JUNE 2024

SMITHSONIAN INSTITUTION

# Climate Change Adaptation Plan

2024–2027

Smithsonian

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# From the Secretary of the Smithsonian

As the world's largest museum, education, and research complex, the Smithsonian Institution has a unique role to play in understanding and adapting to a changing planet. For over 175 years, our researchers have studied climate, establishing the Smithsonian as a trusted scientific source. When we combine that reputation with our responsibility as the country's cultural and scientific stewards, we have a platform to lead by example as we face the multiple and interconnected issues of a changing planet.

The Smithsonian's latest strategic plan, *Our Shared Future*: *Smithsonian 2027*, emphasizes our commitment to providing Americans and the world with the tools, information, and context needed to grapple with major challenges, including climate change. We have a responsibility to use our exhibits and educational programs to promote understanding of a changing Earth.

Further, *Our Shared Future: Life on a Sustainable Planet* initiative leverages the Smithsonian's vast collections, museums, education, and research to advance an increased understanding of the challenges our world faces in an endeavor to pursue nature-based solutions for a more resilient planet. As the Smithsonian works across the organization to raise awareness, it is our goal that we turn knowledge into inspiration, and inspiration into action.

We are also acutely aware of the inequality that is laid bare as the effects of climate change become apparent. It is our low-income communities and communities of color that are often at the most risk of climate change. Harnessing the legacy of community-based, environmental action, the Smithsonian's Center for Environmental Justice at the Anacostia Community Museum launched on Earth Day 2023. It strives to create a future where environmentalism through civic engagement helps to create healthy, equitable communities.

Our commitment to fostering a climate-ready Smithsonian and global community goes far beyond our scientific, educational, and museum programing. While we work to increase sustainability across the Institution, we must also face that climate is changing and we must do what we can to ready our buildings and protect our invaluable collections.

The Smithsonian has been entrusted with over 150 million objects and specimens, over two million library volumes, 2,000 living animals, and 10,000 plants located across several states, Washington, D.C., and in Panama. Our buildings, grounds, and collections require the highest levels of care, which will be made more difficult as climate changes. This report details where we face the threat of increasing heat, precipitation, flooding, and wildfires and highlights not only the actions we are currently taking to become more resilient, but also our plan to combat those increasing risks.

I am heartened by the work our researchers, educators, curators, collections staff, and facilities personnel have already taken and the progress that has been made to increase awareness, make our buildings more resilient, and increase the safety of our collections. There is much yet to do, but the plans we have developed, combined with the expertise and dedication of our staff, gives me the confidence that the Smithsonian is ready to meet the challenge of climate change and can be seen as a leader for not just government agencies, but other cultural institutions, as well as individuals and organizations around the world.

Lonnie G. Bunch III
*Secretary of the Smithsonian Institution*

SECTION 1

# Agency Profile

Data provided below include federally funded facilities, employees, and programs as well as those that are privately funded, referred to as trust.

| AGENCY PROFILE | |
|---|---|
| **Mission** | The Smithsonian Institution is the world's largest museum, education, and research complex, with 21 museums, 21 libraries, the National Zoo, numerous research centers, and several education units and centers. Through our unparalleled collections and research capabilities, and the insight and creativity we foster through art, history, and culture, the Smithsonian strives to provide Americans and the world with the tools and information they need to forge *Our Shared Future.* |
| **Adaptation Plan Scope** | This report includes all Smithsonian units based in the United States including employees and facilities in the District of Columbia, Virginia, Maryland, New York, Florida, Massachusetts, Arizona, and Hawaii. Facilities located in Panama (Smithsonian Tropical Research Institute) were not included in the CEQ risk assessment tool but are included in this report where noted. |
| **Agency Climate Adaptation Official** | Ellen Stofan, Under Secretary for Science and Research; Pierre Comizzoli, Research Biologist and Senior Program Officer, National Zoo and Conservation Biology Institute |
| **Agency Risk Officer** | The Smithsonian Enterprise Risk Management governance structure provides for significant risks to be brought to the Executive Risk Council. |
| **Point of Public Contact for Environmental Justice** | Lisa McClure, Director, Center for Environmental Justice,<br>Anacostia Community Museum<br>Email: SI-environmentaljustice@si.edu |
| **Owned Buildings** | The Smithsonian encompasses 506 owned buildings (13 million sq. ft.). This information comes from the Federal Climate Mapping for Resilience and Adaptation Application (Federal Mapping App) provided by CEQ in the fall of 2023 and the building number is based on the 2021 Federal Real Property Profile. |

| AGENCY PROFILE | |
|---|---|
| **Leased Buildings** | In addition to the buildings mentioned above, the Smithsonian leases 73,246 sq. ft. occupied by the National Museum of the American Indian in the GSA-owned Alexander Hamilton U.S. Customs House in New York, New York and 97,958 sq. ft. in the GSA-owned Postal Square Building in Washington, D.C. occupied by the National Postal Museum. This information is not included in the mapping tool. The square footage has been provided by the Smithsonian facilities database (2023).<br><br>In total, the Smithsonian portfolio includes 22 leased buildings representing 1,838,383 rentable sq. ft. |
| **Smithsonian Collections** | Smithsonian owned and leased buildings house approximately 157.3 million objects including scientific specimens, art, cultural, and historic artifacts; as well as 2.3 million library volumes and 153 thousand cubic feet of archival materials. This information was provided by the Smithsonian National Collections Program on September 30, 2023. |
| **Employees** | Federal Employees: 3,939<br>Trust Employees: 1,747<br>Smithsonian Enterprises Employees: 600<br>Total Employees: 6,286<br><br>The number of federal employees was taken from the Fiscal Year 2024 Budget Appendix, Fiscal Year 2023 Actual. The number of trust employees and Smithsonian Enterprises staff was provided by the Smithsonian Office of Planning, Management, and Budget.<br><br>Badged Contractors: 2,190 (Number provided by the Office of Protection Services)<br>Volunteers: Over 6,000 (Number provided by the Office of Visitor Services and Volunteer Management in 2023). |
| **Federal Lands and Waters** | The Smithsonian features 25,789 acres, including those otherwise managed. This number comes from the Federal Real Property Profile from Fiscal Year 2023. |
| **Smithsonian Budget** | **FISCAL YEAR 2022** |
| | FY22 Federal Enacted: $1,062,215,000 (Enacted on March 15, 2022)<br>FY22 Trust: $561,448,000 (Regents approved on August 26, 2021)<br>FY22 Total: $1,623,663,000 |
| | **FISCAL YEAR 2023** |
| | FY23 Federal Enacted: $1,144,500,000 (Enacted on December 29, 2022)<br>FY23 Trust: $687,537,000 (Regents approved on August 25, 2022)<br>FY23 Total: $1,832,037,000 |

