IPCC [Intergovernmental Panel on Climate Change], Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change,	In response to this comment, we have revised the text to emphasize the significance of the agreement, and have included the number of parties who have ratified the Agreement as well as the percent of global emissions this represents. The urgency of emissions reductions is captured in the existing text: In order to reach the Paris Agreement's long-term temperature goal, Parties to the Agreement "aim to reach global peaking of GHG emissions as soon as possible… and to undertake rapid reductions thereafter." The remainder of the comment does not make a particular request of or suggestion to the authors.
Shaye	Wolf	143649	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	23	26	The section states that "In June 2017, the United States announced its intent to withdraw from the Paris Agreement, citing economic costs and competitiveness concerns." This statement should be changed in two ways to make it accurate: (1) President Trump or the Trump administration announced its intent to withdraw, since this was an Executive Action, and since many sub-national actors in the US are still committed to the Paris goals; (2) change "citing" to "claiming" since "citing" commonly means that authoritative sources of information are being used as evidence for making a statement, when this was not the case. Alternately recommend removing the entire phrase "citing economic costs and competitive concerns" so as not to imply that this is evidence-based.	With regard to point (1), the Executive branch has sole authority to represent the United States' participation in this agreement. Though sub-national actors may commit to Paris goals, the Agreement is based upon the participation of signatories to the UN Framework Convention on Climate Change. Sub-national actors are not parties to the agreement. We have added additional text illustrating the actions of sub-national actors to meet emission reduction targets consistent with the Agreement. With regard to point (2), we have removed this clause from the text to avoid any implication.
Shaye	Wolf	143652	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1351	27	6	This section on Mitigation-Related Regulatory and Non-Regulatory Actions within the United States is incomplete and misleading with regard to federal mitigation actions. The American public should be fully informed about the current state of federal climate mitigation action, including the numerous rollbacks of climate policy by the Trump administration. The section should (1) clearly list the federal mitigation actions that were put into place under the Obama administration and (2) clearly list the actions that the Trump administration has taken and is taking to roll-back these mitigation actions, including but not limited to: â€¢ rescinding the Climate Action Plan â€¢ attempts to repeal the Clean Power Plan â€¢ a proposal to dramatically expand offshore oil drilling in all oceans along U.S. coast under the Proposed 5-year offshore drilling plan â€¢ an attempt to rescind the Obama-era withdrawal of offshore drilling in U.S. federal waters in most of the Arctic and parts of the Atlantic â€¢ lifting of the moratorium on new federal coal leases â€¢ attempts to weaken emissions standards for cars and light duty trucks â€¢ delaying the implementation of methane emissions standards for new and modified oil and gas facilities â€¢ intended withdrawal from the Paris Agreement.	We note that the chapter title has been changed from "Mitigation: Avoiding and Reducing Long-term Risks" to "Reducing Risks through Emissions Mitigation" in order to better inform readers' expectations about the chapter focus being on the consequence of mitigation (e.g., the potential for risk reduction) rather than the mitigation undertaking. The chapter emphasizes that the Administration is reviewing many regulatory and non-regulatory actions related to emission reductions with the aim of easing the burden of increasing domestic fossil fuel (and nuclear) supply. An assessment of the effect of proposed regulatory actions has not yet appeared in the academic literature for the authors to assess. We have included a discussion of projected US emission reductions in relation to the US national determined contribution under the Paris Agreement.
Union of Concerned Scientists	Union of Concerned Scientists	143814	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	33	36	I would also add to this list "tax credits and incentives" such as the Production Tax Credit and Investment Tax Credit for renewable energy	We have modified the text to list these particular subsidies as examples of subsidies.
Union of Concerned Scientists	Union of Concerned Scientists	143815	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1351	1351	2	6	It should be acknowledged that Executive Order 13783 could lead to increased fossil fuel use and emissions unless they are paired with carbon capture and storage which is not a requirement. This will make it more difficult to achieve the emission reductions that are needed to limit temperature increases and the impacts of climate change. Repealing and replacing the Clean Power Plan with also make it more difficult to reduce emissions in the electricity sector.	We cite two analyses at the end of section 29.3.2 on mitigation-related actions (Larsen, 2018; EIA 2018) that provide projections of future US emissions. The ultimate effect of the Executive Order on emissions is governed by a complex set of factors and interactions that are beyond the scope of this chapter (see for example, Aldy 2017 https://www.tandfonline.com/doi/abs/10.1080/00963402.2017.1388673).
Union of Concerned Scientists	Union of Concerned Scientists	143816	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1352	1352	8	14	There has also been a signficant increase in corporate purchases of renewable energy and commitments to purchase up to 100% renewable energy in the future	The text has been modified as suggested.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Union of Concerned Scientists	Union of Concerned Scientists	143817	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1353	1354	10	20	It should be acknowledged somewhere in this section that we are already seeing the impacts and costs of climate change and extreme weather. For example, data from NOAA show that 2017 tied a record for the greatest number of events with costs greater than $1 billion each. You could also reference a September 2017 report by the Universal Ecological Fund, which found that the cost from "weather events influenced by human-induced climate change, with a least $1 billion each in economic losses and damages, have significantly escalated from $1457 billion in the 1980s and $211.3 billion in the 1990s to $418.4 billion in the last decade -- a two-fold increase compared to the 1990s and an almost three-fold increas, compared to the 1980s." (Watson, R. McCarthy, J. and Hisas, L. 2017. The Economic Case for Climate Action in the United States. Universal Ecological Fund: Alexandria VA.)	Thank you for this suggestion. Currently Key Message 1 indirectly acknowledges the existence of current climate impacts through the wording "projected to grow to hundreds of billions of dollars by the end of the century" but does not quantify the cost of present-day impacts due to a lack of robust estimates. In response to the comment, we have added a statement that the impacts and costs of climate change are already being felt in the US and that recent extreme weather events can now be attributed with increasingly higher confidence to human-caused warming, citing the Attribution Ch of the CSSR (CSSR Ch 3 KM 2). We appreciate the reference to the UEF white paper and have reviewed the report. As the report describes the economic costs of recent US weather events we have not used the citation, as this key message addresses climate damages, and there is not a sufficient literature basis to make a claim about the fraction of attributable storm damage to human-induced climate change. Instead we cite the assessment of physical attribution in CSSR Ch 3.
Carole	LeBlanc	143888	Whole Chapter	29. Mitigation: Avoiding and Reducing Long-Term Risks						Respectfully ask consideration of the following language: The Plan-Do-Check-Act Cycle (PDCA) to Mitigate Climate Change, by Dr. Phil Barnes, supports more and better use of the PDCA to reduce contributions to climate change, including the materials used in production, how/what services are rendered and energy. The PDCA is a process tool used to guide managers in the implementation and maintenance of a management system for change and continual improvement. Its history dates back to the 1940s and the development of the International Organization for Standardization (ISO) series of quality standards, ISO 9000. In 1993, the U.S. Environmental Protection Agency (EPA) initiated the Code of Environmental Management Principles, which used the PDCA for continual environmental management improvement. In 1996, the first ISO Environmental Management System (EMS) standard was published as ISO 14001 EMS and included the PDCA; an EMS calls for an organization to identify environmental aspects (causes) and impacts (effects) and plans made to manage them (e.g., address risks) accordingly. Since that time, a number of ISO climate change standards have been promulgated, dealing primarily with GHG inventories and emissions. To date, there are over 1.3 million organizations that have certified to the ISO quality and EMS standards with many integrating the two management systems. The key to successfully using the PDCA as a climate change tool is to ensure that managers incorporate the PDCA continual improvement cycle into the performance culture of the organization.	We note that the Plan-Do-Check-Act Cycle is less relevant to the focus of this chapter, as no management systems are being discussed or implemented, so the specific requested change has not been made to the chapter text. However, we note that iterative risk management is related to the PDCA concept. In coordination with Ch 28: Adaptation, we have added text describing iterative risk management, a strategy in which initial actions are modified over time as learning occurs and note that chapter focuses primarily on the first stage of the iterative process in which risks and vulnerabilities are identified.
Michael	MacCracken	144686	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1359	1359	38	39	This is a quite limited view about CDR, there being a number of approaches that might be less expensive. The real challenge is really the scaling up of CDR, especially when emissions are not brought way down. So, while mitigation can likely to a lot at reasonable cost, as its cost rises as the easy changes are made, CDR is likely to be a better option. Thus, I really think the framing has to be a bit different here, indicating that all play together and research is needed on all, and that then the least expensive option may change as one goes from efficiency to substitution of renewables to use of biofuels and CDR. I think a more integrated perspective is needed in this paragraph, especially in that there will be the need for negative emissions to meet the temeprature targets as virtually all emissions pathways now envisioned will lead to significant temperature overshoots. Once the write-up is fixed here, then the front of the chapter needs to reflect the more integrated view of approaches I'm urging here.	We have modified the text to incorporate the point that CDR costs vary across different measures, and that are estimated to be currently expensive at scale. We have also indicated that these costs need to be viewed in the context of other mitigation options, both of which are points that are made in the CSSR chapter on which this section draws. We have emphasized the point by adding text indicating that CDR is frequently an element of mitigation scenarios that also involve more traditional mitigation options, which includes scenarios with negative emissions.
Michael	MacCracken	144687	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	1	2	Actually, I think it would better to just indicate that climate sensitivity is the response of the climate system to changes in radiative forcing that are caused, for example, by changes in atmospheric composition.The text now focuses only on CO2 and makes it seem that one does not have to worry about the problem until CO2 doubles.	The revised text now has removed "(the change that would result from a doubling of CO2 in the atmosphere relative to preindustrial levels)" from the sentence since "climate sensitivity" is defined in the glossary of the NCA4 Volume 1 or Climate Science Special Report (CSSR): https://science2017.globalchange.gov/downloads/CSSR_AppE.pdf
Michael	MacCracken	144688	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	9	9	This is a really vague sentence--underway by whom, to what extent, etc. Is this about the US or the globe, what?	This sentence is intended to introduce this section on the 'State of Mitigation'. The following sections (29.3.1 and 29.3.2) describe specific examples of the types of actions being taken at global, national, and subnational levels. In response to this comment, we have amended the introductory sentences to read: "Actions are currently underway at global, national, and subnational scales to reduce GHG emissions. This section provides an overview of agreements, policies, and actions being taken at a variety of levels."
Michael	MacCracken	144689	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	28	30	This aggregation is based on using GWP-100 and this needs to be stated--if one wants a near term response, this aggregation should really be done with GWP-20 or at least the point needs to be made about the limits of the GWP-100 approach.	The text has been clarified to state that these values use a 100-year global warming potential (GWP). As this is the standard metric, we do not present results under other GWPs.
Michael	MacCracken	144690	Figure	29. Mitigation: Avoiding and Reducing Long-Term Risks	1	1351				New Jersy has just rejoined RGGI.	The figure has been modified and revised to reflect the change in NJ policy.
Michael	MacCracken	144691	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1360	1360	3	4	Oh come now, that is not really what the results show (and given there has been virtually no government support for research to try to optimize things, this is really quite a cheap shot). Yes, there are differences, but in most situations they tend to fall within the range of natural variations, and in virtually all cases the remaining differences are far, far less than the perturbation that exists without undertaking climate interventions. In addition, most of the studies done are for very large interventions (trying to offset the doubling or quadrupling of the CO2 concentration instead of seeking to offset what is left given a good go at mitigation and even CDR). To suggest one would not be better off with climate intervention is in my view irresponsible and very misleading (like saying because one can't fix the scratch on one's arm, there is no basis for applying a tourniquet to staunch the flow from an artery; and this comment similarly applies on the ocean acidification issue--does one not do anything if one can't do everything? Again, what needs to be done is to consider an integrated approach to using all the potential tools available and not be acting as if the question is if any one can do what needs to be done alone (mitigation clearly is not enough, for example, so why should the other options be considered alone either?).	After revisiting the literature, we disagree with the assertion that it does not show that regional effects of SRM differ from those resulting from mitigation via emissions reduction. This is true not only in SRM-only scenarios, but also in those in which smaller amounts of SRM are combined with mitigation (see e.g. Tilmes et al., 2016, Geophysical Research Letters, 43, 8222-8229). This is true to greater extent for some variables (precipitation, aridity) than for others (temperature extremes). We also disagree that this text suggests that climate intervention would make things worse off than without intervention. The comparison is between climate intervention and emissions mitigation. Nonetheless we have decided that it is more important to make the broader point here that SRM effects on precipitation and other outcomes are more uncertain than those on temperature, rather than focusing on the comparison of effects of mitigation vs SRM. The text has been modified to this effect.
Michael	MacCracken	144692	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1359	1359	35	38	This basically suggests the only conceivable implementation is global. That is not really the case--it is quite likely possible to focus attention on particular regions or latitudes, depending how one applies the various options, so one could seek to moderate Arctic amplification, for example.	We agree with this point and have addressed it in response to comment 144695.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144693	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1350	1350	14	17	Given all the impacts described in this assessment, it needs to be made quite clear that the notion of 1.5 or 2 C as the long term stabilization level for the Earth's temperature (especially in that the change over land and mid- and high-latitudes are greater than the global average) would have very, very severe consequences of the environment and society (the equilibrium sea level sensitivity from paleoclimate information is 15 to 20 meters per degree), as Hansen and colleagues made clear in a paper a few years ago. The global average temperature really needs to be brought back down to less than 0.5 C, and even that would likely not keep sea level rise within a range that would not require very substantial impacts to most of the world's coastal cities. The Paris Accord can be considered a start, but its goal is a political one and not scientifically based.	In response to this comment, we have inserted the following statement where the 2C objective is mentioned: "These targets were developed with the goal of avoiding the most severe climate impacts; however, they should not be viewed as thresholds below which there are zero risks and above which numerous tipping points are suddenly triggered."
Michael	MacCracken	144694	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1360	1360	5	7	Another statement that really is strange--so just let global warming go up and up--all envisioned emission pathways have significant overshoots of the Paris objectives, much less of the 0.5 C value that was when major impacts started to occur. It would be just as unreasonable to say now that everyone might stop mitigation so why even give it a try. Given it is important to the world and is relatively easily done, it would seem far better for the frog to jump out of the pot even though there is of course the chance that someone might put the frog back in the pot. The world has, perhaps to a lot of people's surprise, has kept from having an all-out nuclear war, showing that it can show some degree of wisdom. Given the adverse consequences of climate change without SRM, the situation sure looks pretty bleak given that staying below 1.5 C likely requires ending global fossil fuel use in a decade or two, and this is without considering the warming effect of losing the sulfate cooling offset. This particular sentence I think should simply be deleted, or rephrased to say that SRM can provide an early time warming offset, and the phasing out of it could then be accomplished by combined mitigation and CDR--treat the overall issue with an integrated response, not thinking of the approaches being singly applied--it is far too late for such thinking.	We believe it is important to reflect the literature on risks of sudden cessation of SRM, leading to rapid climate change. We have modified the text however to indicate that this refers specifically to "sudden" cessation of "large-scale" SRM, and that a gradual phaseout of SRM would not have the same effect.
Michael	MacCracken	144695	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1359	1359	31	33	This is really a very narrow way of thinking about these approaches. Various of the approaches could conceptually be applied regionally to moderate the projected increase in tropical cyclone intensity, to moderate amplified Arctic warming, to make up for loss of the sulfate cooling offset, to moderate increases in water temperature over sensitve areas like the Great Barrier Reef, to moderate loss of ice from the ice sheets, etc.--given how little funded study there has been, we just do not know, but there quite possibly are a number of special types of activities that might be pursued. And, given that variations in orbital parameters involving changes in the amount of radiation at various latitudes by several percent are apparently what drove (with feedbacks) the growth and decay of ice sheets for glacial-interglacial cycling, that human stimulated changes of a few percent, so comparable to what major volcanic eruptions do, would seem worth investigating. Were by chance Nature to cause the eruption of volcanic erutpions over a period of time, I don't know of any studies suggesting that such an event would not be welcomed to limit the cooling, so what is it that so summarily is dismissing the potential stepping in of humans to intentionally do this in light of the quite dismaying situation that we are in (which this chapter does not really seem to highlight very well)? I just think the overall presentation on this issue (so in this section) is totally inadequate in laying out the dilemma that we face. Indeed, climate intervention is not perfect, but that is not the issue to be considered. What needs to be considered is if it makes more sense to be doing mitigation plus CDR and adaptation with or without a role played by global and/or regional SRM. One can hope that every other approach is adequate and so SRM is not needed, but this is not the way that things look now if one wants to keep the temperature increase below the Paris objectives and then come back quickly, as is essential, to below 0.5 C. And this section simply does not lay that out.	We agree that describing climate intervention as aimed solely at moderating global average temperature is overly narrow, and have added or modified text in several places to indicate the possibility of other aims (the first sentence of the section, the fourth sentence of the revised text which defines SRM, and the discussion of pros/cons of SRM with an added reference). More generally, we have indicated in the first sentence that the main treatment of this issue is in the Climate Science Special Report, to which the reader can refer for additional discussion. Given the focus of this chapter, we provide only a brief accounting of climate intervention strategies, based primarily on the CSSR treatment.
Michael	MacCracken	144696	Text Region	29. Mitigation: Avoiding and Reducing Long-Term Risks		1361	1361	3	15	Where is the reference to the Hansen et al. paper of a few years ago making clear the extent of damages from being above 0.5 C? Sensitiviites from paleo analyses suggest that going to 1.5 or 2 C as a ne equilibrium level for temperature will lead to horrendous outcomes for the planet requiring major relocation of virtually all coastal cities and relocation of a large share of the global population. This issue needs investigation and consideration. Overall, the text here just does not frankly and clearly present the very difficult situation that the world faces.	We have reviewed the Hansen et al 2016 (and earlier variants) paper exploring the potential pathways for extreme sea level outcomes. The current chapter text does acknowledge the concerning potential for nonlinearities in the climate system and the associated risks. In response to this comment, we have included an additional citation to a comprehensive reference on the topic, Ch 15 of the CSSR, which better serves the space constraints of this section.
David	Wojick	141617	Text Region	5. Land Cover and Land Use Change		196	196	29	32	Here is the text as written: 29 Key Message 1: Changes in land cover, which may be driven by societal choices concerning 30 land use, continue to impact local- to global-scale weather and climate by altering the flow 31 of energy and water between ecosystems and the atmosphere, with important feedback effects 32 on the climate system. Comment: the underlined text falsely asserts a speculative claim as an established physical fact. It is not in fact known that changes in land cover change climate. This text probably violates the Information Quality Act requirement that federal agencies ensure and maximize the "quality, objectivity, utility, and integrity of information disseminated by the agency." This text exhibits neither quality, objectivity, utility nor integrity. To begin with there is neither objectivity nor integrity, as these errors have been pointed out repeatedly during the previous series of National Assessments (references should not be necessary), yet they persist. As a result there is no quality or utility.	This comment is inconsistent with the author team's thorough assessment of the science and is inconsistent with the current state of the science on this topic. Thank you for your comment. This key message is strongly supported by recent scientific literature as evidenced by the extensive number of references that we've cited throughout this section of the chapter. Additional support is provided in the chapter's Traceable Account. Lastly, we refer you to NCA4's Chapter 2: Our Changing Climate for additional details on the supporting science.
David	Wojick	141618	Text Region	5. Land Cover and Land Use Change		198	198	33	34	Here is the text: 33 However, climate change is expected to directly and indirectly impact land use and cover by 34 altering disturbance patterns, species distributions, and suitability of land uses. Comment: This text falsely states a speculation as an established physical fact. The stated expectation is merely an abstract possibility being explored via computer modeling.	This comment is inconsistent with the author team's thorough assessment of the science and is inconsistent with the current state of the science on this topic. Thank you for your comment. This key message is strongly supported by recent scientific literature as evidenced by the extensive number of references that we've cited throughout this section of the chapter. Additional support is provided in the chapter's Traceable Account. Lastly, we refer you to NCA4's Chapter 2: Our Changing Climate for additional details on the supporting science.