| AGENCY PROFILE | |
|---|---|
| **Smithsonian Budget (cont.)** | **FISCAL YEAR 2024** |
| | FY24 Federal Enacted: $1,090,5000,000 (Enacted on March 9, 2024)<br>FY24 Trust: $764,2000,000 (Regents approved on August 22, 2023)<br>FY24 Total: $1,854,700,000 |
| | **FISCAL YEAR 2025** |
| | FY25 President's Proposed Federal Budget: $1,160,200,000 |
| **Key Areas of Climate Adaptation Effort** | 1. **Museum Programs** including digital and in-person exhibitions as well as educational programming.<br>2. **Research** including unique long-term monitoring and collaborations with other agencies and private organizations.<br>3. **Collections** including improved storage facilities and equipment, and training for emergency response to climate events.<br>4. **Central Support** (Management, Procurement, Finance, HR) including climate resilience in decision making, policies, budget, and risk management.<br>5. **Facilities and Infrastructure** including master plans and individual projects to improve resilience, particularly with respect to potential for flooding.<br><br>These five categories formed the framework for the Smithsonian's August 13, 2021, Climate Change Action Plan and for the Institution's Fiscal Year 2022 written report and the Fiscal Year 2023 oral progress reports. These focus areas remain a valid way to chart progress, plan internally, and communicate to internal and external stakeholders. |

*The Smithsonian Institution is not an Executive Branch government agency subject to Executive Order (E.O.) 14008 (Tackling the Climate Crisis at Home and Abroad), E.O. 14030 (Climate-Related Financial Risk), or E.O. 14057 (Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability). However, the Institution provides this Climate Change Adaptation Plan voluntarily.*

## MUSEUMS AND EDUCATIONAL PROGRAMS

Through the Smithsonian's *Life on a Sustainable Planet* and Earth Optimism initiatives, the Institution is working to change the climate narrative in the public space that, while climate change poses an existential threat, there is also opportunity and reason for optimism. Across the Smithsonian Institution, units are developing public-facing exhibits, programming, participatory science experiences and other solutions-oriented resources to educate and inform the public and to promote action. These ongoing efforts leverage the Smithsonian's expansive research, collections, and diverse content to engage local, national, and international audiences. The Smithsonian is also conducting audience research to better understand how the Institution can maximize its public impact through audience engagement.

## RESEARCH

The Smithsonian contributes to scholarship and research that advances scientific understanding of climate change impacts on ecosystems and communicates climate change science to the public through exhibits, programs, and the media. The Smithsonian leads key, ongoing research networks contributing to the understanding of climate

Smithsonian Institution Building, known as the Castle, Washington, D.C.

change, including ForestGEO, MarineGEO, and the Coastal Carbon Network. In 2024, the Smithsonian launched GEO-TREES, a global biomass reference system for remote sensing of forest responses to climate change engaging the Smithsonian's ForestGEO network of international forest study sites and collaborations with other well-established networks in tropical and temperate forests. NOAA and the Smithsonian also have a formal agreement to collaborate on ocean biodiversity research and education motivated by the urgent need to protect and restore marine ecosystems faced with climate change adaptation, some elements of which, such as blue carbon data synthesis and research, concern nature-based solutions to climate change. The Smithsonian works on seven continents on projects as diverse as our planet. By working together with governments and organizations around the world, we amplify the benefits of our impact.

**COLLECTIONS**

Through programs to replace storage cabinets, move collections in vulnerable locations to ones with reduced exposure to hazards, and to train staff in emergency procedures, the Smithsonian has increased its resilience and built adaptive capacity across the Institution.
In collaboration with the National Gallery of Art, the Smithsonian is building the Pod 6 expansion of the Museum Support Center in Suitland, Maryland, which will include collections from the National Museum of American History and the National Museum of Natural History, both buildings located in the flood plain. To inform and engage the workforce, the Collections Collaboration Community convenes staff from across the Smithsonian to focus on understanding the impacts of climate change on collections and how the Institution can address those impacts.

**CENTRAL SERVICES AND MANAGEMENT**

Meeting the challenge of successfully navigating through the COVID-19 pandemic has built adaptive capacity in Smithsonian leadership and staff to support its mission in the face of major disruptions and made the Smithsonian a nimbler organization. The Smithsonian has introduced sustainability and climate resilience into its training for purchasing, including hosting an annual forum to highlight resources for product selection and travel. The Institution is expanding its fleet of electric vehicles and is incorporating climate risk into strategic decision-making including emergency preparedness.

**FACILITIES**

The Smithsonian is implementing capital projects across the organization to address climate vulnerabilities, beginning with master plans that incorporate climate resilience as a major driver in the plans' individual projects. The Institution is collaborating with the National Capital Planning Commission to identify the next steps to address flooding in the Federal Triangle Area. Evaluation of sites for two new Smithsonian museums included analysis of flooding vulnerabilities as well as opportunities to build more sustainably.

SECTION 2

# Risk Assessment

## 2A. Climate Hazard Exposures and Impacts Affecting Federal Buildings

The Smithsonian Institution used the Federal Climate Mapping for Resilience and Adaptation Application (Federal Mapping App) which was developed for federal agencies by the White House Council on Environmental Quality and the National Oceanic and Atmospheric Administration to conduct a high-level screening of climate hazard exposure to federal facilities. Because Smithsonian federal and trust employees are not included in the Federal Mapping App, the Institution used data provided by its Office of Human Resources. The Smithsonian assessed the exposure of its buildings; employees; and lands, waters, and cultural and natural resources to five climate hazards: extreme heat, extreme precipitation, sea level rise, flooding, and wildfire risk.

**CLIMATE DATA USED IN AGENCY RISK ASSESSMENT**

| Hazard | Description | Scenario | Geographic Coverage |
|---|---|---|---|
| **Extreme Heat** | Measured as whether an asset is projected to be exposed to an increased number of days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually), calculated with reference to 1976–2005. Data are from high-resolution, downscaled climate model projections based on the Localized Constructed Analogs (LOCA) dataset prepared for the 4th National Climate Assessment. | RCP 4.5 | CONUS |
| | | RCP 8.5 | CONUS |
| **Extreme Precipitation** | Measured as whether an asset is projected to be exposed to an increased number of days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amounts (calculated annually), with reference to 1976-2005. Data are from high-resolution, downscaled climate model projections based on the LOCA dataset prepared for the 4th National Climate Assessment. | RCP 4.5 | CONUS |
| | | RCP 8.5 | CONUS and AK |

| CLIMATE DATA USED IN AGENCY RISK ASSESSMENT | | | |
|---|---|---|---|
| **Hazard** | **Description** | **Scenario** | **Geographic Coverage** |
| **Sea Level Rise** | Measured as whether an asset is within the inundation extents from NOAA Coastal Digital Elevation Models and the 2022 Interagency Sea Level Rise Technical Report. Intermediate and Intermediate-High sea level rise scenarios used as proxies for RCP 4.5 and 8.5, respectively. | RCP 4.5 | CONUS and PR |
| | | RCP 8.5 | CONUS and PR |
| **Wildfire Risk** | Measured as whether an asset is in a location is rated as high, very high, or extreme risk based on the U.S. Forest Service Wildfire Risk to Potential Structures (a data product of Wildfire Risk to Communities), which estimates the likelihood of structures being lost to wildfire based on the probability of a fire occurring in a location and likely fire intensity. Data reflects wildfires and other major disturbances as of 2014. | Historical | All 50 States |
| **Flooding** | Measured as whether an asset is located within a 100-year floodplain (1% annual chance of flooding) or 500-year floodplain (0.2% annual chance of flooding), as mapped by the Federal Emergency Management Agency National Flood Hazard Layer. | Historical | All 50 States and PR |

Exposure to extreme heat, extreme precipitation, and sea level rise were evaluated at mid- (2050) and late-century (2080) under two emissions scenarios, Representative Concentration Pathway (RCP) 4.5 and RCP 8.5. Exposure to flooding and wildfire risk were only evaluated for the present day due to data constraints.

| CLIMATE SCENARIOS CONSIDERED IN AGENCY RISK ASSESSMENT | | |
|---|---|---|
| **Scenario Descriptor** | | **Summary Description from 5th National Climate Assessment** |
| **RCP 8.5** | Very High Scenario | Among the scenarios described in NCA5, RCP 8.5 reflects the highest range of carbon dioxide (CO2) emissions and no mitigation. Total annual global CO2 emissions in 2100 are quadruple emissions in 2000. Population growth in 2100 doubles from 2000. This scenario includes fossil fuel development. |
| **RCP 4.5** | Intermediate Scenario | This scenario reflects reductions in CO2 emissions from current levels. Total annual CO2 emissions in 2100 are 46% less than the year 2000. Mitigation efforts include expanded renewable energy compared to 2000. |

Additional details about the data used in this assessment are provided in Appendix A.

| INDICATORS OF EXPOSURE OF BUILDINGS TO CLIMATE HAZARDS | RCP 4.5 2050 | RCP 4.5 2080 | RCP 8.5 2050 | RCP 8.5 2080 |
|---|---|---|---|---|
| **Extreme Heat:** Percent of buildings projected to be exposed to more days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually) from 1976–2005 | 100% | 100% | 100% | 100% |
| **Extreme Precipitation:** Percent of buildings projected to be exposed to more days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amount (calculated annually) from 1976–2005 | 100% | 100% | 100% | 100% |
| **Sea Level Rise:** Percent of buildings projected to be inundated by sea level rise | 10% | 11% | 10% | 11% |

| | HIGH RISK | VERY HIGH RISK | EXTREME RISK |
|---|---|---|---|
| **Wildfire:** Percent of buildings at highest risk to wildfire | 6% of buildings by count and <1% by sq. ft. | 0% of buildings by count and 0% by sq. ft. | 4% of buildings by count and <1% by sq. ft. |

| | 100– or 500– year floodplain |
|---|---|
| **Flooding:** Percent of buildings located within floodplains | 6% of buildings by count are in the flood plain. The percentage of the same buildings by sq. ft. is 26%. |

All Smithsonian facilities in the United States are expected to experience more days of high heat and increased precipitation in all scenarios. Museums and offices in Washington, D.C., including the National Zoo which houses live animal collections, will experience between 18 (mid-century RCP 4.5) and 55 (late century RCP 8.5) more days above the 99th maximum-temperature percentile annually, and more days of precipitation. Smithsonian facilities on the National Mall will be exposed to greater risk of flooding, particularly those at the bottom of the Federal Triangle watershed, and where the topography of sites creates ponding. The Smithsonian Astrophysical Observatory's Whipple Observatory and base camp in Arizona, including research site and scientists' dormitories, are exposed to a significant risk of wildfires. The Federal Mapping App indicates that the mountaintop observatory and support facilities are at extreme risk while the base camp facilities and visitor center are at high risk. The Smithsonian's Conservation Biology Institute in northwestern Virginia has low or moderate risk of wildfires but hot dry weather could increase the risk. The Smithsonian Environmental Research Center facilities in Edgewater, Maryland also have low or moderate risk of wildfire. Waterfront research facilities in Maryland and Florida will be at risk of both sea level rise and coastal surge.

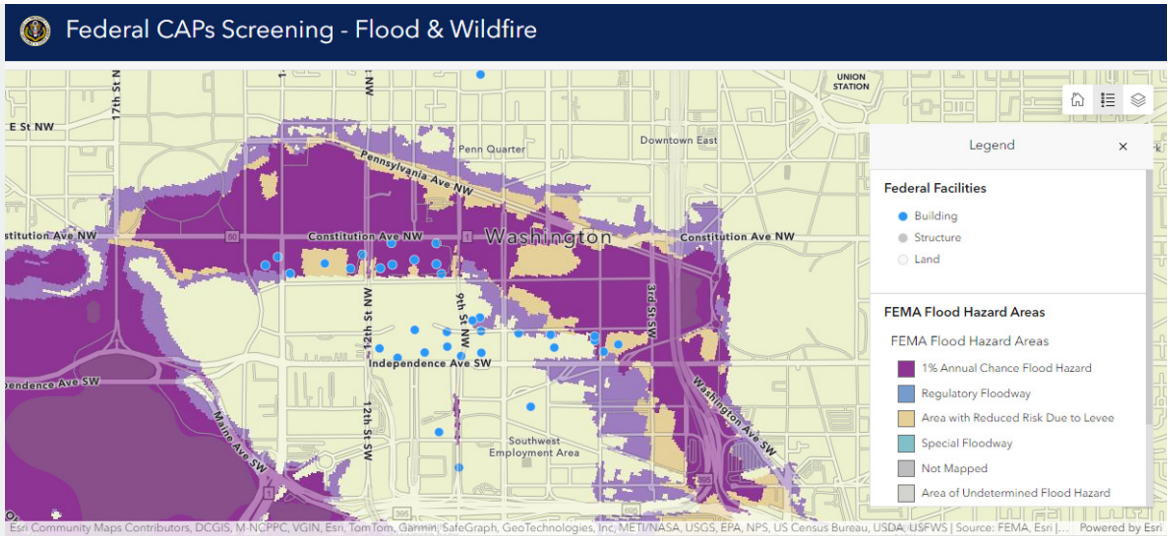
Because the number-of-buildings metric called for in this report treats each building equally, it does not reflect building size, occupancy, or use. As such, the Smithsonian has added percentages of building area in square feet to the table. The size of building expresses the order of magnitude of the effect of risks on building assets and

distinguishes between buildings that may be small guard booths occupied by one or two staff, unoccupied chiller plant enclosures, or museums with thousands of visitors and staff.