Linda	Heath	142421	Text Region	5. Land Cover and Land Use Change		199	200	38		Most of the discussion on future vegetation depends on citations of the literature based on statistical modeling. This approach has been largely discredited over the past decade because it does not include any biophysical processes or competition, which are the drivers of vegetation change. This is also inconsistent with other chapters in the report. It would be appropriate to substitute citations of process-based vegetation modeling that provide a more credible foundation for inferences about climate change effects.	The references provided in this section include studies using dynamic vegetation models, as well as statistical approaches. We recognize the difficulty in making projections of vegetation/land-cover change in this context, and have added a sentence to the end of the paragraph emphasizing the limitations of projections and some of the other driving forces driving these changes. We have also included a reference the the review by Pearson and Dawson (2003) which discusses the limitations of species niche modeling.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Linda	Heath	142422	Whole Chapter	5. Land Cover and Land Use Change						The data continually cited as coming from US EPA is based on Forest Service statistics. Given that "USGS" is constantly used throughout as a source, why not just use USDA Forest Service as the source instead of US EPA?	The USGS is not listed as a source for any of the specific data sources (see Reference list). The reference to the U.S. Geological Survey was erroneous for each of the three figures and has been updated. The land use estimates asscoiated with the US EPA (2017) citation were obtained from USDA Forest Service, Forest Inventory and Analysis (FIA) Program and USDA NRCS Natural Resources Inventory (NRI) data when available for an area because the surveys contain additional information on management, site conditions, crop types, biometric measurements, and other data that is needed to estimate C stock changes, N2O, and CH4 emissions on those lands. If NRI and FIA data are not available for an area, however, then the NLCD product is used to represent the land use. Since all three data sources were used in the land representation analysis within the National Inventory Report we used the US EPA (2017) citation. We appreciate the suggestion and have determined that the current references are appropriate and adequate given the chapter's space limitations.
Linda	Heath	142423	Whole Chapter	5. Land Cover and Land Use Change						The definition of land use used here is distorted so much from academic, IPCC guidance for reporting to national greenhouse gas inventories, and official statistics of the US usage that it is difficult to follow. Allow Grant Domke, the Forest Service author, the opportunity to contribute properly to this and fix it.	The authors disagree. The first sentence of the chapter says : "Climate can affect and be affected by changes in land cover—the physical characteristics of land such as trees or pavement, and land use—human management and activities on land, such as mining or recreation." The IPCC describes land use as "the total of arrangements, activities, and inputs that people undertake in a certain land cover type" and land cover as "the observed physical and biological cover of the earth's land, as vegetation or man-made features." We believe these definitions are entirely consistent. No changes have been made to the definition of land cover and land use. However, we have added additional clarrification to the caption of Figure 1 to describe the classification of land use in the National Land Use Dataset, which provides a hierarchical classification scheme to understanding land use. We have also included a table (5.1) showing land-use estimates from EPA.
Linda	Heath	142424	Figure	5. Land Cover and Land Use Change	1	193				The National Land Use Dataset has nothing to do with the well known debate about land use versus land cover in a climate change context. National Forest Inventories traditionally employ two phases, ground plots and remote sensing (including from the air). Researchers are constantly comparing remote sensing data to forest inventory data, and the remote sensors use inventory data in calibrating/validating their observations. Whatever this NLUD information is more of a societal designation at some cosmic level, and using it here risks the credibility of the entire chapter.	The intent of this figure and chapter was not to debate differences between terms and definitions. The intent of this figure was to illustrate how different land classifications and land use and land cover products and estimation procedures may lead to different land use and land cover estimates. Each classification and data product or process has been developed with a specific set of goals and objectives which may be reflected in the definitions of each land classification and contributes to differences in the regional estimates. We thank the reviewer for the comment, but the suggestion is outside the scope of this report.
Linda	Heath	142425	Text Region	5. Land Cover and Land Use Change		192	192	11	11	Lal et al (2011) does not say that decisions about land use, cover, and management can help determine… The term land cover is not in that publication which is labeled a "research editorial". They discuss cover crops but that is a different use of the word "cover". Reconsider the use of this citation or revise the text. How many other publications are mis-interpreted or mistated here?	We assume this comment is in reference to p. 192 Line 18-19. The citation was in reference to land management strategies but we see how it could be confused as also applying to land use and cover. We have removed the reference.
Linda	Heath	142426	Text Region	5. Land Cover and Land Use Change		198	198	7	7	What is an "otherwise natural area" that is really urbanization? And is urbanization mean developed areas, or does it mean changing to a developed area? Using standard terminology from IPCC's national greenhouse gas inventories would be internationally understood and have scientific credibility.	Thanks! That was poor wording. The text has been revised to incorporate this suggestion.
Linda	Heath	142427	Text Region	5. Land Cover and Land Use Change		198	198	31	31	how society uses the land is management. This key message is not coherent. So is climate change expected to affect the ability of the Nation's ecosystems to provide goods and services? Or is the main point that climate change is expected to impact land use ad land management by altering disturbance patterns, etc.	The key message has been modified to focus on how climate change affects land use which can in-turn, affect the ability of ecosystems to produce goods and services.
Linda	Heath	142428	Text Region	5. Land Cover and Land Use Change		192	192	6	6	Land use does not respond to changes in climate and weather. How people use land changes in response to changes in climate and weather.	After consideration of this point, we have determined that the existing text is clear and accurate. We agree that people's use of the land changes in response to weather and climate and we further define land use as the collecction of human management and activities on land.
Linda	Heath	142429	Text Region	5. Land Cover and Land Use Change		192	192	20	28	Growing forests will also increase carbon stocks. Increasing area of forest is another way to increase land based carbon stocks, but that is a land use change, whereas increasing the amount of carbon per area of forest is land management.	Due to the size of the topic and the page limit for the chapter, we focused on broad trends rather than providing such a level of specificity. We have updated the text with a reference to the "Forests" chapter for a more thorough discusison of forest management and carbon dynamics.
Sarah	Thunberg	142430	Text Region	5. Land Cover and Land Use Change		201	201	18	21	Is the term "changes in land cover" the same as "changes in land cover class"? This is quite confusing. The amount of forest cover can be changed by land management only, without a land use change.	Throughout this chapter changes in land cover are assumed to reflect changes between classes. Increases of forest cover would reflect a change in land cover condition. We disagree with the notion that only management can change land cover. Storms, insects, and fire all can result in a change in cover without a change in use or management. After consideration of this point, we have determined that the existing text is clear and accurate.
Linda	Heath	142431	Text Region	5. Land Cover and Land Use Change		191	191	7	10	Understanding these terms is problematic when authors confuse the difference between land cover and land use as simply an issue defined by technology constraints. National Forest Inventories have always included two phases, ground plots and a remote sensing phase (or aerial photo phase) because the resulting estimates needed to be meaningful for land use and land management. In the past, remote sensing alone did not provide accurate enough information, and it still does not present the holistic picture needed to describe vegetation conditions for a wide variety of stakeholders.	The authors believe the current text confirms the comment. We state a number of reasons why estimates of cover and use may differ, including "consistency and correct application of terminology and definitions, time, scale, data sources, and methods. While each approach may produce land use or land cover classifications, each method may provide different types of information at various scales so choosing appropriate data sources and clearly defining what is being measured and reported is essential." After consideration of this point, we have determined that the existing text is clear and accurate.
Linda	Heath	142433	Text Region	5. Land Cover and Land Use Change		192	192	10	11	increasing temperatures have a negative effect on agricultural yields, and forest yields are also susceptible. (the term 'land use' seems out of place.) Is the term yield meant or is the term productivity meant? Those are different.	The term yield is meant. See the Lobell and Field (2007) paper for more information. After consideration of this point, we have determined that the existing text is clear and accurate.
Linda	Heath	142434	Text Region	5. Land Cover and Land Use Change		192	192	11	11	Decisions about…"cover", does this mean cover class?	We believe the comment refers to P192, L18. We do not feel that the word "class" needs to be included in the sentence. The sentence refers to cover, use, and management in general terms. After consideration of this point, we have determined that the existing text is clear and accurate.
Linda	Heath	142435	Whole Chapter	5. Land Cover and Land Use Change						This chapter ignores the well accepted and used literature based on the official forest land statistics of the US (Oswalt et al 2014), such as Dave Wear's work with the Forest Service, Southern Research Station. IPCC's national greenhouse gas inventory guidance is quite clear about land use change and land management. Land cover has its own issues in terms of classifying vegetation on the land. Allow the Forest Service author on the author's list to fix this chapter.	The authors disagree with this comment and have provided estimates of land use change from the most recent EPA GHG report (2017) within the state of the sector section. No changes have been made.
Tomi	Vest	142793	Whole Chapter	5. Land Cover and Land Use Change						The chapter content is skewed towards a discussion of land cover. The chapter would benefit from a more in-depth discussion of land use change, with supporting statistics, even if only on individual land use types. It would also benefit from a more in depth discussion on how LULC pattern and changes in pattern relate to climate and climate adaptation. The chapter should be checked for references ‰ÛÒ there are several that are cited but not included in the references.	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter. We have also checked the paper for inconsistiencies in references and corrected where appropriate.
Tomi	Vest	142797	Text Region	5. Land Cover and Land Use Change		191		28		Consider mentioning coastal wetland loss as well as beach loss as this is a major issue with sea level rise	We added wetland and beach loss and cited the Coastal, Northeast, and Southeast chapters
Tomi	Vest	142800	Text Region	5. Land Cover and Land Use Change		191		31		This sentences is a bit sweeping, consider rewording removing ‰ÛÏtraditionally‰Û removing ‰ÛÏshort term‰Û. For timberlands, economic considerations are longer-term given stand rotation times.	The text has been revised to incorporate this suggestion. We removed the reference to "short-term".

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Anne	Marsh	142803	Text Region	5. Land Cover and Land Use Change		193	194	18	14	A reader with little understanding of these data may find this discussion confusing. Consider first discussing changes in LC and then changes in LU, so you can better explain the differences and trends behind. Also US EPA 2016 is not included in the references.	After consideration of this point, we have determined that the existing text is clear and accurate.
Tomi	Vest	142805	Text Region	5. Land Cover and Land Use Change		195	195	10	11	Wetland loss is much higher on the Gulf and Atlantic coasts; consider adding specification for better context.	We thank the reviewer for their commnent and included reference to wetland loss in this section, citing the appropriate NCA4 chapters.
Anne	Marsh	142808	Text Region	5. Land Cover and Land Use Change		195		17		Consider discussing LULC change in the WUI, as patterns of landscape change are critical to interactions with climate	Thank you. We specifically mention WUI in relation to disturbance (pg 197).
Anne	Marsh	142810	Text Region	5. Land Cover and Land Use Change		195	195	17	30	Use more current statistics on forest health disturbance ‰ÛÒ See the US Forest Service publication Forest Health Monitoring: National Status, Trends and Analysis. Also, (line 21-23) permanent transitions to other systems can happen for reasons other than invasives related to disturbance, so consider qualifying the sentence.	The chapter focuses on broad trends for the topic. We refer those interested in a deeper treatment of the topic to the Forest Chapter of this report. With respect to the second comment on transitions, good suggestion and we have modified the text to qualify the statement that transitions can occur for many reasons.
Anne	Marsh	142811	Text Region	5. Land Cover and Land Use Change		196	196	11	12	Include full citation	Thank you. The citation has been corrected.
Anne	Marsh	142812	Text Region	5. Land Cover and Land Use Change		197		15		Fire can also change the albedo of the surface itself; consider including.	Thank you. We now include fire's effect on surface albedo (pg. 199)
Anne	Marsh	142813	Text Region	5. Land Cover and Land Use Change		199	199	2	4	Provide a reference as an example	Rather than single out one or two individual models we have listed a few different classes of models which are currently used to estimate changes in yields and/or land use allocation. We have also change "rising temperatures" to "climate change."
Anne	Marsh	142814	Text Region	5. Land Cover and Land Use Change		200	200	3	6	Provide a qualification or better context on scale so that the sentence will not be taken out of context	Good suggestion. We have modified the sentence to clarify that the changes could affect some areas of the western United States.
Anne	Marsh	142815	Text Region	5. Land Cover and Land Use Change		200	200	6	7	As there have been many studies with this finding, consider rewording	Good suggestion. We have modified the sentence accordingly.
Tomi	Vest	142816	Figure	5. Land Cover and Land Use Change	5.1	197				It would be helpful to list the specific citations and dates for the LULC data in the legend and include dates on the figure.	Citations for figures will be provided according to Information Quality Act guidelines for an HISA.
Tomi	Vest	142817	Traceable Account	5. Land Cover and Land Use Change		203		13		Please include citation	We have added the Bowman, 2009 Science paper reference at the end of the sentence.
Social Science	Coordinating Committee	143349	Text Region	5. Land Cover and Land Use Change		191	191	30	34	Is there not more recent literature to cite for this? 2013 is now 5 years ago.	The 2013 reference represents an update since the last assessment (this paper was not cited in NCA3). The authors do not feel an updated reference is necessary since the concept of land use change being driven by economic factors is fairly well established.
Social Science	Coordinating Committee	143350	Text Region	5. Land Cover and Land Use Change		193	194	18	22	Throughout this sextion it is hard to know what proportion the numbers reported as sq. miles are of the total, perhaps express as a percentage. I do not understand what is meant by the phrase "and an estimated loss in land-use area of about 29 square miles over the same period."	This sentence provides estiamtes of land cover change (-5150sq. mi) and land use change (-30 sq. mi.) for the categories listed, and illustrates how the different classifications result in differing estiamtes of change. Due to the size of the topic and the page limit for the chapter, we focused on broad trends rather than providing such a level of specificity. Introducing percent changes would have necessisitated introducing additional detail which we did not have the space for.
Social Science	Coordinating Committee	143351	Text Region	5. Land Cover and Land Use Change		195	195	5	16	Is the Crossett et al. paper the citation for all of the #s reported in this paragraph?	We have added a reference to the NOAA C-CAP program, which was used to derive the data used in this paragraph.
Social Science	Coordinating Committee	143352	Text Region	5. Land Cover and Land Use Change		195	195	17	30	Why only talk about disturbance events in forests?	The intention was not to discuss only forest disturbances. However, the wording in the second sentence certainly made it appear that way. We have modified the sentence to be clear that one example of disturbances altering land cover results from forest disturbance events. We do also present more specific data on forest disturbances which draws upon national-scale data. These data are not available for non-forest classes.
Social Science	Coordinating Committee	143353	Whole Chapter	5. Land Cover and Land Use Change						The main examples given seem to be from California. Are there examples from other regions of the US?	It is unlcear what this comment refers to. We have used examples from other areas of the country, in addition to California. No changes were made.
Social Science	Coordinating Committee	143354	Text Region	5. Land Cover and Land Use Change		196	196	29	32	While the key message says that some LCLUCC "may be driven by societal choices", none of the text supporting this message discusses those choices nor cites any literature.	We agree with this comment and have modified the key message, removing the reference to societal choices.
Social Science	Coordinating Committee	143355	Text Region	5. Land Cover and Land Use Change		199	199	4	7	Are there no citations for any of the statements in this paragraph?	We have added references for changes in Agriculture suitability (Zabel et al, 2014) and references for changes in fire regimes. We have also added examples of different types of models which are frequently used. Lastly, we have also included links to the Ag and Rural Communities and Forests Chapters.
Michelle	Tigchelaar	143676	Text Region	5. Land Cover and Land Use Change		195	195	5	5	This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. P. 195, line 5: please define how ‰Û÷coastal regions‰Ûª is 23% of the contiguous U.S. land area. Is this figure the total land area of all coastal states combined? The total area of ‰Û÷coastal regions‰Ûª are defined differently in Ch. 8, based on counties with coastline. Consistency between chapters would be useful for clarity.	We have added to the description to explicitely state that the land cover composition estimates used here were based on the extent of NOAA's Coastal Change and Analysis Program (C-CAP). We have also included a reference to these data in the reference list.
Union of Concerned Scientists	Union of Concerned Scientists	143695	Text Region	5. Land Cover and Land Use Change		189	189	11	11	As soon as "land use" and/or "land cover" are introduced, it would be helpful to explicetly define them (within the context of this report)	Thank you. We define LU and LC in the first sentence of the introduction.
Union of Concerned Scientists	Union of Concerned Scientists	143696	Text Region	5. Land Cover and Land Use Change		191	191	4	4	"for example, "dense" livestock grazing" - please complete the example by comparing to a different intensity of land use	Because the chapter does not go into detail on the topic of land-use intensity, we have remvoed this sentence. We also believe this improves the flow between definitions of cover and use and how the two concepts are inherently coupled.
Union of Concerned Scientists	Union of Concerned Scientists	143697	Text Region	5. Land Cover and Land Use Change		192	192	1	3	"decreases in demand for agricultural land…" This seems like a very general statement that may not be true everywhere.	The chapter focuses on broad trends for the topic. We refer those interested in a deeper treatment of the topic to the provided citations.
Union of Concerned Scientists	Union of Concerned Scientists	143698	Text Region	5. Land Cover and Land Use Change		192	192	21	25	It would be great to highlight more of the agricultural opportunities and literature here, as this is a very robust field of work. The review by Paustian et al. 2016 or Chambers et al. 2016 could be good to cite. Also, this could be a good place to briefly mention mixed land-use categories, such as agroforestry, silvopasture, etc.	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter. However, we have added the review by Paustian (2016) to the text.
Union of Concerned Scientists	Union of Concerned Scientists	143699	Text Region	5. Land Cover and Land Use Change		192	192	28	30	Also worth mentioning may be the uncertainty about how the soil carbon storage (just mentioned in the same paragraph) would be affected by climate change, even if it does happen.	The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text. This chapter, and paragraph in particular, focus on how changes in LULC/management can impact mitigation and adaptation. While climate impacts on soil C are certainly important, they are beyond the scope of this chapter.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Union of Concerned Scientists	Union of Concerned Scientists	143700	Text Region	5. Land Cover and Land Use Change		194	194	3	5	This sentence is unclear	After consideration of this point, we have determined that the existing text is clear and accurate.
Union of Concerned Scientists	Union of Concerned Scientists	143701	Text Region	5. Land Cover and Land Use Change		197	197	13	15	What about the potential effect of aerosols on precipitation patterns?	The section is about affects of land cover and land cover change on climate. The points the commenter raises are beyond the scope of this chapter/report and we have not revised the text.
Union of Concerned Scientists	Union of Concerned Scientists	143702	Text Region	5. Land Cover and Land Use Change		198	198	9	10	What about the effects of the impervious cover on runoff and larger-scale water cycling?	Great point! Thanks for catching the omission. We added text (and citations) to the paragraph (L12-24). The text has been revised to incorporate this suggestion.
Union of Concerned Scientists	Union of Concerned Scientists	143703	Text Region	5. Land Cover and Land Use Change		198	198	29	29	"potentially drought inducing effects of irrigation" - This is confusing, because irrigation is typically used to reduce impacts of drought. Perhaps instead reference the effect of irrigation on water resources, and ultimate effect on drought risk?	The text has been revised to incorporate this suggestion.
Michelle	Tigchelaar	143882	Whole Chapter	5. Land Cover and Land Use Change						This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. This chapter overemphasizes the role of land use in the U.S. on weather patterns and global climate (see, e.g., first sentence of Key Message 1). By ‰ÛÏweather patterns‰Û the implication is synoptic scale - or thousands of kilometer. No doubt there are local land-use impacts on weather and climate, but the numbers that are given for land-use changes in the text (e.g., Fig 5.2) are too small to have a significant influence on patterns of that scale. For example, numbers in the thousands of square miles of change per 40 years are given in Fig 5.2 on p 194, for which the total of all regions is only about 1% of the CONUS U.S. land area.	Figure 5.2 shows the net change in land cover, not land use. Furthermore, net change represents only a fraction of the total land cover change (gross change). The figure shows the annualized rate of change. The authors agree that the annualized rate of change is relatively small and likeley not a significant driver of weather and climate change. However, when considered over sufficiently long temporal periods their cumulative effect can have profound consequences and significantly alter regional to global climate.