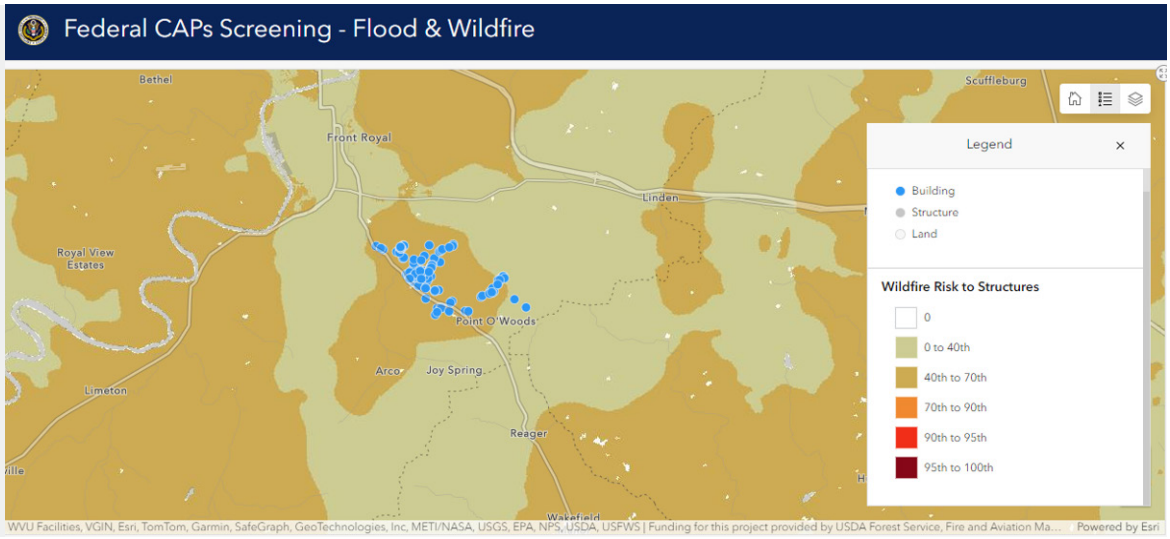
Additionally, the national-scale GIS tool used to create consistency for these agency plans is necessarily less precise at an individual site level than the Smithsonian's geospatial database and individual facility climate vulnerability analyses. When available, this report uses more refined data that varies from that derived from applying the Federal Mapping App. While the Smithsonian has not done an Institution-wide assessment of heat impacts, its analyses of impacts from combinations of intense precipitation, sea level rise, and flood plain location employ greater topographical precision, as well as a more detailed understanding of the relationships of building features to topography and how the use of space within the building may contribute to vulnerability. Accordingly, the National Museum of American History has equivalent or greater vulnerability to flood and sea level rise effects than the adjacent National Museum of Natural History and the National Museum of African American History and Culture. Risk and vulnerability data for more remote locations including Smithsonian Astrophysical Observatory telescope facilities in Hawaii and Smithsonian Tropical Research Institute facilities in Panama, is currently less developed. Those locations typically feature much smaller facilities that do not exhibit or store accessioned collections.

Refer to Section 2C which discusses impacts to historic buildings and districts listed on, or eligible for, the National Register of Historic Places.

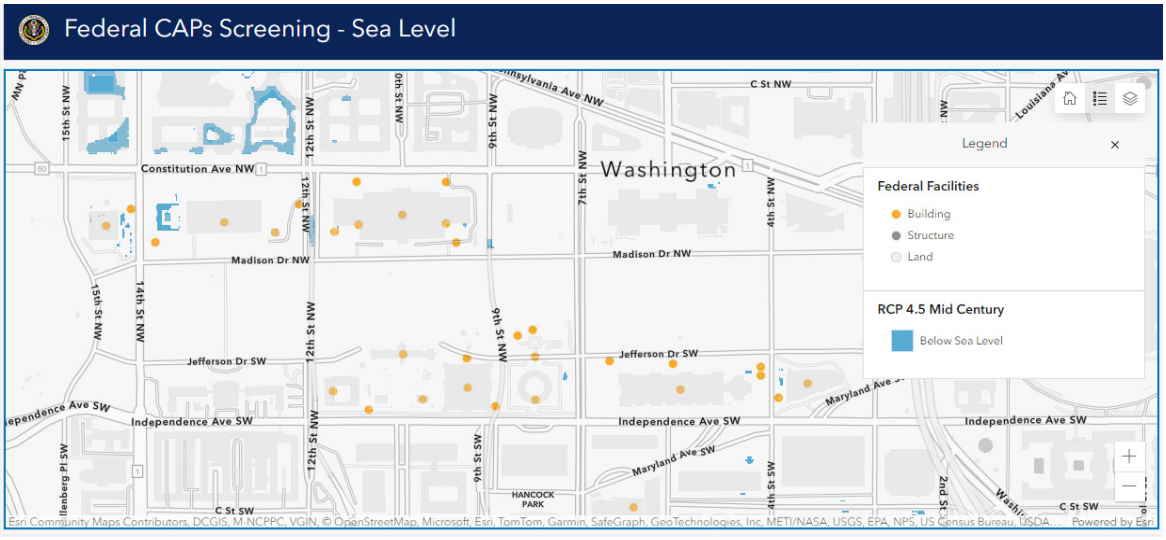
**D.C. National Mall Current FEMA Flood Map**
The blue dots represent Smithsonian buildings, including museums as well as guard booths, sheds, mechanical equipment enclosures, etc.