Michelle	Tigchelaar	143883	Figure	5. Land Cover and Land Use Change	5.2	194				This comment was prepared after discussions by subgroups of the University of Washington Program on Climate Change and the Public Comment Project in Seattle, WA. Among those who participated in discussions, the following wished to be named: Mary Fisher, Megan Feddern, Dr. Michelle Tigchelaar, Dr. Cecilia Bitz, Dr. Richard Gammon. There is an inconsistency about forest area change in Chapters 5 and 6. Figure 5.2 shows decreasing forest area in all regions, while Chapter 6 says there is net aforestation in the U.S. in recent decades.	Figure 5.2 illustrates estimated changes in land cover while text in Chpt. 6 reports land use changes in the forest land category. As the text indictates in Chpt 5, lines 2-17 on page 194, forest land cover has declined over the last decade but the forest land use has increased which is consistent with the text in Chpt 6. No changes were made.
Michael	MacCracken	144262	Text Region	5. Land Cover and Land Use Change		189	189	9	10	Why is it that "essential good and services" or "ecological services" or something are not mentioned in the second sentence which lists what climate change is disrupting? This seems a significant omission.	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter. The focus of this Key Message is the affects of climate on land use and cover. Impacts on ecosystem services was beyond the scope of this chapter.
Michael	MacCracken	144263	Text Region	5. Land Cover and Land Use Change		189	189	11	12	I would think that "the demand" would better be plural, or drop "the"	Good suggestion. We have deleted the "the".
Michael	MacCracken	144264	Text Region	5. Land Cover and Land Use Change		189	189	14	15	On both lines, "Earth" the planet needs to be capitalized--although perhaps on the second line the text is referring just to the "dirt" part of the surface and so it is fine as it is. Just because some old style guides adopted the convention not to capitalize earth, moon, and sun, is not a reason to accede (my speculation being this choice was made to try to suppress or not respect those practicing Nature-focused religions, a speculation made more likely by their choice to capitalize "God" but not "gods"). Our planet deserves the respect of having its name capitalized, like the names of all the other planets (NASA does not list the planets as mercury, venus, earth, etc.--and the excuse that the proper name of our planet is "Terra" is something that not 1 in 100 would know).	Thanks for the comment. We have given Earth the respect he/she deserves and capitalized the "E".
Michael	MacCracken	144265	Text Region	5. Land Cover and Land Use Change		189	189	27	27	font-size problem	Corrected.
Michael	MacCracken	144266	Figure	5. Land Cover and Land Use Change	1	190				Very interesting figure. Just a minor note that it took me a few seconds to figure out that the graphs for Alaska and Hawai'i were for them as there was not the name of the region above the bar graph inset. It might be worth adding that, although I know it would be repetitive. Also, regarding snow/ice category, I assume this means permanent cover, at least for present climate conditions, and has nothing to do with occasional snow and ice cover. Also, I gather that the EPA approach does not include "water"--might be an interesting point to note.	Thank you for the suggestions. We have modified the figure to improve clarity where possible. In response to other comments we have made the following modifications. We have significantly modified Figure 5.1. We now include two maps, one showing NLCD (land cover) and another showing land use (NLUD). Each map has NCA regional proportions as stacked bar charts placed below the maps. We have also added Table 5.1 which has the EPA estimates of land use for each NCA region. Captions have been modified for each and include references to the data used to make the figure.
Michael	MacCracken	144267	Text Region	5. Land Cover and Land Use Change		191	191	16	29	I'm confused by how referencing is done here--two author papers typically have an "and" between authors last names and then a year, but here there names together without an "and" but followed by "et. al." which is usually used after one last name for first author is given. Are there "and"s and years missing?	The reference style for papers with more than 2 authors uses the first two authors names followed by et al. and a year. References will be formatted consistently across all chapters. No changes were made.
Michael	MacCracken	144268	Text Region	5. Land Cover and Land Use Change		191	191	21	22	"Earth" needs to be capitalized to indicate the reference to the planet. This is done, for example, on page 197, line 14 and needs to be consistently done.	This has been changed.
Michael	MacCracken	144269	Text Region	5. Land Cover and Land Use Change		191	191	30	31	Aren't decisions also influenced by the character of the land itself, issues of ownership and tradition?	We agree with the reviewer that land legacy, character, ownership and other characteristics are important, however, the best science indicates these factors act more as constraints on land-use change than as direct drivers. We have added Lambin et al (2001) which emphasizes the point about economic drivers and land use change.
Michael	MacCracken	144270	Text Region	5. Land Cover and Land Use Change		192	192	11	14	Might the die-off of western conifer forests due to pests also be an example to cite, especially given increased likelihood of forest fires and the persistence of the change.	We have added a sentence and two references discussing the climate-insect feedbacks (Bentz et al, 2010; Kurz et al, 2008).
Michael	MacCracken	144271	Text Region	5. Land Cover and Land Use Change		192	192	14	17	It seems to me important to make clear that sea level rise is going to have influences over quite extensive inland areas. For example, many of the so-called islands in the Sacramento-San Joaquin delta are below sea level and are going to be hard to sustain (as Marc Reisner noted in his final book, these so-called islands would more appropriately be called "empty reservoirs". Also many rivers (and river deltas) are near sea level far inland and so there will be effects, and then large areas of the lands (even the state of Delaware) Chesapeake Bay and other such features will also be affected. So, not just what many would call as coastal lands.	We have added a senteence to p 192 lines 24-27 describing impacts in coastal areas and have also included a cross reference to Ch. 8 Coastal Effects.
Michael	MacCracken	144272	Text Region	5. Land Cover and Land Use Change		194	194	6	6	Given uncertainties how can the net decline be known to five significant figures? Perhaps a bit too precise.	We agree and have rounded to the nearest 10 sq. mi. to be consistent throughout the chapter. Thanks for catching this!
Michael	MacCracken	144273	Text Region	5. Land Cover and Land Use Change		194	194	8	8	Use of the word "conversion" makes it sound as if this is happening by some deliberate choice--it is really the forest retaking land that had been cleared. Being part of a group owning such land in NW CT, trying to keep the forest at bay is the challenge--it is quite aggressive in seeking its land back.	The term "conversion" is simply meant to imply a change from one class to another and is not intended to denote the mechanisms driving the change. After consideration of this point, we have determined that the existing text is clear and accurate.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144274	Text Region	5. Land Cover and Land Use Change		194	194	21	22	I think you want "are the large declines"	We believe the text is correct as is.
Michael	MacCracken	144276	Text Region	5. Land Cover and Land Use Change		195	195	32	39	Again, a bit of confusion (or inconsistency with other chapters, etc.) on linking to references.	All references will be formatted consistently across the report.
Michael	MacCracken	144277	Text Region	5. Land Cover and Land Use Change		196	196	9	9	To judge significance, it would be helpful to also be provided what the new percentage covers would then be, not just how much the change was.	Due to the size of the topic and the page limit for the chapter, we focused on broad trends rather than providing such a level of specificity.
Michael	MacCracken	144278	Text Region	5. Land Cover and Land Use Change		196	196	23	23	It would be helpful to provide the percentage of the present total in order to judge how important this is as agriculture is by far the major water consumer in California.	The chapter focuses on broad trends for the topic. We refer those interested in a deeper treatment of the topic to the provided citations.
Michael	MacCracken	144279	Text Region	5. Land Cover and Land Use Change		197	197	5	5	Change "temperature" to "temperate"	Thank you for catching the typographical error. It was fixed.
Michael	MacCracken	144280	Text Region	5. Land Cover and Land Use Change		197	197	5	6	While this wording might be technically correct, it is, in my view a bit misleading. I'd suggest that what would happen would be a moderation of the warming, which is a cooling influence, but the latter sort of implies that warming will not generally be occurring. And the other thing that going to forests will do is to increase the absolute humidity, and so the wet-bulb temperature will rise and overall discomfort index would also be affected in ways that would make the situation for humans less comfortable.	We appreciate the reviewer's comment. However, each of the 8 studies cited shows that modeled or observed temperature for forest are cooler than those associated with herbaceous cover. After consideration of this point, we have determined that the existing text is clear and accurate.
Michael	MacCracken	144281	Text Region	5. Land Cover and Land Use Change		197	197	21	22	Change "may" to something like "can, in some situations,"	This sentence has been removed in the 4th order draft.
Michael	MacCracken	144282	Text Region	5. Land Cover and Land Use Change		198	198	25	25	You might change "efforts" to "installations"	The text has been revised and the word is no longer used.
Michael	MacCracken	144283	Text Region	5. Land Cover and Land Use Change		198	198	33	34	In addition to previous comment about adding ecological services to the list on line 34, I don't understand why the word "However" is included here--why not two direct sentences?	We agree with the comment and have removed "However" from the Key Message.
Michael	MacCracken	144284	Text Region	5. Land Cover and Land Use Change		199	199	23	23	Change "may" to "can" or "have the potential to"--it is not a question of permission, but ability.	The authors agree and have made the suggested change ("have the potential to").
Michael	MacCracken	144285	Text Region	5. Land Cover and Land Use Change		199	199	28	28	No need for word "future"--you actually have the scenarios now.	After consideration of this point, we have determined that the existing text is clear and accurate.
Michael	MacCracken	144286	Text Region	5. Land Cover and Land Use Change		198	200	35	35	This whole section is really quite under-developed given its importance.	Due to the size of the topic and the page limit for the chapter, we focused on broad trends rather than providing such a level of specificity.
Michael	MacCracken	144287	Whole Chapter	5. Land Cover and Land Use Change						I'm a bit surprised there is no mention of drying, aridification, generation of dust, etc. Also, more extreme rainfall will tend to increase erosion. And there was no real mention of permafrost thawing (I guess Arctic lands are covered separately). Also, there is virtually no mention of soil moisture changes and the influence of that, of the lengthening warm season and its effect on phenology, and virtually no mention of the effects of climate change on the fauna that are associated with the land cover.	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most relevant information and illustrations to include and therefore have not revised the chapter.
Thomas	Moore	140842	Whole Chapter	Appendix 1: Process						No doubt about it, peer review is the most important and most reliable way to assure accuracy and honest evaluations of critical data, opinions, and hypotheses.	We thank the reviewer for the comment and agree that peer reviewed literature is a critical component of science assessments such as the NCA.
Mikko	McFeely	143012	Whole Chapter	Appendix 4: International						The European Union provides comprehensive climate change assessments for Europe's main regions since 2002. The latest report published on January 25, 2017 presents updated assessments of past and projected climate change and its impacts on ecosystems and society. It further aims to support the development of national and transnational adaptation strategies and plans. In its scope and content it is similar to NCA4 and is worth mentioning in Appendix 4 in the final version of NCA4; https://www.eea.europa.eu/publications/climate change impacts and vulnerability 2016	Thank you for this suggestion. The International Appendix highlights a small set of assessment models (with distinct mandates and requirements, process, content structure, and discussion of international dimensions) from geographically varied nations with varying capacities to conduct such assessments. As such, it is intended to be an illustrative rather than comprehensive presentation of national approaches to climate assessments. We agree that the EU's recent report is an important and valuable document, and have included a reference to it in our text. However, since it is sufficiently similar to the NCA4 in scope and content and does not add further geographic or development balance, we have chosen not to include a full summary.
Robert	Kopp	141203	Figure	Appendix 5: Frequently Asked Questions	3	1448				Consider adding Figure 12.2b from the CSSR, which also shows the extraordinary nature of global sea level rise in the 20th and 21st centuries.	Thank you for the comment, we have a separate FAQ on sea level rise so we choose not to include two different sea level rise figures in this chapter
Robert	Kopp	141204	Figure	Appendix 5: Frequently Asked Questions	8	1456				Consider also showing the ice core CO2 record of the last 800kyr for context.	Thanks for the comment, we replaced this figure with one that shows CO2 over the past 800k years.
Robert	Kopp	141205	Text Region	Appendix 5: Frequently Asked Questions		1464	1464	26	27	As discussed two pages on, approximations associated with parameterizations are not the only source of model uncertainty.	Thank you for the comment, a reference to that FAQ was added.
Kaveh	Rashidi Ghadi	141206	Whole Chapter	Appendix 5: Frequently Asked Questions						Many of the questions categorized under "Ecological effects" have more to do with the cryosphere than ecology.	Thank you for the comment, we assessed the questions in each category and will come up with appropriate headings based on the final version of each question
Juanita	Constible	142760	Text Region	Appendix 5: Frequently Asked Questions		1444	1444	7	8	"Numerous independent studies" sounds vague and underwhelming, when the reality is many hundreds of studies show evidence of warming. Consider rewording to better reflect the volume of research.	Thank you for your comment; we edited the text to better reflect the actual volume of publications
Juanita	Constible	142761	Text Region	Appendix 5: Frequently Asked Questions		1444	1444	22	27	Does a cooling upper atmosphere have different implications for the planet or atmosphere? CO2 being trapped near the surface and causing warming makes sense, but some clarification of the importance/relevance of a cool upper atmosphere would be helpful.	Thanks for your comment; we revised the text to clarify cooling of the upper atmosphere
Juanita	Constible	142762	Text Region	Appendix 5: Frequently Asked Questions		1445	1445	3	4	Consider rewording "Increases in heavy rainfall events show that the atmosphere's ability to hold water vapor has increased with its temperature (Ch. 3: Water)." Someone unfamiliar with weather patterns may be confused, as "rainfall" implies that the atmosphere can no longer hold the vapor (i.e. releases it as precipitation), rather than the volume it holds has increased. "Capacity" may work better than "ability."	Thank you for the comment; the text was edited to be more clear for non-technical readers
Juanita	Constible	142763	Figure	Appendix 5: Frequently Asked Questions	2	1446				Consider changing the color of the grey indicator arrows (showing an increase or decrease) to a more eye-catching color. Due to the bright and variable colors used in the images themselves, the arrows get lost. Otherwise, this graphic conveys a ton of fantastic information clearly.	Thank you for the comment, this graphic is being redone to match the same graphic in the Overview chapter. It will contain very similar information, just presented on a more compelling image (based on comments received regarding this figure in the overview).
Juanita	Constible	142764	Text Region	Appendix 5: Frequently Asked Questions		1447	1447	17	17	Please add a year estimate or reference to when the global Industrial Revolution started.	
Juanita	Constible	142765	Text Region	Appendix 5: Frequently Asked Questions		1451	1451	11	13	Add "(GHGs)" after the first mention of greenhouse gases in the intro paragraph, rather than in the first main paragraph after already using the abbreviation.	We included GHG after the first mention of greenhouse gases

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Juanita	Constible	142766	Text Region	Appendix 5: Frequently Asked Questions		1455	1455	30	32	"This heat-trapping gas is part of the carbon cycle and is released and absorbed through natural processes on seasonal to multidecadal time scales and longer." sounds like it is cut off, or missing the ending of the sentence. Consider removing "and longer" or completing the thought.	Thanks for the comment, "and longer" was deleted and the sentence was edited for clarity.
Juanita	Constible	142767	Text Region	Appendix 5: Frequently Asked Questions		1456	1456	11	13	Consider rewording or splitting up this sentence; it is somewhat confusing and hard to follow.	Thanks for the comment, the sentence was edited for clarity
Juanita	Constible	142768	Text Region	Appendix 5: Frequently Asked Questions		1458	1458	1	1	"Lower -" and "upper atmosphere" have been used previously in the chapter without being noted (troposphere) and (stratosphere); consider introducing these terms earlier in the chapter for clarity and continuity.	Thanks for the comment, we edited the text to introduce troposphere and stratosphere earlier in the chapter
Juanita	Constible	142769	Whole Page	Appendix 5: Frequently Asked Questions		1462				While there is mention of "wetter" and "drier" regions, it may be helpful to tie in some context regarding these implications on drought/flooding, and touching on the risks associated with those. This may hit a little closer to home, in that they are damaging phenomenon rather than just "more rain" and "less rain."	Thank you for the comment, we edited the text to include mentions of droughts and floods.
Juanita	Constible	142770	Figure	Appendix 5: Frequently	20	1471				At first glance, it appears the figure contradicts the discussion paragraphs; "sixteen of the 17 warmest years	Thanks for the comment, we added a sentence in the figure caption to clarify this confusion.