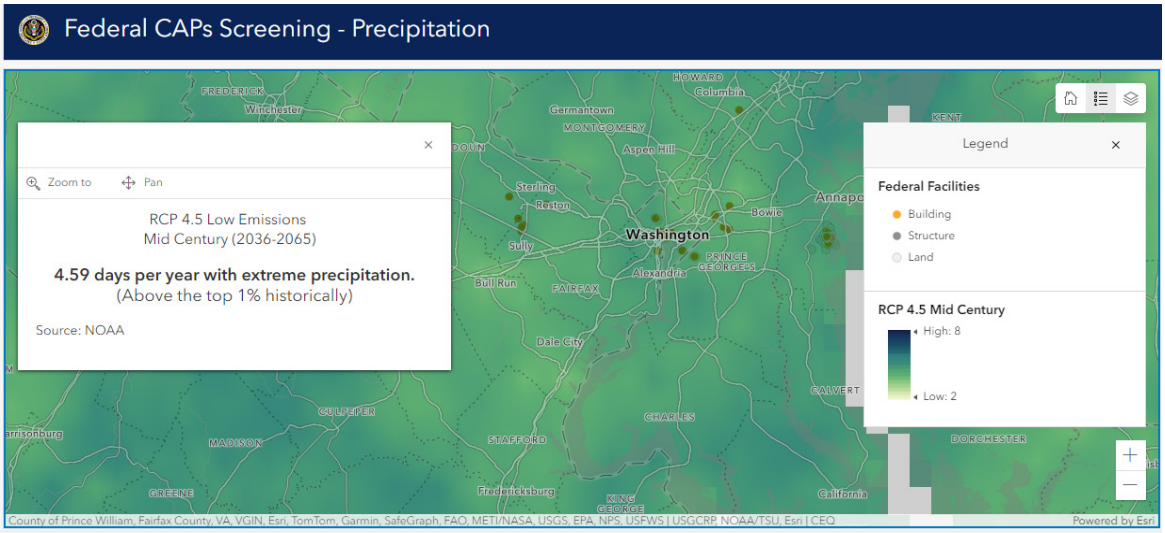

**Virginia Current Wildfire Risk Map**
Current wildfire risk to Smithsonian Conservation Biology Institute facilities in Front Royal is moderate (NOAA data provided).



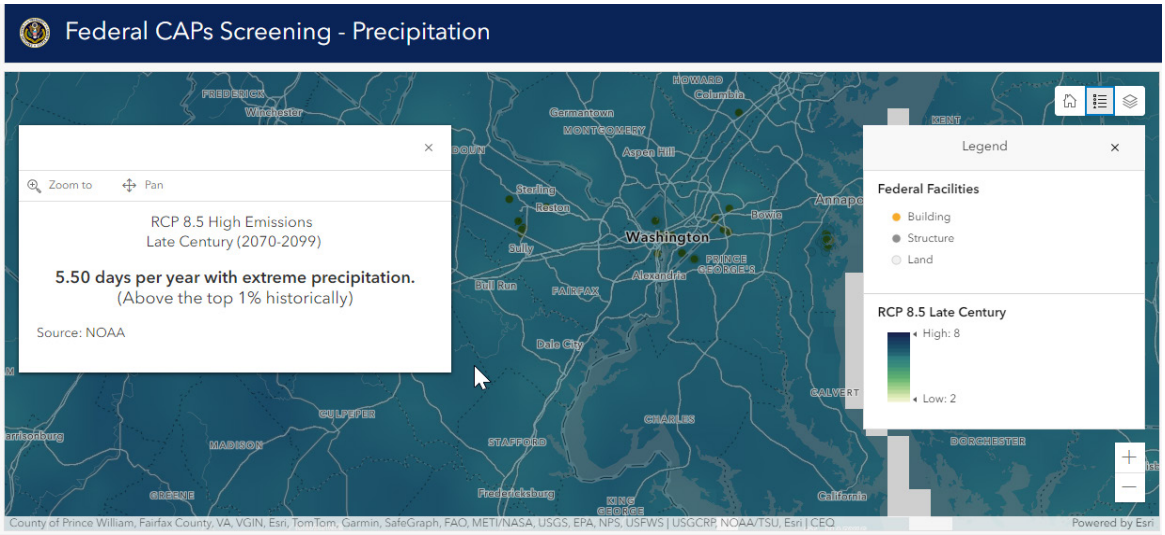

**D.C. Sea Level Rise RCP 8.5 Late-Century Map**
Smithsonian facilities in the D.C., Maryland, and Virginia area will be subject to sea level rise late century (NOAA data for RCP 8.5).



**DMV Precipitation**
**RCP 4.5 Mid-Century**
By mid century, Smithsonian facilities in the DC, Virginia and Maryland area are expected to experience 4.6 additional days with as much or more precipitation as the four current highest days. (NOAA data)




**DMV Precipitation**
**RCP 8.5 Late-Century**
By late century, Smithsonian facilities in the DC, Virginia and Maryland area are expected to experience 5.5 additional days with as much or more precipitation as the four current highest days. (NOAA data)



## 2B. Climate Hazard Exposures and Impacts Affecting Smithsonian Employees

| INDICATORS OF EXPOSURE OF EMPLOYEES TO CLIMATE HAZARDS | RCP 4.5 2050 | RCP 4.5 2080 | RCP 8.5 2050 | RCP 8.5 2080 |
|---|---|---|---|---|
| **Extreme Heat:** Percent of employees duty-stationed in counties projected to be exposed to more days with temperatures exceeding the 99th percentile of daily maximum temperatures (calculated annually), from 1976–2005 | 100% | 100% | 100% | 100% |
| **Extreme Precipitation:** Percent of employees duty-stationed in counties projected to be exposed to more days with precipitation amounts exceeding the 99th percentile of daily maximum precipitation amount (calculated annually), from 1976–2005 | 100% | 100% | 100% | 100% |
| *% of agency Federal employees located in counties exposed **to sea level rise.*** | 5% | 5% | 5% | 5% |

| | HIGH RISK | VERY HIGH RISK | EXTREME RISK |
|---|---|---|---|
| **Wildfire:** Percent of employees duty-stationed in counties at highest risk to wildfire | <1% | 0% | 0% |

**HEAT**

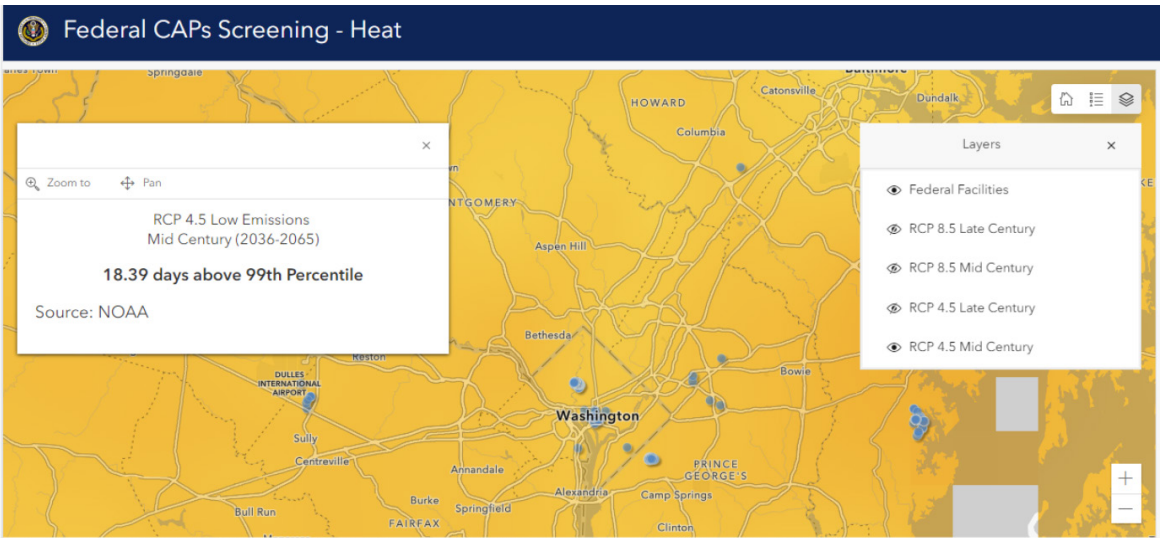
All Smithsonian sites are expected to experience an increase in the number of extremely hot days under both mid- and late-century scenarios for RCPs of 4.5 and 8.5 analyzed with the Federal Mapping App using NOAA data. The Smithsonian's most impacted sites in Arizona and Florida have relatively few employees (approximately 30 each) and will need to take heat factors into consideration for planning and operational decision making. Increasing impacts will be severe in the National Capital Region and surrounding areas where 80% of employees (federal and trust) are based. Predictions based on NOAA data applied in the Federal Mapping App indicate the following for Washington, D.C.:

- Mid Century, RCP 4.5: 18 days as hot or hotter than the four hottest days of the year now
- Mid Century, RCP 8.5: 26 days as hot or hotter
- Late Century, RCP 4.5: 26 days as hot or hotter
- Late Century, RCP 8.5: 55 days as hot or hotter

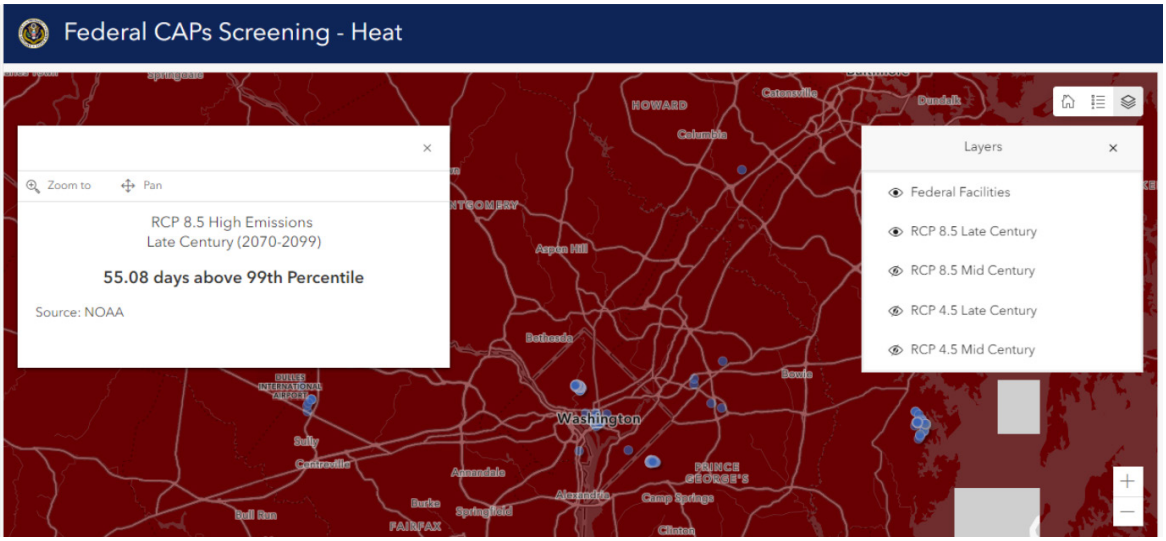
The above scenarios will likely impact in-person visitors in many ways. Some may not vacation in or tour the Washington, D.C. area while others may choose to visit the air-conditioned museums and stay longer. Additional loads on mechanical, electrical, and plumbing systems would need to be planned and budgeted for.

Employees at the National Zoo and Conservation Biology Institute care for living animal collections and support

**DC Heat RCP 4.5 Mid Century Map**
By Mid Century, Washington DC is predicted to have 18 days as hot or hotter that the four hottest days now experienced (NOAA predictions based on RCP 4.5)




**DC Heat RCP 8.5 Late Century Map**
By Late Century, Washington DC could experience as many as 55 days as hot or hotter than the four hottest days now experienced (NOAA predictions based on RCP 8.5)




the specialized indoor and outdoor environments those animals require. These include water features requiring tightly controlled conditions for aquatic animals. Similarly, Smithsonian Gardens staff's care of their living collections, gardens, and landscapes is more challenging in the face of increasingly hot days, as are outdoor educational programs for visitors and staff.

National Zoo security staff as well as security personnel stationed at museum entrances to loading docks work outdoors. Security officers wearing heavy protective gear and uniforms are further impacted by heat. Construction and maintenance crews also must adjust their work to extreme heat conditions. The constant need to maintain closely controlled environments for museum collections requires high levels of repair and maintenance. Current practices and policies in place for hot work precautions by Smithsonian staff and outside contractors will be triggered more frequently in future years.

Employees at the Smithsonian Astrophysical Observatory's Whipple Observatory, located on U.S. Forest Service land in Arizona, conduct research activities that involve equipment including extensive outdoor reflector arrays. Increased heat is particularly damaging to equipment sealants. If equipment or personnel are not able to operate due to heat, it may impact time-sensitive research. Smithsonian scientists' outdoor field research will likely be impacted — both in the need to design research studies to account for heat and in the findings of that research.