Juanita	Constible	142771	Figure	Appendix 5: Frequently	24	1476				It would be helpful to note in the description of this figure if the cost of these events was adjusted for inflation.	Thanks for the coment, we included a note in the figure captions saying these values are adjusted for inflation
Juanita	Constible	142772	Text Region	Appendix 5: Frequently Asked Questions		1478	1478	13	23	The use of "people" makes these impacts sound very detached from the population as a whole, and makes it easy to think "someone will be impacted, but not me" when this is affecting everyone to some extent. Consider to changing to "we" or "everyone".	Thank you for the comment, the answer was edited to be more connected to the population as a whole
Juanita	Constible	142773	Text Region	Appendix 5: Frequently Asked Questions		1482	1482	4	6	Consider rewording this sentence, for clarity.	Thank you for the comment, the sentence was reworded for clarity
Juanita	Constible	142774	Text Region	Appendix 5: Frequently Asked Questions		1482	1482	27	31	It would be worth mentioning how much more potent these short-lived pollutants are compared to carbon, to add a layer of understanding.	Thanks for the comment, we added a statement about potency short lived species
Juanita	Constible	142775	Figure	Appendix 5: Frequently Asked Questions	28	1486				What do RCP 8.5 and RCP 4.5 stand for?	Thank you for the comment, in the front matter of the report all representative concentration pathways scenarios are described
Tomi	Vest	142776	Text Region	Appendix 5: Frequently Asked Questions		1492	1492	38	38	How does it impact marine life? Examples would be helpful before diving into the specific question on page 1493.	Thank you for the comment, since there is an entire question devoted to ocean acidification, we just linked to that question for more details
Tomi	Vest	142777	Text Region	Appendix 5: Frequently Asked Questions		1496	1496	3	4	How does CO2 reduce the efficacy of herbicides?	Thank you for the comment, we edited the text for clarity. I will refer you to Ziska et al. 2012 Recent and Projected Increases in Atmospheric CO2 Concentration Can Enhance Gene Flow between Wild and Genetically Altered Rice (Oryza sativa)
George	Bakken	143658	Figure	Appendix 5: Frequently Asked Questions	A5.6	1452				I'm not sure what the best way to explain this to the general public is, as the actual processes are a complex with re-radiation from various depths within the atmosphere, etc. Nevertheless, the figure A5.6 is open to criticism because, although it was intended to be schematic, taken literally it is obviously wrong, or at least requires a lot of interpretation that is not provided. Figure A5.6 shows the same amount of solar radiation (arrow width) in both panels, but says "less heat escapes into space" in the text in the right panel. In fact, the same amount of shortwave solar energy from the sun that is not immediately scattered or reflected must necessarily be re-radiated into space by the earth as thermal radiation (less a miniscule fraction stored on earth as it warms - maybe that is what it was intended to show). Else, the temperature of the earth would rise very extremely rapidly. See if you think a professional figure something similar to my poor, hasty PowerPoint efforts sent separately might be a little closer. The sum of the widths of the outgoing arrows equals the width of the incoming solar arrow. I show that it is re-radiated from the atmosphere at a lower level causing near-surface warming. Of course, one cannot show the infinite series in the figure. So, the skinny downward arrow at the left end of the sequence represents the stored fraction and terminates the series logically. Suggested revised Fig A5.6 emailed separately as *.pdf "Bakken Fig A5.6 suggestion"	Thank you for the comment, we included some of your suggestions in a new figure that is hopefully a better way to explain the concept to the general public
George	Bakken	143674	Figure	Appendix 5: Frequently Asked Questions	A5.20	1471				Figure A5.20 page 1471 line 1 The "2016" on the figure appears misplaced as it appears when you look at the page - should be above and somewhat right the curve to indicate the top line is 2016. This is if it is interpreted as a static figure (as it would be in the print edition). I know it looks ok when you run the video, but to cover all bases I'd move it to upper right of curve in the video, Or eliminate it from the static figure.	Thanks for the comment, we will fix the placement of "2016"
Michael	MacCracken	144697	Text Region	Appendix 5: Frequently Asked Questions		1444	1444	11	11	I'm sure that in some nations the observations are by paid observers, etc. Text here is too limited.	Thank you for your comment; we editied the text to be more inclusive
Michael	MacCracken	144698	Text Region	Appendix 5: Frequently Asked Questions		1444	1444	12	14	I would think it better to reverse the order of these two sentences.	Thank you for your comment; we revised the two sentences
Michael	MacCracken	144699	Text Region	Appendix 5: Frequently Asked Questions		1444	1444	17	18	Actually, the floats go up and down as well, so not always drifting on deep ocean currments.	Thanks for your comment; we revised the text to incoorporate movement of bouys
Michael	MacCracken	144700	Text Region	Appendix 5: Frequently Asked Questions		1444	1444	23	24	Huh? The stratophere cools because the ozone absorption of solar UV tays about constant while the added CO2 increases that capacity for this layer to radiate away IR.	Thanks for the comment, this section of the text has been removed based off of suggestions by other reviewers
Michael	MacCracken	144701	Text Region	Appendix 5: Frequently Asked Questions		1444	1444	25	27	This is just plain wrong. Most of CO2's influence is in the upper troposphere where the water vapor concentration is low. And this explanation does not mention the effect of the added water vapor and the importance of the convective coupling of the troposphere. And this idea of less heat coming up to warm the stratosphere is just wrong--that is not at all the major influence.	Thanks for the comment, this section of the text has been removed based off of suggestions by other reviewers
Michael	MacCracken	144702	Text Region	Appendix 5: Frequently Asked Questions		1444	1444	31	31	I'd just note that for some mountain glaciers, warming can lead to glacial growth as snow amount can increase as long as temperature is below freezing. So, nice statistic, but it does not mean the other 10% are not responding. Warming can also lead to thinning and spreading, so just calculating area is not adequate.	Thank you for the comment, we added text about the other 10% responding and pointed the reader to the FAQ on Glaciers for more information

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Michael	MacCracken	144703	Text Region	Appendix 5: Frequently Asked Questions		1445	1445	3	5	It might also be mentioned that observations directly show that the water vapor loading is increasing.	Thanks for the comment; the text was revised to include water vapor
Michael	MacCracken	144704	Text Region	Appendix 5: Frequently Asked Questions		1445	1445	7	8	This is hardly enough to explain the attribution issue.	Thanks for the comment; this paragraph was out of place and was moved to the start of this question
Michael	MacCracken	144705	Text Region	Appendix 5: Frequently Asked Questions		1447	1447	1	4	Actually,with respect to the question and point 1, what I think is important is that the change in global average temperature is quite consistent with the types of changes that have occurred in the past when one considers the roles of the various natural and human-induced forcing factors. It is actually the similarity of the magnitude of the responses that raises the concerns--did the past show no or only a small response to changes in forcings comparable to ones that humans are responsible for, one might well not be so concerned. But what past temperature changes show is that large changes can result from relatively small changes in forcing, and that is what really is concerning. So, I think the first part of this question is answered incorrectly--and the question is posed incorrectly. The second point is indeed the case. Because of the need to change the first point, some of the following text needs revision.	Thank your for the comment. We understand the point you are making, however we want to emphasize that the current period of warming is being driven by human emissions, which is captured in the first part of the answer. We did change the question from "how is" to "what makes" to get at the point that humans emissions are the driver.
Michael	MacCracken	144706	Text Region	Appendix 5: Frequently Asked Questions		1447	1447	10	13	I don't think one says "only processes" when earlier in sentence it says "such as" meaning the list won't be complete. And it isn't complete--changes in dust, vegetation asteroid impacts, continental drift, closing of the isthmus of Panama, orogenesis---all sorts of things have contributed to climate change. Fine to say climate did change due to natural forcings--what is really critical here is to say that past climate change was not just random bouncing around--the changes happened for reasons involving changes in forcing. The point is that, when Nature changed the forcing, the Earth's climate changed, so that when humans cause a comparable change in forcing, the climate would not be expected not to respond.	Thanks for the comment; the text was edited to be more inclusive of natural processes.
Michael	MacCracken	144707	Text Region	Appendix 5: Frequently Asked Questions		1447	1447	17	17	"has changed atmospheric composition"--be precise.	Thank you for the comment, the text was editied to be more precise
Michael	MacCracken	144708	Text Region	Appendix 5: Frequently Asked Questions		1447	1447	19	19	I'd at this point leave out "and future"--we are talking here about what has happened.	Thanks for the comment, we left out "future" to stick with the current message of the answer
Michael	MacCracken	144709	Text Region	Appendix 5: Frequently Asked Questions		1447	1447	25	25	Change "takes" to "took"--this is about the past.	Thank you for the comment, we changed "take" to "took"
Michael	MacCracken	144710	Text Region	Appendix 5: Frequently Asked Questions		1447	1447	26	26	than what? Needs to be stated.	we added "than the average rate of warming from a glacial maximum to a warm interglacial period"
Michael	MacCracken	144711	Figure	Appendix 5: Frequently Asked Questions	4	1449				Why a figure only going to 2009. Needs to be updated.	Thanks for the comment, we updated this figure with the most recent data that goes through 2014
Michael	MacCracken	144712	Text Region	Appendix 5: Frequently Asked Questions		1450	1450	10	13	While the scientific community did not come to consensus on this, there certainly were prominent individual scientists suggesting that the world might go into a cooling phase, and doing so for a couple of reasons. First, the first ocean sediment core indicated that 90% of the time it was colder than present and the average glacial cycle lasted about 100,000 years, so with the Holocene being about 10,000 years old, we were possibly due to head into a glacial period; more detailed analyses of the sediment cores indicate that the length of interglacials can vary from a few thousand to perhaps 40,000 years and our present situation is most like the orbital situation that led to the 40,000 year duration. Second, during the 1960s there was a continuation of the buildup of tropospheric aerosols that resulted from going to tall stacks to emit the gases from coal-fired power plants and it was thought the resulting cooling influence would be larger than the long-term CO2 warming influence because it was only beginning to be understood that the persistence time of at least some of the CO2 perturbation is many millennia rather than the several year lifetime of a particular CO2 molecule (which was a result that emerged in the 1960s when considering the lifetime of radioactive C-14 from atmospheric nuclear weapons tests. Third, the early satellite derived trends of wintertime snow cover showed a strong positive change--it turned out this was due to just occasiaonal, thin snow cover over the Tibetan Plateau, and so with a longer record the trend toward increasing snow cover went away. But there were strong proponents on both sides of the issue. The subsequent text seems to capture this pretty well.	Thank you for the comment. You are certainly right that there was discussion of possible explanation for cooling phases early on the development of the climate community. In the interest of keeping the FAQs short, readable, and targeted to as broad an audience as possible, we did not integrate the detail of your comment to the question. However, we did clarify in the answer that there was scientific discussion around understanding this from the beginning.
Michael	MacCracken	144713	Text Region	Appendix 5: Frequently Asked Questions		1451	1451	11	12	This needs to be more precise. I'd suggest change to "atmospheric gases that absorb and emit thermal (i.e., heat) infrared radiation." Then leave off the last phrase. The word "trapping" is not really correct--because the atmosphere gets warmer, the atmosphere actually emits more radiation than it did before. Because more radiation is now emitted back to the surface, this leads to the surface warming and emitting more radiation, etc. But, the atmospheric gases themselves to not really "trap" radiation.	Thank you for the comment, we included all of the suggested changes
Michael	MacCracken	144714	Text Region	Appendix 5: Frequently Asked Questions		1451	1451	15	16	Actually the process is quite different--a greenhouse roof/enclosure keep the evaporated mositure from escaping to the atmosphere and so the plants can't evaporatively cool. You might say "analogous" rather than similar.	We used the word analogous rather than similar
Michael	MacCracken	144715	Text Region	Appendix 5: Frequently Asked Questions		1451	1451	17	17	Well, ozone is a GHG and is not at all transparent to UV. I'd leave UV out of the discussion. Also, the UV only contains about 3% of the Sun's energy (despite what skeptic Peter Ward says), and since the UV radiation is mostly absorbed above the main greenhouse gas (i.e. water vapor), the UV radiation plays a very small role in the GH effect. There are solar IR wavelengths and that energy does matter.	Thank you for the comment, we included the suggested changes
Michael	MacCracken	144716	Text Region	Appendix 5: Frequently Asked Questions		1451	1451	20	21	Again, get rid of "trap" and say "absorb and re-emit"	We used the word absord instead of trap
Michael	MacCracken	144717	Text Region	Appendix 5: Frequently Asked Questions		1452	1452	1	5	And on Mars there is CO2, but no water vapor, so the GH effect is small and Mars is generally too cold for habitation.	Thank you for the comment, but it does not appear a suggestion is being made, although it is a good factoid.

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Michael	MacCracken	144718	Text Region	Appendix 5: Frequently Asked Questions		1452	1452	7	8	No--only about half of the Sun's energy reaches the surface. About 30% is reflected and about 20% is absorbed in the atmosphere.	Thank you for the comment, we included the suggested changes
Michael	MacCracken	144719	Text Region	Appendix 5: Frequently Asked Questions		1452	1452	8	9	Ozone also needs to be mentioned--indeed, it might be worth noting that all gases made of of three or more atoms are GHGs (so including CFCs, etc.).	Thank you for the comment, we incorporated your suggestion into to main text
Michael	MacCracken	144720	Text Region	Appendix 5: Frequently Asked Questions		1452	1452	15	15	There are no degrees of certaintly. Replace "certain" by "confident" as there are degrees of confidence.	Thank you for the comment, "certainty" was replaced with "confidence"
Michael	MacCracken	144721	Text Region	Appendix 5: Frequently Asked Questions		1455	1455	19	26	WRONG NUMBERS HERE. The 3,000 billion tons I think is the emission as CO2 (so including the mass of the oxygen atoms). The 10 billion tons per year is of C (carbon) so not counting the oxygen atoms. So, consistent units have to be used.	Thank you for your comment, this question was combined with the previous FAQ and this section was deleted
Michael	MacCracken	144722	Text Region	Appendix 5: Frequently Asked Questions		1455	1455	27	27	I think the number is more like 2.5 if one does a mult-iyear slope. With the atmospheric perturbation growing each year to accommodate about 50% of the emitted carbon, one can come pretty close to the ppm increase by dividing the emissions (i.e., the 10 of 10 billion tons of C per year) by 4.	Thank you for your comment, this question was combined with the previous FAQ and this section was deleted
Michael	MacCracken	144723	Text Region	Appendix 5: Frequently Asked Questions		1455	1455	32	32	"cyclical" not best word to be using. Natural processes mainly involve exchanges into and out of the ocean and into and out of the biosphere, that when the CO2 concentration was steady before human emissions from fossil fuels, were essentially equal and opposite, so no net exchange. With human activities only emitting CO2, the natural system is having to adjust to this persistent push, and it is leading to the increase in atmospheric concentration going up by the equivalent of what would result from half of the emitted CO2 remaining in the atmosphere.	Thank you for the comment, "cyclical" was replaced with balanced.
Michael	MacCracken	144724	Text Region	Appendix 5: Frequently Asked Questions		1456	1456	13	16	It doesn't seem to me that you are comparing equivalent items--I don't understand.	Thanks for the comment, the sentence was edited for clarity
Michael	MacCracken	144725	Text Region	Appendix 5: Frequently Asked Questions		1456	1456	17	17	Change "these" to "CO2 and" for clarity	Thanks for the comment, the sentence was edited for clarity
Michael	MacCracken	144726	Text Region	Appendix 5: Frequently Asked Questions		1456	1456	20	25	Yes, humans do add water vapor to atmosphere, but breathing it out as well. However, the atmospheric loading is controlled by the atmospheric circulation, plus to the extent that we directly raise the concenetration in the lower atmosphere, this reduces the gradient of water vapor concentration from surface to atmosphere, and so this suppresses evaporation. The typical lifetime of an atmospheric molecule in the atmosphere is of order 7-10 days, so it isjust hard to build up the concentration.	Thanks for your comment, the sentence was edited to include the life span of water vapor in the atmosphere.
Michael	MacCracken	144727	Text Region	Appendix 5: Frequently Asked Questions		1465	1465	12	12	I'd suggest the answer should be "This is just starting to become possible with respect to the large-scale factors that influence the local climate." The go to "With advances in computing power, Ã‰" and say can start to be projected. I'd really redo the question and use the word regions instead of communities.	Thank you for the comment, we incoorporated some of what you suggested into the answer and changed "communities" to "regions"
Michael	MacCracken	144728	Text Region	Appendix 5: Frequently Asked Questions		1467	1467	7	9	The example of volcanic eruptions might be given.	Thank you for the comment, a volcanic eruption was added as an example
Michael	MacCracken	144729	Text Region	Appendix 5: Frequently Asked Questions		1467	1467	10	14	Another example to list might be aerosol effects.	Thank you for the comment, we included aerosol effects as an example
Michael	MacCracken	144730	Text Region	Appendix 5: Frequently Asked Questions		1468	1468	10	22	I would think an important point to make would be with respect to the cold spells over eastern North America, which scientific research is suggesting is at least in part due to the effects of Arctic warming on the atmospheric circulation in the Arctic, the historical vortex not being strong enough to keep the cold air in the Arctic.	Thank you for the comment, however this question is related to longer term trends not short (days-weeks) cold snaps. The comment was noted and we included a sentence about polar vortex in the question about climate vs. weather.
Michael	MacCracken	144731	Text Region	Appendix 5: Frequently Asked Questions		1471	1471	9	14	We are actually making climate projections, not predictions--so that means we are saying if keep all non-human influences constant. There have been studies asking scientists to predict, so including what possible natural influences they think might happen and do, and the range of future temperatures broadens out in response. [see Delphi study done by Granger Morgan perhaps 25 years ago]	Thanks for the comment, we changed "predict" to "forecast", the second part of the comment is outside the scope of this question
Michael	MacCracken	144732	Text Region	Appendix 5: Frequently Asked Questions		1473	1473	5	5	This is a pretty strong statement--it did appear that may be the case due to some flaws in the oberving network that have been found and fixed, and due to the effects of some small volcanic eruptions. What really persisted was the warming influence of CO2 and other GHGs--it just ended up a bit hidden for a while and did not persist for 30 years, so not really appropriate to call it a hiatus.	Thank you for the comment, however, this comment does not appear to raise a question or suggest a revision.
Michael	MacCracken	144733	Text Region	Appendix 5: Frequently Asked Questions		1473	1473	17	18	And quite likely some warm biases in the ocean record from the years during World War II that have yet to be fully investigated and corrected for.	Thank you for the comment, however, this comment does not appear to raise a question or suggest a revision.
Michael	MacCracken	144734	Text Region	Appendix 5: Frequently Asked Questions		1475	1475	20	25	It might well be important to explain that the increase in warm extremes (and decrease in cold extremes) if one compares what was happening in the mid-20th century. If one instead keeps updating ones normal/baseline, there is still a bell-shaped distribution of decadal temperature anomalies, etc. So, when making the statement, important to say with respect to values that are fixed in time, such as over 90F, etc.	Thank you for the comment, we included a statement regarding reference points in the answer
Michael	MacCracken	144735	Text Region	Appendix 5: Frequently Asked Questions		1476	1476	11	15	As Trenberth has noted, with as much influence as the increased CO2 is having, everything is at least being affected somewhat by human influences and nothing is truly natural. What the attribution studies look at is the relative likelihood of an even occurring in the past to the relative likelihood in the present, and, indeed, there are events occurring now that were very rare in the past, if they occurred at al.	Thanks for the comment, we incoorporated the second half of this statement into the answer. The first part of the comment is a bit out of the scope of this question.
Michael	MacCracken	144736	Text Region	Appendix 5: Frequently Asked Questions		1477	1477	14	16	It is not that natural variability caused the event--it is that the likelihood of it occurring in the past is about the same as it occurring today--"caused" is the wrong word.	Thank you for the comment, the sentence was edited and reworded to remove the word "caused"
Michael	MacCracken	144737	Text Region	Appendix 5: Frequently Asked Questions		1479	1479	18	19	Actually, the projections do include situations where the same area could have both more floods and droughts (not at the same time), and this should be noted. An example is California with general aridification, and then years with atmospheric rivers.	Thank you for the comment, we included a statement regarding dry areas with increased flooding
Michael	MacCracken	144738	Text Region	Appendix 5: Frequently Asked Questions		1481	1481	13	14	A statement drawing on title to report a number of us authored about a decade ago (UN Foundation and Sigma Xi sponsored the activity).	Thank you for the comment, however, this comment does not appear to raise a question or suggest a revision.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144739	Text Region	Appendix 5: Frequently Asked Questions		1482	1482	11	12	I would suggest that what really matters is reducing emissions of short-lived species. If we do it soon, we can have an effect before 2050. For CO2, generall , it is total emissions that matter--a bit less on the timing.	Thanks for the comment, we added a sentence about reducing short lived species
Michael	MacCracken	144740	Text Region	Appendix 5: Frequently Asked Questions		1484	1484	24	32	I was surprised not to see food and food prices on there. If there are food shortages, this will pull money out of it being used for other purposes like funding the ongoing academy, and a global recession or worse could result.	Thanks for the comment, in the body text we discuss drought as it relates to agriculture
Michael	MacCracken	144741	Text Region	Appendix 5: Frequently Asked Questions		1485	1485	17	24	You main answer leaves off the potential for geoengineering as a complement to mitigation and adaptation, both SRM for the short term and CDR for the longer term so SRM could be phased out.	Thank you for the comment, we incorporated your suggestions of includeing CDR and SRM in combination with mitigation and adaptation, then phasing out SRM
Michael	MacCracken	144742	Text Region	Appendix 5: Frequently Asked Questions		1487	1487	5	10	This answer is focused on using these approaches along, and no one advocates this. The question is whether they can complement mitigation and adaptation, not if they can do it alone. I would note that neither mitigation nor adaptation can do what is needed alone either--and os it is really mistaken to be considering geoengineering approaches alone. Given where we are, we need a comprehsnive approach that considers the potential role of each and relative costs, and I'd suggest when one does this, the geoengineering has a very important role to play and the answer here is just inappropriate. For example, there appears to be no practical way for mitigation to keep the temperature to 1.5 C, which will lead to impacts such as ongoing sea level rise that adaptation cannot possibly cope with except at very, very high cost. The global average temperature increase really needs to be below 0.5 C as rapidly as posssible (see Hansen et al paper on consequences of being over this value--given climate sensitivity from paleoclimate being of order 15-20 meters per degree at equilibrium). And there is no way mitigation and adaptation can do this. CDR can, likely over many decades, though there are efforts to find ways to get to negative emissions faster--but aggressive mitigation is also required. The notion is that one might use SRM to do it early and then phase it out as CDR takes over, so a much smaller role for SRM (global, or perhaps just regional) than is covered in most ot the papers to date that are very exploratory as virtually no research is being funded. Basically, I think the position taken in this opening statement is not technically correct and does not even cover what is being suggested, which is a coprehensive approach using all possible and needed approaches. We are too far along to do anything less.	Thank you for the comment. This question is posed to introduce people to the idea of geoengineering, not to advocate the use of geoengeering alone. We have edited the response to incorporate some of your suggestions, such as complimenting geoengineering with adaptation and mitigation and noting that much of the geoengineering research is still in the developmental phase. We cannot, however, advocate for the use of any particular geoengineering method or even the we need to use geoengieering as that would be policy perscriptive.