**INCREASED PRECIPITATION**

Increased precipitation impacts Smithsonian employees at all sites. Employees located in or near the flood plain including portions of the National Mall and National Zoo as well as the National Museum of the American Indian's New York City facility will be particularly impacted. Emergency protocols require employees working in facilities housing collections to remain on site during severe emergencies, including some intense precipitation events, to protect visitors and collections and maintain building system

operations. Unlike hurricanes, rainstorms with intense precipitation often occur with little warning. A high proportion of employees in Washington, D.C. and New York City commute via public transit. If these systems are disrupted by precipitation events, it may be difficult for staff to reach our facilities to perform essential tasks. This is accounted for in planning for emergencies.

**SEA LEVEL RISE**

The Federal Mapping App indicates that sea level rise will impact 10–11% of Smithsonian buildings under all future scenarios. This includes employee workplaces in Washington, D.C.; Edgewater, Maryland; Ft. Pierce, Florida; and New York City, New York as well as Smithsonian facilities not included in the CEQ database and located throughout Panama. The Smithsonian has considered the additional impact of sea level rise in its flood vulnerability analysis of mainland U.S. facilities and will be studying impacts to facilities (buildings and employees) throughout Panama and in Hilo, Hawaii in the future.

**FLOOD PLAIN**

Half of the Smithsonian's National Mall museums lie at least partially in the 100- or 500-year flood plains. Employees at the National Museum of American History and the National Museum of Natural History are potentially the most impacted. Their location, along with the extent of stored collections and exhibits in those buildings, and the topography contribute to the vulnerability at these worksites.

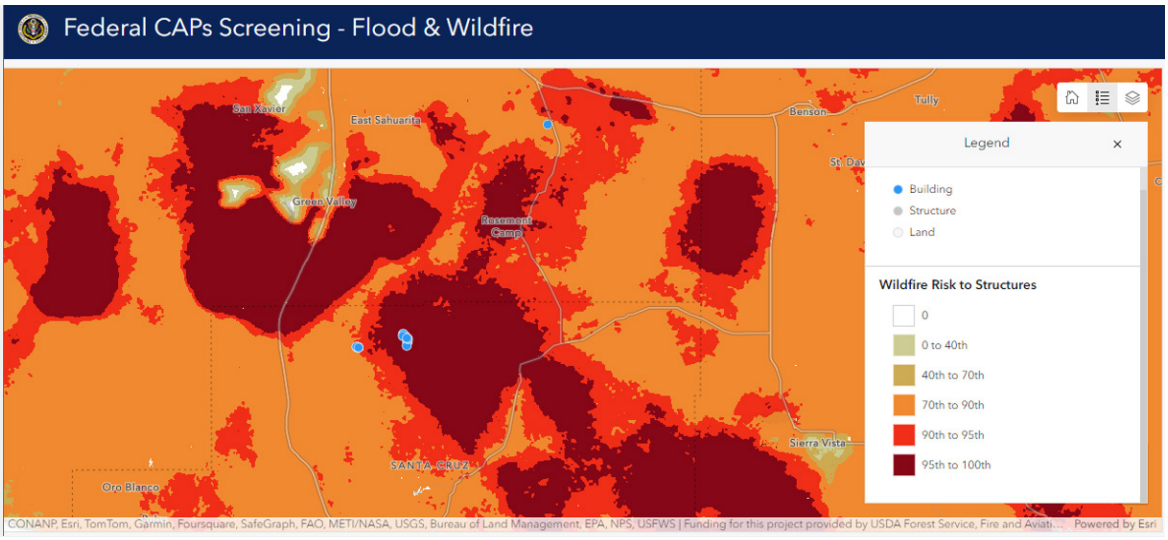
Most facilities at the National Zoo are not within a flood plain. However, the Amazonia exhibit and several key support structures housing critical employees and operations are within, or are immediately adjacent to, the flood plain. The Boiler Plant, providing heating for most zoo facilities, and the General Services Building where animal food prep takes place, are at risk.

Other Smithsonian workplaces with at least a portion of land and structures in the flood plain include the Smithsonian Environmental Research Center housed on 2700 acres in Edgewater, Maryland, National Museum of the American Indian–NY (in the GSA's Hamilton Customs House) and the Smithsonian Marine Station in Fort Pierce, Florida.

**WILDFIRE**

The Smithsonian Astrophysical Observatory in Arizona has high (base camp and administration) and extreme exposures (observatory) to wildfire risk for the location's 35 employees and visiting researchers.

As summer 2023's wildfires in eastern Canada demonstrated, even employees at great distance from wildfires can be impacted by wind-born smoke, particularly those working outdoors or whose health is most at risk.




**Arizona Current Wildfire Risk Map**
Smithsonian Astrophysical Observatory facilities in Amado, Arizona (blue dots) include a visitor center and administration buildings in the High Risk (orange) area and a dormitory, the main observatory, and other equipment in the Extreme Risk category (dark red), representing the higher mountaintop and ridge areas of Mt. Hopkins.

## 2C. Climate Hazard Exposures and Impacts Affecting Federal Lands, Waters, and Associated Cultural Resources

This section addresses Smithsonian's cultural resources recognized by State Historic Preservation Officers. Impacts and exposures to the land surrounding Smithsonian's facilities are included in Section 2A on impacts to buildings and in 2C on impacts to employees. The facilities listed below are impacted by increased intense precipitation. None are exposed to a high, very high, or extreme risk of wildfire.

| FEDERAL ASSET — CULTURAL ASSETS LISTED ON THE NATIONAL REGISTER | CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE | FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE |
|---|---|---|
| National Zoological Park: 14 cultural resources on 163 acres within the National Zoological Park Historic District. | 38 acres of the National Zoo are within the 100-year flood plain and an additional 2.9 acres are within the 500-year flood plain. The Boiler Plant (1912), responsible for providing heat to much of the Zoo, is within the 100-year flood plain. | The National Zoo is predicted to remain within the 100-year flood plain. For this and other assets currently in the flood plain, frequency and severity of flood impacts are expected to increase as is the land area defined as the 100-year flood plain. |
| National Museum of Natural History: Completed in 1911. | This museum is part of the National Mall Historic District and is located within the 100-year flood plain. | The museum is predicted to remain within the 100-year flood plain. |
| National Museum of African American History and Culture: Completed in 2016, the site includes the Bulfinch Gatepost. | The museum is part of the National Mall Historic District and is affected by mid-century and late-century sea level rise. It is located within the 100-year flood plain. | The museum is affected by mid-century and late-century sea level rise and is predicted to remain within the 100-year flood plain. |
| National Museum of American History: Completed in 1964. | The museum is part of the National Mall Historic District and is affected by mid-century and late-century sea level rise. It is located within the 100-year flood plain. | The museum is affected by mid-century and late-century sea level rise and is predicted to remain within the 100-year flood plain. |