Michael	MacCracken	144743	Text Region	Appendix 5: Frequently Asked Questions		1487	1487	17	21	Iron fertilization is only one of suggested approaches. There are a number of others that would have much more capability and could be done in the open ocean where little marine life is no present. Basically, what is said here is no up-to-date. And the question is how the supposed "harmful consequences" would compare with not doing it--the harm from which is potentially huge.	Thanks for the comment, we noted that this was one of the first proposed methods and that there are cost-benefits to all approaches.
Michael	MacCracken	144744	Text Region	Appendix 5: Frequently Asked Questions		1487	1487	28	29	This is simply WRONG! (1) It is widely agreed that the cost would likely be far less than mitigation(once past the lowest hanging fruit) and CDR (though some researchers are working on this). One of the concerns is that it is so low cost that mitigation might not be pursued, which would be disatroous as there are limits to how much SRM can be done without creating other serious issues and a very extended commitment. (2) There are limits in understanding as virtually no research has gone on into it, but I'd suggest that we should have more confidence in models simulations for SRM, which keeps the climate near to what we know and experience, than for ongoing GHG driven climate change, where the climate is headed to conditions for which we have no experience--the uncertainty situation is backwards compared to the text. (3) Indeed SRM is not perfect but the question is whether one would be better off with mitigation plus CDR and SRM or with mitigation without CDR and/or SRM. I don't know anyone (wel, except those with mirror-based solar systems) would would be upset if there just happened to be an ongoing series of mnor volcanic eruptions going on to keep the temperatures a bit cooler than they otherwise would be--yet if this were done by humans, there is all this fear of unintended consequences. I really do think an appropriate consideration of the situation we face needs to be done and this answer is not even cose to that.	We modified the text to simply state what SRM is and that it is a under researched. This section of the report is not meant to go into detailed analysis of these techniques or what we should or should not do, it is here to engage the reader to hopefully use the resources suggested to learn more.
Michael	MacCracken	144745	Text Region	Appendix 5: Frequently Asked Questions		1492	1492	15	15	I'd urge saying "The oceans have absorbed over 90% of Ã‰" 93% is too precise and there is no assurance this will continue in the future as emissions change, so verb needs to be changed.	Thank you for the comment, we revised the sentence to say "the oceans have absorbed…"
Michael	MacCracken	144746	Text Region	Appendix 5: Frequently Asked Questions		1495	1495	15	15	A qualifying phrase needs to be added, saying "growth, assuming other factors like water and nutrients are not limiting'	Thank you for the comment, the text was revised to incorporate the suggestion.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Clifford	Thompson	140828	Whole Document							Concern: With global ice melting far faster than predicted, our plight seems relatively dire & the time to turn things around fairly short. Solution: Remove all CO2 added to the air since the Industrial Revolution, in 1-10 years using a forest of Columbia University geophysicist Klaus Lackner's synthetic trees. Abstract: Each of Columbia University geophysicist Klaus Lackner's High Volume Shipping Container synthetic trees removes 90 Kilotons of CO2 per year. Roughly 600-900 Gigatons of CO2 have been added to the air since the Industrial Revolution (IR), thus needing 10 million trees to remove it all in 1 year, or 1 million in 10 years (Al Gore‰Ûªs timetable) or 0.3 million in 30 years (John Doerr‰Ûªs timetable). Note that in 2002-2003 China alone added 10 million cars to its roads. Since global ice is melting much faster than predicted, consider the need as urgent & go for the shortest time period doable. Of all global warming/CO2 removal geo-engineering proposals, such as increasing cloud/ice reflectivity, stimulating oceanic plankton blooms or launching orbiting space sunshades, most all of which augur unanticipated & potentially disastrous run-away ecological responses, synthetic trees are the safest because they aren‰Ûªt ecosystem invasive - serving as a distributed, planetary scale CO2 scrubber, they simply mimic natural tree‰Ûªs CO2 removal ability & give humanity breathing room to develop & switch to Net 0 CO2 tech. Even if all other reduction schemes fail, the trees will remove all post Industrial Revolution CO2 to the present, can continue to run as a stopgap to remove future global annual contributions, & can be switched off when done. A primary aim of this proposal is to supplant the many lines of attacking the CO2 problem with an alternative approach - it does not require or rely upon the success of any other CO2 reduction scheme, nor does it deem likely that remaining fossil fuel will go undeveloped & that developing nations will curtail their development programs. This proposal‰Ûªs alternative approach is that it recommends a single, relatively simple, direct & failsafe method of CO2 removal regardless of source or quantity, thereby providing countries the time to make the changes to renewable/sustainable technologies & meet the UN IPCC goals without damaging their economies. Detail: A specific approach to implement the project has been submitted as a proposal to the MIT Center for Collective Intelligence Climate CoLab, titled ‰ÛÏEnd Global Warming & Climate Change Now‰Û at http://tinyurl.com/EndCO2Now	We appreciate this comment; however, revising the report to address this comment is outside the scope of the document. The aim of the National Climate Assessment is assess the state of understanding of climate change, the science underlying it, and current and potential impacts on the United States. The assessment is not aimed at assessing the viability and economics associated with or promoting speciifc ideas for mitigating climate change.
Kate	Larsen	140834	Whole Document							I am a member of the Climate Impact Lab and one of the authors of our American Climate Prospectus work. Our team wanted to make sure the correct citation isused. The report is cited as a working paper (2014) throughout the NCA, but should instead be the book which was subsequently published in 2015. The correct citation for the American Climate Prospectus should be: Houser, T., Hsiang, S., Kopp, R.E., Larsen, K., Delgado, M., Jina, A., Mastrandrea, M., Mohan, S., Muir-Wood, R., Rasmussen, D.J., Rising, J. and P. Wilson. (2015). Economic Risks of Climate Change: An American Prospectus. New York, NY: Columbia University Press. All references to Houser et al. 2014 throughout the report should be changed to Houser et a. 2015.	We appreciate this comment and have corrected this reference where appropriate.
Javier Lorenzo	Galindo Ozuna	140854	Whole Document							Phoenix.org It is a non-pro t organiza on, for real democracy and the development of humanity, independent of poli cal par es, with legal validity and opened to all ci zens. The Phoenix organiza on has a code of founda ons for human improvement, towards resource-based neocapitalism: 8th sector: Erudi on 8.sector There is no produc ve sector capable of mee ng the current demand of employment, neither now nor in the future. With the fourth industrial revolu on, jobs required will be very speci c. Pallia ve measures are not valid to eradicate the problem. We‰Ûªd need deeper and more structural ones: universal basic income, 3-hour workday per day, exible recruitment, programs to help companies or philanthropic redistribu on of wealth. The Phoenix organiza on will create Erudi on, an eighth sector, based on learning, as the universal law of employment, with a living wage, augmented by merit. The salary will be paid in phoenix virtual currency and calculated with the following formula: Mean of the average qualita ve wage and the minimum wage + Annual percentage obtained and calculated on the basis of the salary received. Higher Educa on/courses: 6-12% Bachelor's degree: 6-12% Master: 12-18% Doctorate degree: 18-24% Erudi on will have a program of agreements with universi es and a ached learning centers, as well as aid for their crea on. You can choose a workday and complete the hours that best suit your needs, both face-to-face and online. Universal basic income, it will be an op on of conformists in the coming years, because the fourth industrial revolu on is a reality. Edvi: edvi.com Will be the e-Sports of knowledge, where you decide the limits of your ambi on. The amount of the lot is decided by bets and par cipants. Phoenix virtual currency This digital currency will be paid to the employees of the eighth sector and Edvi knowledge sportsmen through the public bank, Phoenix Bank, pbank.com The currency will be issued and regulated by United Central Banks,	We appreciate this comment but its content does not relate to the scope of this document.
Javier Lorenzo	Galindo Ozuna	140855	Whole Document							I found Madeleine and real brothers!!! His false name is Raquel Ludel±a My name is Javier Lorenzo Galindo Ozuna and my brother Eric Garrido. We all live in Sant Andreu de la Barca	The content of this comment has absolutely nothing to do with the scope of this document. However, the commenter's excitement is noted.
Pei-Lin	Yu	140861	Whole Document							An excellent document overall. I commend its authors for their expertise, creativity, and hard work in a very difficult political setting. My overall comment is that cultural heritage merits its own section. The topic is mentioned many times, but mostly as an 'add-on' to indigenous, tourist, recreational, and case study sections. The number of mentions alone indicates this topic is of major importance in understanding impacts of climate change, past and present, to human cultures--as well as resiliency and adaptation.	We appreciate this suggestion. The outline of the NCA4 Vol. 2 report has already been set, but this comment will be taken into consideration in future USGCRP assessment efforts.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Dave	White	140868	Whole Document							There is no global warming. Mostly northern hemisphere warming. You can see these NOAA graphs here: http://cctruth.org/index.php/data/. The oceans will not rise anymore then the past. The satellite data shows the same rate. (you can see the EPA graph at cctruth.org at the bottom) Increased evaporation due to less salty water and warmer oceans is keeping the rate the same. This same evaporation increase is making more and severe storms. These increase the clouds. The clouds historically reflect 20% of the suns energy. With increased clouds more will be reflected until an equilibrium is reached. Also with Pearson regression we received a 0.19 factor for co2 emissions as the cause of the co2 increase. We received a 0.90 for destruction of the rain forest as the cause. That paper is under review at a climate journal. You can see all the truth about climate change on the reports page. CO2 does not go into the ocean. The diffusion coefficient in air is 10000 times that in water. It just waits in the atmosphere until a plant grabs it. You can learn about diffusion in Welty Wicks and Wilson. Fundamentals of Momentum, Heat and Mass transfer.	We disagree with this comment as it is directly contradicted by the scientific literature as summarized in NCA4 Volume 1. We refer the reviewer to Volume 1 for more information on the scientific basis for observed change, natural and anthropogenic forcing, and ocean acidification. It is accessible at science2017.globalchange.gov.
Elizaveta Barrett	Ristroph	140905	Whole Document							"arctic" should be "Arctic" when it is used to modify something located in the Arctic geographical regions. Lowercase is only used as a general adjective like "arctic winds"	We use "arctic" when it is an adjective and "Arctic" only when referring to the region proper. Editorial staff has worked to ensure consistency in this approach throughout the report.
Robert	Kopp	141100	Whole Document							I agree with the content, scope and general conclusions presented so far. There were many figures that could not be accessed so my comments are based only on the current content. While I am not a climate scientist, my world is that of global air quality, specifically carbonaceous particulate matter. The information synthesis and discussion presented are very relevant to my field because of the completeness and wide-ranging array of data and observations. In addition to the US Global Change Research Program, I also follow the BAMS State of the Climate Report. It would be useful if the USGCRP Climate Indicators and the BAMS Essential Climate Variables were consistent. A number of these climate parameters are the same, may have different names, or are not included (BAMS has many more than USGCRP). I can see using this updated report in the classroom in my undergraduate and graduate hydrology classes. It would be great if there were direct links to data used (EXCEL) to produce this document. We could create some interesting exercises in MatLab illustrating climate change science. Also, I use ESRI ArcGIS. Data layers and geodatabases that could be used in ArcGIS also would be very useful. Great work. Thank you.	We appreciate these helpful and constructive suggestions. In Chapter 2, there is a box on the USGCRP climate indicators that provides more information, including additional resources. We have also revised the Indicators figure in the Overview, which may address some of this commenter's question. There is a history of USGCRP Indicators as initially laid out in work such as this paper: https://link.springer.com/article/10.1007/s10584-016-1609-1 More recently, the USGCRP Indicators Inter-agency Working Group has re-focused their efforts and are implementing a new Indicators Platform: https://www.globalchange.gov/browse/indicators. As far as the specific comparison between Indicators and ECVs go, the ECVs were built to help define the observations and data streams needed to help refine our understanding and modeling of the climate system, and have an "observational inputs" origin. The climate indicators, while they overlap with the ECVs, are more intended to inform decision-making and understanding that includes, but is larger than, the monitoring of the climate system itself.
Robert	Kopp	141172	Whole Document							Throughout the report, the document refers to results from the American Climate Prospectus or the Risky Business Report, cited alternatively as Gordon, 2014; Risky Business, 2014; Houser et al. 2014; and Houser et al. 2015. The American Climate Prospectus is the peer-reviewed technical analysis, whereas the Risky Business Report is a summary for policymakers; I would therefore suggest citing the ACP instead of the Risky Business Report. The final version of the ACP was published in 2015 by Columbia University Press; the 2014 version is a Rhodium Group report. Citations should be to Houser et al. 2015: T. Houser, S. Hsiang, R. Kopp, K. Larsen and others (2015). Economic Risks of Climate Change: An American Prospectus. New York: Columbia University Press, 384 pp.	We appreciate this comment and have corrected this reference where appropriate.
Robert	Kopp	141194	Whole Document							Consideration should be given to include a sea-level rise projection figure based on the regional results of Sweet et al 2017 in each of the regional chapters addressing a coastal region. Right now, this is done intermittently and with inconsistent sourcing.	We have now included a map / figure of the downscaled SLR projections from Sweet et al. in the Overview, providing this valuable new information greater visibility. Each (coastal) regional chapter decided whether it was appropriate - and whether space contraints permitted - to include such a figure.
Christen	Armstrong	141605	Whole Document							My comments on the whole document are included in the Microsoft word file NA4_wholecomment_PJM, which has been emailed to review@usgcrp.gov.	The comments contained in this submitted .docx file raised several highly-technical concerns, all of which are addressed in other comments throughout this spreadsheet, as well as by directing the reader to Chapter 2 of NCA4 Vol II and Vol I in its entirety (science2017.globalchange.gov) - including its appendices and references.
Rebecca	Ambresh	141764	Whole Document							The U.S. so far is performing very poorly toward reducing its contributions to global warming. The U.S. is decreasing the chances of leaving a livable planet for future generations of humankind. But this scientific assessment of those chances is a great contribution toward convincing U.S. citizens to wake up and improve, or in some cases continue to improve!	No changes were made; we appreciate the enthusiasm for this report.
Mohammed	DIOURI	141779	Whole Document							Release the whole document as currently based on the best scientific information possible. Do NOT, under any circumstances, or for any reasons, alter scientific conclusions for political ends. Do not even hedge. Speak the plain truth.	We appreciate this encouragement.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
fourtimesayear	fourtimesayear	141893	Whole Document							Climate change is a false premise for regulating or taxing carbon dioxide emissions. Political leaders who advocate unwarranted taxes and regulations on fossil fuels will be seen as fools or knaves. Nature converts CO2 to limestone. Climate change may or may not be occurring, but is NOT caused by human fossil fuels use. Temperature records relied upon by researchers are corrupt for many reasons. They used weak proxies for periods prior to 1850. Actual temperature readings were tampered with. Evidence such as ice cores suffer poor chain-of-custody, and were altered by ambient conditions. Temperature changes cause changes in ambient CO2; not vice versa. Temperature caused by naturala forces cause changes in CO2. since 95% of CO2 air emissions are emitted by rotting vegetation, of course such en=missions will be higher at higher temperatures. There is no empirical evidence that fossil fuels use affects climate. Likely and well-documented causes include sunspot cycles, earth/sun orbital changes, cosmic ray effects on clouds and tectonic plate activity. The further point here is that earth naturally recycles all carbon dioxide. Fossil fuels emit only 3% of total CO2 emissions. 95% comes from rotting vegetation and other sources. All the ambient CO2 in the atmosphere is promptly converted in the oceans to calcite (limestone) and other carbonates, mostly through biological paths. CO2 + CaO => CaCO3 (exothermic). The conversion rate increases with increasing CO2 partial pressure. A dynamic equilibrium-seeking mechanism. The organisms that convert dissolved CO2 to calcite all have short lifespans. At the most basic level, they include cyanobacteria and sea butterflies. Higher levels include corals, bivalves and other crustaceans. An acre of oysters or mussels can create 100 tons of calcite in a single season. 99.84% of all carbon on earth is already sequestered as sediments in earth's crust. The lithosphere is a massive hungry carbon sink that converts ambient CO2 to carbonate almost as soon as it is emitted. The Paris Treaty is now estimated to cost up to to $100 trillion -- $13,333 per human being. Nearly two-thirds of humanity's cumulative savings over history. And will not affect climate at all. A modern coal power plant emits few air effluents except water vapor and carbon dioxide. Coal remains the lowest cost and most reliable source of electric energy, along with natural gas. Coal has always competed effectively with natural gas.	We disagree with this comment in its entirely; it is directly contradicted by the scientific literature as summarized in NCA4 Volume 1 (as well as many other prior analyses and assessments of the science). We refer the reviewer to Volume 1 for more information on the scientific basis for observed change, natural and anthropogenic forcing, and more. It is accessible at science2017.globalchange.gov.
Richard	McNider	141894	Whole Document							I would put forth that there is no need to be concerned about this issue. Several points: There is no global temperature. An average is a statistic that won't melt ice anywhere. CO2, let alone man's 3% yearly contribution to it, does not determine climate. Climate is determined by location in relation to the tilt of the planet as it orbits the sun, altitude and proximity to large bodies of water. This used to be standard grade school education. CO2 does not control the jet streams; it does not control the ocean currents, it does not control the spinning of the planet, its tilt or its orbit around the sun; it doesn't determine the input from the sun or cosmic rays. There are much greater forces at work, none of which we have any control over. It's time to put this foolishness behind us and deal with real life issues.	We disagree with this comment as it is directly contradicted by the scientific literature as summarized in NCA4 Volume 1. We refer the reviewer to Volume 1 for more information on the scientific basis for temperature change throughout the planet, the use of globally averaged temperature as a metric, the contribution of natural and anthropogenic forcing to observed warming, and the latest scientific understanding on future projections and on the relationship between climate change and atmospheric circulation. It is accessible at science2017.globalchange.gov.
Jan	Dash, PhD	141895	Whole Document							Comments on the NCA-4 Whole Document by Richard McNider and John Christy, The University of Alabama in Huntsville. In the last 25 years climate science assessment documents from the IPCC to the Present NCA-4 have devolved from a rational accounting of knowns and unknowns to a one-sided epistle for climate action. This has come about as physical climate scientists with skeptical views have been systematically removed or marginalized in the assessment process. Additionally, physical climate scientists have been replaced by social/ecological/chemical scientists who are ascribing impacts without understanding that the impacts they attribute to GHG climate change are not a signal of GHG climate change. The present system has produced an echo chamber with little curiosity to address the basic fundamental signals of climate change that are inconsistent with theory and models. The most disturbing aspect of the NCA-4 is the certainty expressed throughout the document. Most everyone who has dealt with the complex physical climate system directly understands that known and unknown interactions produce large uncertainty in both near-term and long-term climate forecasts. There seems to be no curiosity for addressing aspects of the climate system that models consistently fail in verification. Red Team: A solution to bring back more diverse views into the assessment process is to form ‰ÛÏRed Teams‰Û that will specifically look for failures, problems or unresolved issues with the assessment. The findings of the Red Team could be refuted by the regular assessment team. The problem that came about from the IPCC process was the belief that action would be taken only based on consensus. Then the make-up of the IPCC was developed to ensure that the majority were non-skeptical and no minority views were every published. In the Red Team process if issues are unresolved then the Red Team position would be published as a minority opinion as part of the Final Assessment Document. There is also a need to fund Red Team Science since the current peer review process ensures that skeptical proposals are seldom accepted by a majority based peer review process. Lack of Deep Atmospheric Warming: While the NCA-4 contains a litany of weather phenomena and impacts that are linked to climate change, the fundamental fact remains that actual global warming is proceeding at a pace well below the model projections that have been made by the climate change community over the last three decades. For all the concerns about changes listed in the assessment, the basic tenet of GHG climate change as	We disagree on almost all of the diverse statements made in this comment. First, there was no bias at all in the author selection process. The authors were selected after an open process for nominations (through a Federal Register announcement). This was the case for both NCA4 Volume 1 and Volume II. The selection of the authors by the Federal Steering Committee considered a variety of criteria, the most important of which were the accomplishments of the prospective authors and their likelihood for accurately assessing the state of understanding of the changes in climate and resulting impacts for the chapters they were selected for as an author. Early in the commentary, there was also mention that “physical climate scientists have been replaced by social/ecological/chemical scientists”. That is not true of NCA4 Volume 1 on the science of climate change or the associated chapter 2 in Volume II. However, it is important that the impacts analyses in much of Volume II truly reflect the experts in impacts, and those often come other disciplines. However, we have also maintained strong interactions between the physical scientists and the impacts analyses to ensure that the connections of the impacts to climate are carefully accounted for in the assessment. It should be noted that Chapter 2 in Volume II is a short summary of findings from the now published Volume 1. Uncertainties of the science are extensively discussed in Volume 1. It is important to recognize that volume II builds on Volume 1 and does not replace it. Volume 1 does discuss the issues raised by the reviewers related to the science of climate change, including the concerns about models and associated uncertainties (for example, note that for the first time in an assessment a weighting was applied to the models in NCA4 based on how well they represented observations that has not been found in any previous assessment – see Chapter 4 and Appendix B of NCA4 Volume 1). We also refer the reviewers to the Traceable Accounts, which describe in greater detail than is possible – or intended – for the narrative text just how “certain” the authors are in a given conclusion – and why / how they came to that level of certainty in a given conclusion. Traceable Accounts are found for any key finding made in both Volume 1 and Volume II. Comments about models overestimating the observed trends in globally-averaged temperature primarily relate to the slowdown in the rate of temperature increase that occurred between about 2000-2013. The slowdown in temperature change during the 2000- 2013 time period and why that is not fully represented in the modeling studies is extensively discussed in NCA4 Volume 1, especially in Chapter 1 but is also discussed in later chapters.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Anne	Jensen	141896	Whole Document							NCA4 TOD Comments by Jan W. Dash PhD Whole document 1/29/18 PAGE, LINE: *IS *SHOULD BE SUGGESTION Page, line: 5, 32. *Is: The RCPs *Should be suggestion: No dynamic non-stabilizing RCP scenarios exist past 2100. The RCPs Page, line: 7, 9. *Is: Risk Framing *Should be suggestion: Climate Change Risk Management Framing Page, line: 7, 11. *Is: climate changes *Should be suggestion: climate change Page, line: 7, 18 and 22. *Is: impacts, both positive and negative *Should be suggestion: impacts, both negative and positive Page, line: 16, 25-27. *Is: nutrients, and ocean circulation are contributing to overall declining oxygen concentrations in many locations. *Should be suggestion: nutrients, ocean circulation, and declining oxygen concentrations are consequences of human-caused emissions. Page, line: 17, 24. *Is: increases in Atlantic hurricane activity *Should be suggestion: increases in Atlantic hurricane intensity Page, line: 19, 12. *Is: climate extremes. *Should be suggestion: climate extremes. Climate-induced economic instabilities can occur. Page, line: 19, 26. *Is: While a few aspects of our economy may see slight improvements in a warmer world, without *Should be suggestion: Without Page, line: 21, 4. Is: affect *Should be suggestion: negatively affect Page, line: 23, 9. Is: United States. *Should be suggestion: United States. A multi-trillion dollar opportunity exists for the transition to a renewable energy economy that will mitigate climate change. Page, line: 24, 26. Is: among others. *Should be suggestion: among others. These actions will also reduce climate risk and damage to our descendants. Page, line: 25, 1,2. *Is: especially emissions of greenhouse gases from burning fossil fuels and clearing forests *Should be suggestion: especially emissions of greenhouse gases from burning fossil fuels and to a much lesser extent clearing forests	There are a number of individual comments contained within this single comment. All of them pertain to specific sections of either the Front Matter, Report Findings, or the first part of Chapter 1 (Overview). Readers are directed to the Report Findings, Front Matter, or Overview comment responses to see specific responses: (1) This text region has been edited to read: "More intense weather and climate extremes, expected in a warmer world, will continue to damage the infrastructure, ecosystems, and social systems that provide essential goods and services to communities. Future climate change will further disrupt many areas of life, exacerbating existing and revealing new challenges to prosperity posed by aging infrastructure, stressed ecosystems, and social inequality." (2) It is unclear what change this comment is recommending. Based on another comment, this sentence has been revised to read: "While a few aspects of our economy may see slight improvements in a warmer world, without efforts to reduce greenhouse gas emissions and adapt to climate impacts, climate change is projected to cause substantial damage to the U.S. economy." (3) The effects described here are not uniformly negative; no change. (4) This text has been updated to better reflect mitigation opportunities. (5) The suggested text is not appropriate for this section of the Overview, but similar text has been added later in the Overview that reads: "Actions not taken today will increase risks for future generations and limit their available options to reduce risks." (6) This comment has been accepted and this sentence has been edited to read: "The long-term warming trend observed over the past century can only be explained by the effects that human activities, especially emissions of greenhouse gases from burning fossil fuels and, to a much lesser extent, deforestation, have had on the climate." (7) Not all impacts referenced here are negative. No change. (8) This region of text has been removed. (9) The authors have determined that this broad statement is not supported by the underlying chapters and does not fit in this context. However, this point is made elsewhere in the Overview; for example: "[NCA4] concludes that the evidence of human-caused climate change is overwhelming and continues to strengthen, that the impacts of climate change are intensifying across the country, and that climate-related threats to Americans' physical, social, and economic well-being are rising." No change. (10) This text region has been removed. No change. (11) This text has been moved to a different section of the Overview and the suggested change has been implemented.
Puja	Roy	141956	Whole Document							Comments on the Fourth National Assessment John R. Christy, Alabama State Climatologist and Richard McNider, The University of Alabama in Huntsville This comment is narrowly focused on the issue of using regional climate model projections demonstrating that their use in NA4 fails the data-quality requirement. Due to our extensive agricultural research on climate variations and trends in Alabama we have studied the ‰ÛÏfitness for purpose‰Û of the IPCC AR5 CMIP-5 climate models regarding their applicability to agricultural productivity in the 21st century in our region. We performed simple but tedious analyses on the climate model output over the past century (and more) to determine the quality of the model simulations when compared with observations. These results were published in the American Meteorological Society‰Ûªs Journal of Applied Meteorology and Climatology (Christy and McNider, 2016). One key result is given in Fig. 12 and emailed as part of this response (with annotations for clarity). We examined 76 simulations for 1895 to 2013 from the CMIP-5 models for the state of Alabama as a test of their utility. [Though these runs utilized the rcp8.5 forcing, the period examined (1895-2013) had common forcing in all of the rcp scenarios.] As can be seen, the output for model trends indicated all models produced very positive temperature trends (red) when in fact the observed trend was negative (-0.09 âiC decade-1 and virtually identical between the time series constructed by us in this paper and that of NCEI/NOAA). Thus, 100 percent of the models were in error on the most basic of parameters ‰ÛÒ the sign of the temperature trend. Additionally, the great majority of simulations were in error on the trend in precipitation (blue) over the period. Our conclusion stated, ‰ÛÏ‰Û_ CMIP-5 climate model runs are examined for Alabama and indicate no skill at replicating long-term temperature and precipitation changes since 1895‰Û (emphasis added). Indeed the skill level was actually negative. This result is generally true for the Southeastern US as a whole. We thus demonstrated that all of the models failed a simple statistical validation test of a critical parameter ‰ÛÒ surface temperature. As such, NA4 has no scientifically-defensible basis to go forward and use such simulations to project future climate changes and impacts from those changes. These models have not passed a simple validation exercise which we have published in the peer-reviewed literature.	While we agree that the global CMIP5 models largely do not represent the observed temperature changes in Alabama and various parts of the Southeast (the lack of warming in parts of that region over the last century relative to the extensive warming of most other parts of the United States are discussed in Chapter 6 of NCA4 Volume 1), a major result from Volume 1 was high resolution downscaled evaluations of the regional climate changes that combine model results with observational data. There has been discussion in the science community of whether there are processes not being considered in the global models (e.g., the deforestation of the southeast in the 19th century followed by the reforestation in the 20th century), but the exact causes of the lack of warming in the Alabama region remain uncertain. The downscaled analyses provide an enhanced evaluation of the past and projected future changes for the authors to use in the regional analyses in Volume 2. Since they have a strong tie back to the observations at the local scale, there is more confidence in those analyses relative to just using the results from the global models at the local scales for some regions. We refer the authors of this comment to the discussion of the downscaled products that can be found in Chapter 4 of Volume 1.

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Nicholas	Rajkovich	141981	Whole Document							As this is the fourth NCA it would be fitting to include a review of predictions from previous reports to see how well or badly they played out. The 1st NCA in 2000 predicted (p. 17) that the US would warm between 0.3 and 0.9 oF per decade. It‰Ûªs now nearly two decades later. GISS data for the US is available at https://data.giss.nasa.gov/gistemp/graphs/. Regressing the data from 1997 to 2007 on a time trend yields a warming rate of 0.18 oF per decade which is well below the bottom end of your predicted range. If you cut out the 1998 El Nino and just use the 2000-2017 data the rate is only 0.27 oF per decade, still below the low end of your predicted range, even with a big El Nino spike at the end. Speaking of the El Nino, in several places you say that US average temperatures have risen by 1.2 oF ‰ÛÏover the last few decades.‰Û (It is unclear what the start and end dates are) It is dishonest not to mention the role of the El Nino spike. This report was drafted with data ending in 2016. The GISS US temperature in 2014 just prior to the El Nino was 0.32 oF and in 2016 it was 1.66 oF , a jump of 1.34 oF, which means that the entire increase you are referring to happened in the last 24 months as a result of the El Nino at the end of the sample. These examples point to a pattern of one-sidedness that pervades the document. In the sections I read I saw no attempt to give the reader a balanced understanding of major systemic uncertainties or model failings. The document maintains a promotional tone throughout for a view of climate change as a severe unmitigated catastrophe based on model projections which are nowhere acknowledged to have a history of overstating warming trends. The failure of the catastrophes outlined in NCA-1 to materialize doesn‰Ût seem to have given the authors of NCA-4 the least pause. Picking up on the extraordinary over-prediction from NCA-1, ample recent evidence has shown that measured climate sensitivity is well below CMIP3 and CMIP5 model parameterizations. Dayaratna et al. (2017) re-ran the EPA‰Ûªs Social Cost of Carbon models using the Lewis and Curry (2015) ECS estimate and the SCC fell by 40-80% depending on the model. In the only Integrated Assessment Model that allows for gains from moderate warming (FUND), there is a 40% chance that the Social Cost of Carbon globally will be negative through 2050. Overall the document has a biased and one-sided tone. I can only assume that the authoring team was filtered ahead of time to include proponents of one side, and any balancing material was carefully excluded. As such this document lacks the quality necessary to inform public policymaking. Refs: Dayaratna, Kevin, Ross McKitrick and David Kreutzer (2016) Empirically-Constrained Climate Sensitivity	We disagree with the statements made in this comment or its suggestions for additional discussion for a variety of reasons. First, regarding the first paragraph, the assessments are not making predictions, they are projections that depend on various factors, including the emissions assumptions made about the future. Secondly the analyses of climate change are made on 30-year time scales not 10-year time scales; it is important to actually capture the time scales of climate (using the definition of the World Meteorological Organization). Third, by focusing in on the period since 2000, the author of the comment is really referring to the slow down period, which is discussed extensively in Chapter 1 of NCA4 Volume 1 – there we also explain why the models would not be expected to capture the trend for that shorter period. Fourth, the understanding of the science does evolve over time -- there is no need to evaluate the findings of this assessment relative to prior NCAs. Regarding paragraph 2 of the comment, there is extensive discussion of the effects of ENSO in NCA4 volume 1. The analyses in Chapter 2 use trends over 30 year periods or longer (to capture climate timescales as mentioned above) where the effect of specific El Nino events are much more limited (not to mention that 2017, a neutral to La Nina year, was found by the same NASA analyses to be the 2nd warmest year on record). So our analyses are representative of long term trends and are not tied to years when there was a particular ENSO event. All peer-reviewed findings for climate sensitivity were considered in this assessment, including the full range of analyses of the climate sensitivity, not just those preferred by this reviewer (see NCA4 Volume 1 for more detail on climate sensitivity). The references preferred by the reviewer have been shown by other papers to have major limitations and their findings have been overtaken by other recent references. These are discussed in NCA4 Volume 1.
Sarah	Davidson	141984	Whole Document							Prior to finalizing the report, ensure that references to the current amount of warming (1) are consistent across the report and (2) include updates through 2017 where possible. For example, increase in global average annual air temperature since 1901 is reported as 1.5 deg F (p. 28 line 6) and 1.7 deg F (p. 16 line 8 and p. 57 line 10). Warming over the continental US since the beginning of the 20th century is reported as 1.7 deg F (p33 line 8) and 1.8 deg F (p16 line 36 and p64 line 18). See https://data.giss.nasa.gov/gistemp/graphs/	We have updated references to current amounts of warming, as allowed by the science - and have ensured consistent numbers when the same reference periods are invoked / differences are compared.
Erica	Brown	142029	Whole Document							Summary comments for the NCA4 Volume II as a whole: 1. The document is far, far too massive, relative to it's useful information content. This is a general, and worsening, problem with large scale climate assessments which increasingly take a "kitchen sink" approach--throw everything and anything considered relevant in and let the reader sort out the resulting mess. More specifically: (1) it repeats huge volumes of information, both within the NCA4 itself, and as given in IPCC Assessment Reports, (2) it is exceedingly wordy at the expense of concise and useful summaries/presentations of relevant, existing data and data sources, and (3) it makes many interpretive and/or judgmental statements and conclusions based on data that are not in fact presented, and/or which it is unclear whether the authors of the cited works themselves actually concluded. These issues get to the heart of the question of what purpose NCA reports are designed to serve, and to what groups of potential readers. Ostensibly, scientists are the target group, but the document's structure, statements and tone indicate rather that it's designed for legislators and others interested in policy more than science. Scientific writing style prioritizes brevity, coherence and readability--criteria which this report fails completely on. At 1383 pages (without appendices), it's unlikely that anyone will in fact read this entire document carefully--but they might well read a much shorter and more cogent document. The amount of both content and copy editing needed in this document is gargantuan. Even more specifically, given that the IPCC Assessments emphasize the global scale, AND that the purview of the NCA process is for the United States only, it is not necessary to repeat the huge volume of global scale analyses that are presented. This material is fully ad nauseum. Obviously, it is far too late in the process to make these kinds of major structural overhauls, which points out the inadequacy of placing the public comment period at the end of the process. 2. There are basically four separate introductory chapters, and collectively they are largely repetitions of IPCC AR5, and/or NCA4 Volume 1 material, with a strong focus on the global, not United States scale. If this material is to be included at all, it should be placed in an appendix. Global scale climatic dynamics, and their drivers, are not identical to the dynamics and relevant drivers operating at smaller spatio-temporal scales. At the latter scales, local and regional processes take on increasing importance--drivers such as land cover change, tropospheric ozone, aerosols and black carbon, irrigation areas	On the first point regarding length, scope and digestibility, the report is a result of extensive consultation across the government and with the general public. Indeed, a public call for input on a draft Table of Contents, coupled with agency priorities (it is a Federal report) resulted in the Table of Contents that we have. Recognizing the desire to keep such assessment reports as concise as possible,s truct page limits were imposed on the authors: 6-pages for the National-level Topic Chapters and 20-pages for the Regional chapters. Naturally, the inclusion of references in some cases almost doubles this length. Moreover, as it relates to the national vs global scope, in fact the report - outside Chapter 2, which sumamrizes the clmate science (albeit still with a focus on the U.S.) - focuses squarely and exclusively on the U.S. /// On the second point regarding "four introductory chapters" and the need to focus at more local scales, we have moved the "Climate Science Findings" from the very front of the report to simply be the Exeuctive Summary of the Chapter 2. We provide the reader with a variety of levels of detail to digest the report: (1) Report Findings summarize NCA4 in a brief 3-4 page summary; (2) the Overview sumamrizes the whole report, but provides a bit more detail, including quantification and more examples than are in the Report Findings; and then (3) the rull report itself, including with an Executive Summary for each chapter. /// On point three, it's unclear what is meant by the assertion that the naming system of NCAs is arbitrary and non-sequential. We are explicit in the Front Matter that this is the final product of the 4th National Climate Assessment. When coupled wih Volume I, it represents NCA4 in its entirety - and Vol. I iss ummarized in Ch 2 of this report. /// On the fourth point regarding more detail about the role of various groups in the report's development process as highlighted o the USGCRP website, this information can be found in "Appendix 1: Report Development Process."
Erica	Brown	142036	Whole Document							In the ES, a statement is made that says the report provides examples of actions underway in communities to reduce risk. There should be, if there are not already, examples of such actions in every chapter, so that decisionmakers can review effects and risks of climate change that are most relevant to them (whether by region or sector, for example) and also in the same chapter, review potential adaptation and/or mitigation measures And the ES chapter should point this out - that is, that there are examples of actions in every chapter - to the reader.	We have provided visibility to a number of case studies throughout this report to highlight a multitude of local actions being taken to address climate risk throughout the nation.
Erica	Brown	142037	Whole Document							Every chapter should be edited to include the key messages at the beginning of each chapter; this will be helpful for readers who will skim each chapter for relevant information, and dive deeper if they find it in the key messages; this will also be helpful if USGCRP again presents the report in an online format similar to the last NCA online report.	Each chapter begins with an Executive Summary that presents the Key Messages first thing.
Erica	Brown	142039	Whole Document							Key messages should be consistent in that the confidence level for the statement should be noted in each key message, or not, across all. It would be best to keep it in the traceable account section for each chapter.	Calibrated confidence and uncertainty language is NOT included in the Key Messages as they appear in the chapter text itself. However, each independent clause of each Key Message DOES have the calibrated uncerainty and confidence langauge in the Traceable Accounts.

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Erica	Brown	142055	Whole Document							AMWA urges all chapter authors to consider how the science and information is being synthesized in the full report to avoid generalizations and unsubstantiated conclusions about the sector, region or topic that is being discussed. The authors must be careful to ensure that the conclusions that are being made are scientifically robust and defensible. Blanket or specific statements that are made in this report without the evidence to back them up will only reduce the report's credibility.	We fully agree with this comment and have re-doubled our efforts to ensure our confidence in findings is stated clearly and accurately and that all findings have adequate support as found in the peer-reviewed scientific literature or other resources that fulfill Information Quality Act Requirements (see Appendix 2).
Erica	Brown	142056	Whole Document							If the intent is for NCA4 to be a complementary continuation of NCA3 and the Climate Science Special Report, then this should be made more clear in the body of the report. It is not clear that NCA4 is meant to build on (and not replace) NCA3 and address some other issues that may not have been covered in the NCA3, such as how sectors and regions can take a risk-based approach to addressing climate change. While it is known to many that NCA4 is part of the "sustained assessment approach," how this document fits into the bigger picture should be explained at the beginning of the document, as well as throughout the chapters. With such a big document as this, it is likely that stakeholders and decision makers will not look at the whole report, or even the introduction, but instead, consider the sections that are most relevant to them. For example, a water utility manager from MN might consider the Midwest chapter as well as the water chapter and the sector interdependencies chapter and not any others. The authors should make sure that the big picture context of this document is made clear in every chapter of the document and in website landing pages about NCA4. Finally, if there are sections of NCA3 that are no longer relevant or are outdated, the NCA4 should explicitly identify them.	We have revised text in the Front Matter and the Overview (in particular in the "What's Happened Since the Last NCA" Box) to include explicit language about how this report relates to both the Climate Science Special Report (i.e., the CSSR is Volume I of NCA4 and this report is Vol II of NCA4) as well as NCA3 (i.e., NCA4 builds on - does not necessarily replace - info in that report).
Sean	Birkel	142062	Whole Document							The City of New York (City) fully supports the Third Order Draft of Volume II of the Fourth National Climate Assessment (NCA4) and the work of the USGCRP. The City utilizes the National Climate Assessment Report in concert with the New York City Panel on Climate Change (NPCC) Report for research and technical analysis to better understand the frequency and magnitude of extreme events, the impacts of these events on City infrastructure, and how these impacts can be measured and monitored. The NCA4 science will drive and inform the City's climate policies, including citywide resiliency planning and sustainability initiatives. The National Climate Assessment Report projections are integral to the implementation of all the climate resiliency initiatives implemented by disparate agencies across the New York City and beyond. The City's reliance on the National Climate Assessment Report and this important update ensures that citywide capital investments take into account accurate climate change projections based on the best available climate change science, including heat, precipitation and sea level rise.	We appreciate this comment - and hearing from stakeholders how USGCRP products are used to inform decisions.
William	Langbo	142383	Whole Document							My overall impression of this report is that it is coming along, but there is great disparity between the chapters in terms of their progress. Some chapters seem like they are in a final draft already (e.g. Tribal), some just need some polishing (e.g. International), some have pretty substantial issues and several pages to cut (e.g. adaptation), and some needs pretty major overhauls (e.g. health, introduction). It is not clear that each chapter did the same level or rigor of literature review and assessment. Furthermore, I found many of the key messages to be exceptionally boring and generic. Many said little more than 'climate change affects my topic' and 'adaptation would be good'. The "risk framing" discussed in the introduction was not observed in the key messages and there were very few quantitative statements. Very few key messages were even different from NCA3, which only begs the question why this report is needed (I believe it is needed, but others won't, and you could be making your case stronger for the need for these assessments!) Very few key messages made good talking points or newsworthy items. It is unclear why you needed experts to write them, when any undergraduate could have written 'climate change affects my topic'. Many were long and wordy, but also nothingburgers. The traceable accounts sections of each chapter really need to be reviewed- maybe by one review editor or one person who looks across all the chapters. These varied wildly- sometimes each TA varied wildly within a chapter. These felt like after-thoughts and were often riddled with mistakes (e.g. listing a high confidence in the key message only to say there was medium confidence in the Description of Confidence and Likelihood section later within the same TA). Some were missing opening paragraphs, some had new references not in the chapter, some had no references, etc. And there needs to be an eye for consistent use of these rankings: what is medium confidence in one chapter needs to be medium confidence in another. This is hard, as different authors will have different levels of risk aversion, but some independent review of these would make the entire report stronger. One of the most disappointing elements of this report was its lack of compelling figures. Perhaps these are still in the works, but I saw many more 'adapted from" or "directly cited" figures than new figures. Since these tend to be shared on social media and used in presentations, much more emphasis is needed on creating new, compelling figures than on recycling old ones. Some chapters had zero or only 1 figure, making that figure even more important. Some chapters need a strong review editing as well. For example, the health chapter had a number of citations	This comment contains several elements: (1) The consistency in quality across chapters has been greatly improved since the release of the Third Order Draft for public comment. Some chapters (e.g., Overview, Ecosystems) have undergone substantial re-writes, while others (e.g., Adaptation) have significantly pared back their length. (2) Additional guidance was provided by NCA leadership to authors to help them refine Key Messages and we feel significant advances have been made in the Fourth Order Draft to include efficient, compelling, clear, and accurate Key Messages. (3) We agree that the quality of the Traceable Accounts (TAs) varied significantly across chapters in the public comment draft, so we focused a lot of attention and guidance on directing authors to pay particular attention to the TA guidance provided at the beginning of the process as chapter teams sought to improve them. As a result, the TAs are now much more consistent within and across chapters in describing the level of confidence in given findings, describing the evidence base, and identifying major uncertainties. (4) A significant amount of effort has gone in to creating and improving graphics since the release of the Third Order Draft for public comment, including in the Overview. (5) Copyediting and proofreading will continue with each successive draft to ensure that references cited in the text exist in the reference list at the end of the chapter and vice versa. (6) We understand that the length of the reportr is daunting; page limits were given to author teams in an effort to constrain the length. A key challenge of an assessment of this nature is covering topics that are of importance to the 13 USGCRP agencies, the general public, decisionmakers, and the scientific community. Coupling fulfillment of those diverse needs with the addressing of multiple rounds of reviews makes an overall concise report quite challenging, though we have sought to pare back text and eliminate redundancy wherever possible. This can be seen with the revamped Overview and Adaptation chapters, for example.
Rachel	Gregg	142438	Whole Document							Recommend including case studies from recent publications, including The State of Climate Adaptation in Water Resources Management: Southeastern United States and U.S. Caribbean, The State of Climate Adaptation in U.S. Marine Fisheries Management, and The State of Climate-â_Informed Coastal and Marine Spatial Planning, throughout the entire document	Relevant author teams were provided with these references to consider incorporating case studies from them in their respective chapters. The use of case studies throughout the report is seen as a critically important aspect of this assessment to give visibility to success stories across the country in the hope of having communities learn from one another about how they might address climate risks.
Juanita	Constible	142444	Whole Document							The Natural Resources Defense Council (NRDC) would like to lend its support to the Fourth National Climate Assessment (NCA4) effort. The NCA4 remains the most comprehensive scientific report on climate change in the United States. It provides a clearly-stated, reliable source of information for local policy-makers, business leaders, and the public, in addition to those within the scientific community. As such, it represents a vital link between our current scientific understanding of the observed changes in extreme weather and environment, climate change, and the well-being of Americans. We strongly urge the Administration to honor the scientific integrity and transparency embodied by the NCA process and content, and to let its rigorous scientific and public review process proceed unimpeded -- a process that has been strengthened and clarified since its establishment under the Global Change Research Act of 1990.	We appreciate this comment.

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Mikko	McFeely	142830	Whole Document							There are several instances where a single number is used to describe the magnitude of an impact. For instance a single value of sea level rise is used for the Northeast region. We recommend using a range where possible. Additionally, at the beginning of the document and again in the regional chapters please emphasize that trends occurring at the regional scale may not be consistent with local scale studies.	In many instances only a single number is given, but authors ensured text around it provided appropriate context so as to not relay an overly precise level of confidence in a given number. In other instances, ranges were include directly in the text, though many author teams felt this would interrupt the flow and, as a result, relegated that information to the Traceable Accounts. Since we felt each chapter "knew" its (regional / sectoral) audience best, we did not seek to overly prescribe how this issue was dealt with throughout the report.
Mikko	McFeely	142831	Whole Document							The traceable accounts are frequently the same text used in the chapter, verbatim. Please revise the traceable accounts to include the logic used to arrive at the KM and confidence level.	Greater attention has been given to the Traceable Accounts (TA) during this stage of revision. While some text being similar between the actual chapter and the TA itself is unavoidable and intentional, authors have imroved the clarity of the TAs to ensure they meet the objective of providing the reader with a deeper dive into the deliberative process among the author team to understand how they arrive at the conclusion they did, what the evidence base is for those conclusions and major uncertainties that precluded more definitive statements.
Mikko	McFeely	142832	Whole Document							The purpose of this document and how it can be used by stakeholders should be addressed at the beginning of the document. This should be apparent in every chapter.	We have added text to the Front Matter to be clear abou the aims and intended audience of this report.
Mikko	McFeely	142833	Whole Document							Some of the coastal regional chapters focused almost entirely on sea level rise, with little information on regional impacts to freshwater or riverine systems that support municipal drinking water supplies and ecosystems, for example the Northeast Chapter 18. One way to keep repetition to a minimum but ensure the topic is acknowledged is to better cross references between chapters. If the impacts to freshwater systems and the impact on drinking water systems is not addressed in Chapter 18, add a statement and reference the Water Chapter 3.	A key focus during this round of revision was to sharpen the connections across chapters. An All Author Meeting held in Bethesda, MD in late March 2018 facilitated a number of cross-chapter discussions that enabled greater cross-referencing of chapters.
Mikko	McFeely	142834	Whole Document							There is a significant amount of repeated text in the Regional Chapters. For instance, the Background in Northwest Chapter 24 is verbatim text from the Summary Overview. This is unnecessarily repetitive.	Care has been taken to reduce redundancy; however, the example cited in this comment is somewhat intentional. The Executive Summaries for each chapter are intended to be stand-alone overviews of each, individual chapter. As such, chapter teams have been instructed to develop these Executive Summaries using verbatim text from the Key Messages and underlying chapter to ensure the content is accurate and consistent.
Mikko	McFeely	142861	Whole Document							As a water utility managed within local government, the Portland Water Bureau is strongly supportive of the value of this report to drinking water managers and city planners. The Fourth National Climate Assessment and its authors are to be commended for summarizing the state of the science and adaptation responses for different regions and sectors of the Nation.	We appreciate this kind comment.
Mikko	McFeely	143081	Whole Document							There are a number of instances where 160 feet appears in the text. In each instance, 160 feet is converted to meters and shown in parenthesis. 160 feet is equivalent to 48.77 meters. However, sometimes the text states 50 meters and other times 48 meters. For example page 1092, line 33 states 50 m, whereas page 1108, line 7 states 48 m. Please be consistent in your conversions throughout the document.	We have worked to ensure that unit conversions are consistent and accurate across the report.
David	Wojick	143188	Whole Document							Thank you for this opportunity! Many comments made in chapters are further documented in: http://www.cambridgescholars.com/demystifying-climate-risk-volume-i and http://www.cambridgescholars.com/demystifying-climate-risk-volume-ii These books have recently been selected for addition to the Library of Congress collections.	We appreciate the commenter highlighting additional resources where these topics are covered.
Mark	Muyskens	143192	Whole Document							COMMENTS ON THE FOURTH NATIONAL CLIMATE ASSESSMENT Patrick J. Michaels Director, Center for the Study of Science Cato Institute Washington DC 20001 Note: The full review has been sent to review@usgcrp.gov under filename Michaels_complete_review, which will be displayed here in its entirety. 1. Introduction and Plain Language Summary The draft fourth ‰ÛÏNational Assessment‰Û (‰ÛÏNA4‰Û) of climate change impacts is systematically flawed and requires a complete revision. NA4 uses a flawed ensemble of models that dramatically overforecast warming of the lower troposphere, with even larger errors in the upper tropical troposphere. The model ensemble also could not accommodate the ‰ÛÏpause‰Û or ‰ÛÏslowdown‰Û in warming between the two large El NiniÁos of 1997-8 and 2015-6. The distribution of warming rates within the CMIP5 ensemble is not a true indication of a statistical range of prospective warming, as it is a collection of systematic errors. Despite a glib statement about this Assessment fulfilling the terms of the federal Data Quality Act, that is fatuous. The use of systematically failing models does not fulfill the ‰ÛÏmaximizing the quality, objectivity, utility, and integrity of information‰Û provision of the Act. Institutional memory relating to the production of previous assessments is strong, and the process itself is long, as the first drafts of this version were written in the middle of the second Obama Administration. They were written largely by the same team that wrote the 2014 Assessment, which NOAA advertised, at its release, was ‰ÛÏa key deliverable of President Obama‰Ûªs Climate Action Plan.‰Û The first (2000) Assessment used the two most extreme models of the 14 considered for temperature and precipitation. In my review I applied them to 10-year running means of lower-48 temperatures and the residual error was larger than the error of the raw data itself! The historical lineage of the fourth Assessment has all but guaranteed an alarming report, regardless of reality. USGCRP should produce a reset Assessment, relying on a model or models that work in four dimensions for	We disagree on almost all of the diverse statements made in this comment. The comments by this reviewer really relate almost entirely to NCA4 Volume I (which was extensively reviewed before publication in November 2017), but the reviewer must not have actually read Volume I or perhaps did not understand it, or the commentary provided on Volume II would have been much different. First of all, the reviewer would have realized that the discussion of past changes in climate are entirely based on observations, that the models were then evaluated relative to those observations throughout the assessment, and that the analyses of future changes were analyzed further than prior assessments by weighting the models relative to how well they represent observations. Then, regarding the authors, there is actually only a small overlap between authors in NCA3 and those in NCA4 (7 out of the 51 authors of NCA4 Volume I were authors of the science sections for NCA3). There was no bias at all in the author selection process. The authors were selected after an open process for nominations (through a Federal Register announcement). This was the case for both NCA4 Volume 1 and Volume II. The selection of the authors by the Federal Steering Committee considered a variety of criteria, the most important of which were the accomplishments of the prospective authors and their expertise, and their likelihood for accurately assessing the state of understanding of the changes in climate and resulting impacts for the chapters they were selected for as an author. Most of the commentary relates to the state of models used for the future projections. First, it should be noted that Chapter 2 in Volume II is a short summary of findings from the now published Volume 1. Uncertainties of the science are extensively discussed in Volume 1. It is important to recognize that volume II builds on Volume 1 and does not replace it. Volume 1 does discuss the issues raised by the reviewers related to the science of climate change, including the concerns about models and associated uncertainties (for example, note that for the first time in an assessment a weighting was applied to the models in NCA4 based on how well they represented observations that has not been found in any previous assessment – see Chapter 4 and Appendix B of NCA4 Volume 1). Comments about models overestimating the observed trends in globally-averaged temperature primarily relate to the slowdown in the rate of temperature increase that occurred between about 2000-2013. Figure 1 in the commentary is a distorted look at the comparison of temperature with observations, largely because it only

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Sarah	Miller	143387	Whole Document							Thank you for the opportunity to review the U.S. Global Change Research Program Forth National Climate Assessment (NCA4) provide comment. The Society for Historical Archaeology (SHA) has increased its attention on heritage at risk in an effort to raise awareness within our discipline and the communities we serve on the impacts of climate change on cultural resources. SHA is the world‰Ûªs leading scholarly society devoted to the archaeology and material culture of the modern world (AD 1400-present). Most of our 2,300 members are professional archaeologists who teach, work in museums or consulting firms, or who have government posts. We have a close relationship with the Advisory Council for Underwater Archaeology and our members include many of the world‰Ûªs leading underwater archaeologists. The Society for Historical Archaeology supports the NCA4 attempt to integrate cultural resources into the regional chapters, adaptation, and complex systems discussion. The assessment mentions archaeology only once but archaeological sites are alluded to under cultural resources and heritage. We appreciate the assessments attention in the overall document to tribal and indigenous communities, as well as maritime heritage in the northeast chapter. SHA recommends a cultural resources section under national topics or increased content on the impact of climate change on cultural resources in the coastal effects, oceans and marine resources, rural communities, built environment, and tribal and indigenous communities chapters. Other areas where research on impacts to archaeological sites can impact the effectiveness of the assessment are economics. For example, in Florida heritage tourism is a 6 billion dollar industry, and a majority of the sites are threatened in the coastal zone. Another area where research on archaeological sites can provide meaningful content is condition of archaeological sites themselves as indicators of climate change. Groups like SCAPE in Scotland, CHERISH in Ireland and Wales, and CITiZAN in England are currently using conditions of submerged and coastal archaeological sites as indicators of climate change. The assessment looks to historical data on climate change, but archaeologists also collect data on the interaction of human cultures with the environment in the United States over 14,000 years and these data can be useful in adaptation and mitigation planning. SHA requests the editors to consider inclusion of an archaeologist in each regional chapter to contribute to the final draft. Data are available for the eastern seaboard that can be included in this report. In November of David	We thank the Society of Historical Archaeology for their comments. These comments about enhanced involvement will be considered for future assessments.
Adam	Carpenter	143388	Whole Document							The draft fourth National Climate Assessment addresses a great deal of important scientific information as well as considerations for taking action on mitigation and adaptation. We strongly support the continuation of the National Climate Assessment. The draft outlines the myriad of ways climate change has and could increasingly affect the lives of virtually all Americans and sectors of the economy. In general, we believe that this draft assessment does a good job of balancing the need to provide scientific information specific enough to encourage reasonable action and laying out the limitations and uncertainties contained within the assessment. A thorough analysis of uncertainties and limitations is exceptionally important to the water sector, as its infrastructure projects are often in place for many decades and the entire range of plausible futures must be known to those designing them to make the most informed decisions possible. However, we believe that the assessment could improve in how it discusses implications to, actions taken by, and other aspects of the water sector as portrayed in the report. Several specific suggestions are described here to utilize the best available information. The water sector is working to address climate related issues and vulnerability to extreme events, while recognizing that there are also many other public health, environmental, and social issues that the sector must also address with its limited resources. AWWA supports the water sector‰Ûªs inclusion is regional analyses and the integration of information on the effects of drinking water quality on human health and wellbeing. We believe the NCA is a valuable assessment that propels action and research across many sectors. AWWA would like to offer the following comments to enhance the effectiveness of the assessment. We appreciate the opportunity to provide comment on this matter. Please feel free to contact myself or Adam Carpenter at AWWA (202-628-8303, acarpenter@awwa.org) if you have any questions regarding these comments. Respectfully, G. Tracy Mehan, III Executive Director of Government Affairs American Water Works Association About AWWA: AWWA is an international, nonprofit, scientific and educational society dedicated to providing total water solutions assuring the effective management of water. Founding 1881, the Association is the largest	We thank the AWMA for their comments to expabd the discussion on water. This will be considered in future assessments.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Aimee	Delach	143599	Whole Document							31 January 2018 U.S. Global Change Research Program, 1717 Pennsylvania Ave. NW., Suite 250, Washington, DC 20006 Submitted via online portal Dear U.S. Global Change Research Program: On behalf of our 1.2 million members and supporters nationwide, we thank you for the opportunity to provide input on the Third Order Draft of the Fourth National Climate Assessment (NCA4), Volume II (82 Fed. Reg. 51614). Defenders of Wildlife is a national conservation organization dedicated to protecting native plants and animals from a range of threats, including climate change and related effects. We value National Climate Assessments as an important resource for understanding and communicating the reality of climate change and its multifarious impacts at national and regional scales We think the decision to create an ‰ÛÏupstream‰Û climate Science Special Report (CSSR) to better inform the sectoral and regional impacts discussed in the current Assessment substantially improved the utility of the current volume by providing a knowledge base, and we were pleased to have the opportunity to comment on that volume during its development. We support the new ‰ÛÏscenario products‰Û that have been developed as part of the ‰ÛÏsustained assessment‰Û process, including documented changes in both averages and extremes of key climate variables like temperature and precipitation, and updated information about changes in local sea level rise along the U.S. coastline. Additionally, because climate change impacts do not occur in a vacuum, we are glad to see that the new scenarios support integrated information that shows the interactions between climate change and other factors, like changes in human population as a function of demographic shifts and migration and land use changes driven by these population changes. We also found the regional roll-ups within the ‰ÛÏSector‰Û chapters to be a useful summary of those impacts. In fact, our primary recommendation for improving the Assessment is to include a similar ‰ÛÏroll-up‰Û summaries that address biodiversity and habitat impacts of for each Sector topic. A case in point is the ‰ÛÏWater‰Û chapter, which scarcely mentions the effects of climate changes on aquatic species and biodiversity, despite the fact that the loss and degradation of wetland, stream and other	The primary recommendation here is to include "roll-up summaries that address biodiversity and habitat impacts of for each Sector topic." Since the scope of this report is focused on climate change (both human-induced and natural), having such a section in each chapter is deemed to be outside the remit for this particular assessment. The commenter is directed to other assessment efforts (e.g., IPBES - including that organization's recent Americas Regional Assessment) for coverage of these issues. Also, we appreciate the praise for the Coastal chapter. Finally, we note that the concern raised about the Ecosystems chapter (i.e., the fact that its focus was too constrained) has been addressed through a fairly substantial reframing of the content around issues beyond "phenologic mismatch."
John	Fleming	143648	Whole Document							Throughout the document, RCP scenarios are relied upon to convey the potential impacts of climate change. However, the two scenarios primarily focused on are RCP4.5 and RCP8.5. Climate change impacts should also be consistently characterized for the RCP2.6 scenario‰ÛÓthe only scenario consistent with keeping temperature rise below 2 degrees Celsius---rather than only (or mainly) RCP4.5 and RCP8.5. This will illustrate the benefits and necessity of reducing emissions to avoid unacceptable climate change damage. Since the benchmark is to stay below 2 degrees Celsius, this should be emphasized by contrasting a RCP2.6 world to a RCP4.5 or a RCP8.5 world.	NCA4 Vol. 1 discusses future projections associated with RCP2.6 in more detail. The reviewer is referred particularly to Chapters 4, 6, and 7. However, a decision was made among the SGCR Principals early in the NCA4 development process to focus the assessment of RCP4.5 and RCP8.5 to provide the reader with a sense of the range of projeced outcomes while not overwhelming the reader with multiple scenarios.
Union of Concerned Scientists	Union of Concerned Scientists	143681	Whole Document							The "Traceable Account" sections for each chapter all contained details on likelihood and confidence, embedded within the key messages, that were extremely insightful. However, many people may not refer to those sections of the report. Consider including those elements within the key message blurbs in other areas where they are presented.	While some readers seek to have that calibrated likelihood and confidence language embedded in the Key Messages wherever they appear, NCA leadership made the decision early in the NCA4 development process to only include that langauge in the Key Messages when they appear in the Traceable Accounts. This was done to make the Key Messages as they appear in the main chapter text read as smoothly as possible.
Union of Concerned Scientists	Union of Concerned Scientists	143793	Whole Document							The traceable accounts are uneven, and often are simply duplicative of the chapters. It would be helpful to explain upfront the purpose of the traceable accounts, ensure that all authors agree, and standardize their use across chapters to ensure that they meet the goals of documenting process and transparency.	The Front Matter explains what the Traceable Accounts are, how they are developed, and the information they are intended to relay. Greater attention has been given by authors to the Traceable Accounts in this stage of review and their consistency and level of detail has been greatly improved, as a result.
George	Bakken	143819	Whole Document							I'm retired, and thus a bit out of the loop. Plus, I got a late start so I only offered a few comments on presentation. However, the area where I have the most expertise (Chapter 7) looks very good except the references, as I noted. This is an accurate and important document, and deserves the widest possible attention. George S. Bakken Professor Emeritus And Distinguished Professor of Arts and Science Department of Biology Indiana State University Editorial Board Journal of Thermal Biology	Thank you for the kind comment; we have responded to the comments you submitted on Chapter 7.
Union of Concerned Scientists	Union of Concerned Scientists	143895	Whole Document							Please be sure that all percent changes or other such projections be coupled with a baseline. There were some instances in which this was not the case, e.g. Page 41, Lines 20-26.	Care has been taken to ensure that percent changes are pegged to a baseline to provide clarity for the reader.
Union of Concerned Scientists	Union of Concerned Scientists	143909	Whole Document							We are pleased to see this important report advancing through the review process. This report is positioned to provide the American public, the private sector, and decision makers alike with critical information to manage risks, and ensure a future that is safe and prosperous for this country. We are pleased to see such a prominent set of authors, and welcome the platform that the report provides for the consideration of diverse perspectives from across the country through, for example, this review process.	Thank you for the kind comment.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Peter	Murdoch	143977	Whole Document							The NCA4 draft provides an excellent and comprehensive synopsis of the major issues facing the Nation as a result of climate change. The report has also improved as a tool for decision support over past versions, although I doubt many decision makers will take the time for 1500 pages of information. Some suggestions: a) The traceable accounts sections should be pulled from the text and published as a second report or an appendix. The chapter-by-chapter sections on uncertainties are my favorite addition to the assessment, but the overall traceable account section naturally contains some redundancies with the core report, and the text is too cumbersome at it's current length, so splitting our the traceable accounts and shortening the core report makes sense. b) I realize the authors were trying not to tell the research community what to study, but hints at critical gaps in data or understanding occur throughout the report (e.g pg 316, lines 12-14; p 430, lines 35-36; pg 590, lines 26-30) and Chapter 29 has a unique format with a section on "Directions for Future Research". The chapter authors must currently have a strong sense of what the critical gaps are in data and understanding that, if corrected, would significantly improve uncertainties in NCA-5. It is a shame not to capture that knowledge in a form that allows us to improve and/or defend both our research and our long-term monitoring over the next 4 years. c) That said, a synthesis of the Traceable accounts sections, with a set of overall recommendations for critical new or existing research, essential studies or monitoring under threat of termination, and recommendations for core measurements to track change in whole systems, and early detect of resilience change across landscapes and waters is a gap in the current report. The knowledge just gathered by the NCA-4 authors provides a short-term opportunity to generate that synthesis and	The Traceable Accounts are an indispensible component of NCA4 Vol II as they provide the reader with greater transparency of the deliberative process taken by the authors to come to the conclusions they did. As a result, publishing them as a separate product is not an option. regarding the second comment about research gaps / needs, great care was taken throughout the report to avoid policy prescriptions. Identifying "research needs" falls into this "prescriptive" territory, so the extent to which the authors could go was to identify research gaps that preclude certain analyses or greater confidence in certain conclusions. The Traceable Accounts actually provide the reader with a sense of what the major uncertainties are for a given Key Message, giving a sense of what research gaps exist. Regarding the final comment about having these identified gaps inform future research directions: this is exactly what we are hoping to do as a Program. Indeed, USGCRP is in the midst of devleoping its Triennial Update to its Strategic Plan (USP). Research gaps identified during the NCA4 process will inform that USP.
Susan	Ask	143983	Whole Document							This is an important document that gathers current, relevant science and makes it available to the people who shape the future (including policy-makers, educators, researchers, farmers, land managers, business people, community organizations and the public). Society will benefit from this report and from efforts to make the data and conclusions accessible to everyone. Thank you to the researchers and authors who have prepared this document.	Thank you for this comment.
Gyami	Shrestha	143984	Whole Document							The Climate Science Special Report (2017) a.k.a. U.S. National Climate Assessment Vol. 1 (USGCRP, 2017) stated with high confidence that assessing the governance challenges, technical feasibility, risks and cost-benefits of climate intervention/geoengineering strategies must be conducted before the benefits and risks of these approaches can be determined. I advise the NCA4 Vol II to assess the above (governance challenges, technical feasibility, risks and cost-benefits of climate intervention or geoengineering strategies) for the U.S. national, regional and/or state/city levels(as feasible) more thoroughly and to cross-reference the latest unreleased USGCRP Sustained Assessment Report, the 2nd State of the Carbon Cycle Report (SOCCR-2, under review by NAS, due for completion mid-2018) as it pertains to the above.	It is beyond the scope of NCA4 Volume II to go into more detail on geoengineering strategies until the science ramifications are better understood. That may require a special assessment. Regarding the second point, a detailed cross-check between the content of SOCCR-2 and NCA4 Vol. II has been undertaken to ensure consistent and accurate characterization of the science in both reports.
Gyami	Shrestha	144050	Whole Document							In addition to updating the current cross-references to SOCCR-2 in NCA4, please conduct a thorough assessment of all carbon and SOCCR-2 pertinent sections of NCA4 Vol 2 to ensure proper cross-referencing and consistency of information between both reports. Where mere cross-referencing is not enough, boxes summarizing pertinent SOCCR-2 information could be developed and inserted strategically in relevant sections of NCA-4 Vol. II chapters, incl. current or new appendices, as needed. A quick search of this NCA4 vol II public draft revealed only 8 instances of the cross-references to SOCCR-2: Page: 419 Page: 429 Page: 448 Page: 1353 Page: 1385 Page: 1399	A detailed cross-check between the draft SOCCR-2 report and the drsaft NCA4 was conducted to determine where one report's findings are relevant to the other. Authors were provided with this information to facilitate conversation between relevant authors and ensure accuracy and consistency in how scientific findings are presented.
Michael	MacCracken	144275	Whole Document							A couple of other editorial suggestions: Always capitalize "Earth" when referring to the planet. There are no degrees of "certainty" but there can be degrees of "confidence" and degrees and various types of "uncertainty." Choose "contiguous" or "conterminous" when referring to the 48 states. I'd also encourage use of "that" for phrases that must be there (with no comma in front), and "which" for phrases that are optional (virtually always preceded by a comma).	Re the capitalization of "Earth", we agree with this comment and the change will be made as part of the regular copy editing process. Re the degrees of certainty, we understand the concern, and where appropriate, the language will be changed to be consistent with Volume I of the NCA, which uses the phrase, "extent of uncertainty". Re "contiguous" vs "conterminous", we agree with this comment and the change will be made as part of the regular copy editing process. Re the use of "that", we agree with this comment and the change will be made as part of the regular copy editing process.
Gyami	Shrestha	144380	Whole Document							Among the 421 instances of the term carbon used across NCA4 Vol II, I found several sections where SOCCR-2 was not cross-references and/or should have been/should be cross-referenced more appropriately. E.g. pages 20-40, pages 48-75, pages 81-107, pages 193-207, pages 222-246, pages 266-276, pages 335-395 pages 654-765 pages 821-941 pages 1089-1125 pages 1137-1325 - Please ensure adequate and consistent cross-referencing with SOCCR-2 across NCA4 Vol. II.	A detailed cross-check between the draft SOCCR-2 report and the drsaft NCA4 was conducted to determine where one report's findings are relevant to the other. Authors were provided with this information to facilitate conversation between relevant authors and ensure accuracy and consistency in how scientific findings are presented.
Michael	MacCracken	144389	Whole Document							There really is very little coverage of the Caribbean Islands in the sectoral chapters of this document, so about Puerto Rico, Virgin Islands, etc. Inserting some examples of the problems they are facing would likely be beneficial.	We have sought to provide greater and more consistent regional coverage and references in the sectoral chapters, as well as in the Overview. In some instances, however, a lack of data, science, or other information precludes a more holistic coverage of some regions for some sectors. This is particularly true for the US Caribbean, Hawaii & US-Affiliated Pacific Islands, and Alaska regions of NCA4.
Michael	MacCracken	144548	Whole Document							I think having special attention paid to tribal issues in each of the regional chapters was very helpful and allowed a nice presentation of specifics and the differences among regions.	We appreciate this comment and agree that this was a valuable addition to NCA4 - driven in large part by public comments suggesting we include such content!

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Michael	MacCracken	144584	Whole Document							Except for the issue of climate engineering (CDR and SRM in chpater 29), I think this is a very well done report with lots of well-documented information--congratulations to all. On the issue of CDR and SRM, they need to be considered in the context of using all approaches available in a coordinated way and not considered as possible single cures on their own--we are far too along in climate change to be thinking that way as seems to be done in the very limited coverage this issue gets in this whole assessment. While I thought it a good idea to have a first attempt at considering effects of climate change on US interests outside the US, a couple of suggestions for the next report. First, it would have been interesting to think about how changes occurring in the US might affect other nations. Second, I did not see anything on how changes in one region are likely to affect other regions, so, for example, how rising sea level and the increasing discomfort index across the Southeast, for example, might drive internal migration in the US from the Southeast to other regions in the country.	We discuss geoengineering briefly in Chapter 29 (Mitigation), but a more detailed discussion was deemed outside the scope of this current assessment. Regarding cross-regional impacts, we would direct the reader to Chapter 17 (Complex Systems) to get a broad sense of how - and where - some impacts can result in additional consequences in other regions or on other sectors.
Michael	MacCracken	144585	Whole Document							As an editorial comment, I'd like to suggest that the phrase "climate change" (singular) be used as the term to describe the entirety of what is happening since pre-industrial times (so mainly human-induced), and that the phrase "climate changes" not be used to refer to the specific changes in the climate that might affect a particular species or system--to describe those specific changes, I'd suggest using "changes in climate" (or even "changes in the weather induced by climate change) to describe changes in the array of climate parameters. It just seemed to me that using the phrase "climte changes" gets confusing--one has "scenarios of climate change", etc. [Also, I'd suggest not saying "future scenarios of climate change" as scenarios are about the future and we have these scenarios now.] I do realize that there are complaints about using "climate change" generally to refer to human-induced climate change because there have indeed been naturally induced changes in the past, so it might be that when referring to human-induced climate change that this whole phrase might need to be use, even though this does seem to rule out consideration of the natural influence on recent climate also meriting consideration. Perhaps a box is needed early on to discuss this point and indicate what the various terms are going to mean.	We understand the commenter's concerns regarding consistency of language. We have made every effort to clarify language and maintain consistency throughout the report, while keeping scientific accuracy and communication to a broad audience in mind. We decided to maintain a generic usage of the term "climate change", so there is no inherent implication of natural or human causes nor is there any inherent implication of timing (since preindustrial times or otherwise). Instead of attaching specific meaning to these generic terms, we decided to clarify their meanings on a case-by-case basis. Additionally, we have taken the commenter's advice to avoid usage of the term "future scenarios".
Michael	MacCracken	144586	Whole Document							Given the effort put in to creating the likelihood and confidence lexicons, there nees to be a scrub of the document done to really try to enforce the use of the lexicons. Many of my specific comments are about using a word from the lexicon instead of using the word "may" (and also the word "could") which provide no sense at all of likelihood--almost anything may happen. Reworking the phrasing can sometimes require adding a conditional phrase, so, for example, saying 'If [this or that] is not done, then it is [likely or unlikely] that [this or that will occur or will result.' This need to scrub assessments of the word "may" and equivalents was learned in the first assessment when a well-known Washington Post columnist wrote a story on a draft of the assessment and offered an interpretation that was far from what was intended because there were so many things that were said "may" happen. Since then, at least, good assessment practice is to avoid using such uninformative words as they allow vastly different readings of the findings. I have so many comments in my specific comments about this there may be an author uprising, but I think fixing it would be better than adjusting the lexicon and saying that "may" means about equally one way or not (so a synonym for "possible") because, in reading through the report, there were many places where it was clear from the context that "is likely to" was what was meant.	We developed additional writing guidance for the authors in light of this (and related comments) providing examples of how to avid the use of "future conditionals" such as "may" or "could". The revised draft, therefore, has far fewer instances where thesse unhelpful and vague phrases are used. We also took care to ensure the calibrated uncertainty language (e.g., "likely", "very likely:, etc.) were not used in the text unless it was specifically in the context of the calibrated uncertainty language as presented in the Front Matter.
Michael	MacCracken	144626	Whole Document							Point of Information: I thought it very helpful to have the "Traceable Account" sections, but due to time constraints, I had to focus my comments on the main texts of the chapters, hopeful that comments made on those sections might be carried on back to the "Traceable Account" section.	We agree and made sure that changes to the text got reflected in the traceable accounts.
Michael	MacCracken	144658	Whole Document							With respect to the word "drought", it usually refers to a reduction in water availability for some limite, finite time, with recovery being expected. We do not say, for example, that the Sahara Desert is experiencing a drought just because it was vegetated several thousand years ago, etc.--it is a desert. The long term trend toward drying in southwestern North America due to the poleward shift of the northern boundary of the subtropics is also not a drought--it is a gradual aridification of the region and not referred to as a drought. Now, one may have some wet and dry years atop the decreasing precipitation trend, so one can have what one might call a drouhgt--but the general drying, the shift from having a good number of rainy years in a decade and an occasional dry year to having mostly dry years and an occasional wet year is not drought--that trend is aridification. I make this point because how one responds really depends--if we are going to have a few dry years and a return to mostly wet years, then larger reservoirs is a plausible response; however, if there will not be that return to extended patterns of wet years and most years will be dry (so aridification), then larger reservoirs is not a useful step--what is needed are actions to reduce per capita demand, so efficiency, xeric land-scalping, shifts away from water-demanding crops, etc. I would urge inclusion of a box somewhere explaining this and then encouraging authors to be using the appropriate terms, because right now, drought is the word being used to explain both the trend and short-term variations, and decision makers and resource managers really need to be provided clear information on this.	Additional guidance was given to authors to clarify how they use the term "drought" in their respective chapters. As a default, the definition as it appears in the USGCRP glossary (https://www.globalchange.gov/climate-change/glossary) is used. We state as much in the Front Matter. "Drought" is defined in the USGCRP glossary as: "A period of abnormally dry weather marked by little or no rain that lasts long enough to cause water shortage for people and natural systems."
Michael	MacCracken	144659	Whole Document							Another point that needs to be made is that while this assessment looks out across the 21st century, changes will continue thereafter. For sea level, for example, it is going to keep rising well past 2100 and the focus on sea level rise in 2100 in the report is rarely accompanied by mention that sea level rise will continue thereafter. Yes, useful to be aware of what the worst case might be for 2100, but in presenting such information, it needs to be mentioned that the indicated level is likely at or below the middle level expected (or that could plausibly occur) by 2150, so a generation or two later. I'd encourage some early discussion on this point and then a way for the chapter authors to refer to it in stating that sea level rise will go on beyond 2100. Similarly, though to some extent dependent on policy actions during the 21st century, there will be ongoing climate change after 2100 if the current pace of emissions cutbacks is not very greatly speeded up. So, I'd like to see some attention to the issue of beyond 2100, perhaps in a box somewhere--and references made from the chapters to that box.	Sea level rise past 2100 is discussed in Chapter 2, as well as in NCA4 Vol. 1 Chapter 15 and Chapter 4. We have also included reference to some impacts that extend beyond 2100 in the Overview. However, the Congressional mandate for the NCA (https://www.globalchange.gov/about/legal-mandate) calls for an analysis of " current trends in global change, both human- induced and natural, and projects major trends for the subsequent 25 to 100 year," so a focus on 2100 is not only important and relevant, but it is also required.
Michael	MacCracken	144747	Whole Document							As both NCA4 and SOCCR-2 are USGCRP reports, scheduled to be released at least 6 months apart (SOCCR-2 first, NCA-4 second) but in the same year (2018), it is important for the internal cross-referencing of NCA4 with SOCCR-2 to be worked out and reflected across all pertinent chapters, appendices and website(s).	We agree; thank you for this helpful comment. A detailed cross-check between the draft SOCCR-2 report and the drsaft NCA4 was conducted to determine where one report's findings are relevant to the other. Authors were provided with this information to facilitate conversation between relevant authors and ensure accuracy and consistency in how scientific findings are presented.

First Name	Last Name	Comment ID	Comment Type	Chapter	Figure/Table Number	Start Page	End Page	Start Line	End Line	Comment	Response
Gyami	Shrestha	144748	Whole Document							In addition to updating the current cross-references to SOCCR-2 in NCA4, please conduct a thorough assessment of all carbon and SOCCR-2 pertinent sections of NCA4 Vol 2 to ensure proper cross-referencing and consistency of information between both reports. As a resource to help you with this process of cross-referencing, please see the Preface in the SOCCR-2 Public Draft, specifically the SOCCR-2-NCA4 cross-walks figure which was developed in response to the Committee of the SGCR Principals' request in year 2016 and presented to them accordingly. Please also refer to the SOCCR-2 Preface Venn Diagram, developed based on an earlier iteration conducted by NCA-4 staff, encompassing overlapping topics among the concurrently developed/soon to be released 2017-2018 release date USGCRP Assessments (CSSR-NCA4-SOCCR2).	We agree; thank you for this helpful comment. We agree; thank you for this helpful comment. A detailed cross-check between the draft SOCCR-2 report and the drsaft NCA4 was conducted to determine where one report's findings are relevant to the other. Authors were provided with this information to facilitate conversation between relevant authors and ensure accuracy and consistency in how scientific findings are presented.