***Left:*** The Hirshhorn Museum and Sculpture Garden is eligible for listing on the National Register for Historic Places and is in the National Mall Historic District. Current projects will improve its resiliency to flooding as well as heat. ***Right:*** The National Museum of the American Indian is located in the lower levels of the Alexander Hamilton U.S. Customs House in Lower Manhattan.

| FEDERAL ASSET — CULTURAL ASSETS LISTED ON THE NATIONAL REGISTER | CURRENT CLIMATE HAZARD IMPACT OR EXPOSURE | FUTURE CLIMATE HAZARD IMPACT OR EXPOSURE |
|---|---|---|
| National Museum of American Indian: Completed in 2004. | The museum is part of the National Mall Historic District and is affected by mid-century and late-century sea level rise. Part of the museum's site is within the 500-year flood plain. | The museum is affected by mid-century and late-century sea level rise and is within the 500-year flood plain. |
| Hirshhorn Museum and Sculpture Garden: Completed in 1974. | The museum is part of the National Mall Historic District and is affected by mid-century and late-century sea level rise. | The museum is affected by mid-century and late-century sea level rise. |

The Smithsonian's cultural resources that line the National Mall in Washington, D.C. contribute to the National Mall Historic District, listed in the National Register of Historic Places. The Smithsonian has two additional leased cultural resources, the National Postal Museum housed within the historic D.C. City Post Office Building (built in 1914), and the Alexander Hamilton U.S. Custom House built in 1907 in New York City. The Custom House is a National Historic Landmark, owned by the General Services Administration, affected by mid-century and late-century sea level rise.

The National Mall area is largely built on land reclaimed from the Potomac River and its watershed. Floods experienced in the National Mall vicinity result from Potomac River and Tiber Creek overflow as well as the failure of the urban stormwater drainage system during heavy precipitation.

The National Park Service's 17th Street levee completed in 2014 addresses large-scale riverine and storm surge flooding on the National Mall, but this system can only be deployed ahead of predicted flooding and does not provide protection from intense precipitation events. The National Museum of American History and the Hirshhorn Museum and Sculpture Garden most regularly experience flooding from rain events.

All the Smithsonian's owned and leased historic buildings are subject to extreme heat and precipitation, both of which accelerate material degradation and compromise building envelopes. Extreme heat particularly accelerates deterioration of roofing systems. Additionally, the Smithsonian's historic facilities are not on cyclical facade maintenance and restoration plans. The combination of extreme heat and precipitation leads to increased water penetration which compromises building envelopes, deteriorates exterior materials, and overtaxes stormwater systems for historic structures that were not designed for the current climate and these increasing risks. The impacts of extreme heat and precipitation will increase, particularly when planned building revitalizations cannot fully address all the historic structure's restoration requirements.

## 2D. Climate Hazard Exposures and Impacts Affecting Mission, Operations, and Services

| SUMMARY OF KEY CURRENT AND PROJECTED CLIMATE HAZARD EXPOSURES AND IMPACTS | | |
|---|---|---|
| **Area of Impact or Exposure** | **Identified Climate Hazard** | **Description** |
| **Museum and Educational Programs** | Heat: All locations exposed. | More extremely hot days may impact some employees' health and require adjustments to outdoor programs. Museum air conditioning may attract more visitors. Those confined by high heat in remote locations may benefit from Smithsonian's expanding digital offerings. It may become more difficult and costly to maintain strict environmental controls in museum and collections spaces. |
| | Extreme Precipitation: All locations exposed. | Museums, the Zoo, and research centers may be required to close if visitors and staff are at risk or cannot safely travel. While resilient, virtual digital resources may not be available during extreme events if their operation is disrupted if IT support employees cannot get to work or an extreme event causes large-scale, long-term power outages. |
| | Flooding: Impacts a subset of facilities exposed to extreme precipitation. | Most frequently, flooding events at Smithsonian's facilities result from extreme precipitation and the impacts to museum programs are therefore similar and may be prolonged if floods damage essential building systems. |
| **Research Programs** | Heat: All locations exposed. | Impacts to researchers and data collection is felt most strongly when conducted outdoors and/or is supported by vulnerable facilities and equipment. There may be opportunities to better understand and communicate impacts to benefit climate adaptation. |
| | Extreme Precipitation: All locations exposed. | Access to research locations may be impacted if, for example, an unpaved road serving a field station is washed out or if D.C. Metro stations serving researchers at museums and the Zoo are flooded. Power outages resulting from some storms may impact research, particularly if supporting electrical equipment is not on emergency power and buildings are closed. |

| SUMMARY OF KEY CURRENT AND PROJECTED CLIMATE HAZARD EXPOSURES AND IMPACTS | | |
|---|---|---|
| **Area of Impact or Exposure** | **Identified Climate Hazard** | **Description** |
| **Research Programs (cont.)** | Flooding: Impacts a subset of facilities exposed. | A subset of buildings exposed to extreme precipitation could be impacted by flooding which could necessitate the temporary relocation of collections or even closure of a building. This would impact Smithsonian's ability to meet its mission as it limits visitation and access for research. |
| | Sea Level Rise: Impacts a subset of facilities exposed. | Impacts of sea level rise will be most directly felt at dock locations used for marine research and adjacent facilities supporting marine research. |
| **Collections** | Heat: Impacts all locations | Extreme heat requires extra demand of mechanical systems to maintain constant temperature and humidity levels in storage facilities and galleries. Mechanical systems will have to work harder, use more energy, and will require more maintenance and earlier replacements.<br><br>Regional or local impacts to the power grid can be mitigated by emergency generators. Potential disruption to central chilled water plants operated by others is less easily mitigated for the museums reliant on this for cooling.<br><br>If environments cannot be maintained, collections may suffer degradation, particularly if conditions change rapidly. Climate-resilient collections equipment; mechanical system strategies such as evening setbacks and reduced air exchanges in storage facilities; and better building envelope design can mitigate this hazard, as does the installation of additional redundant mechanical equipment to maintain conditions in event of a breakdown. |
| | Extreme Precipitation: All locations exposed. | Impacts are experienced most at facilities with aging infrastructure, including collections storage and display locations. This will require funding for maintenance programs, and reliance on additional measures to adapt facility and staff capabilities to best steward collections, including the Preparedness In Response to Collections Emergencies (PRICE) program to strengthen Smithsonian's ability to respond to emergencies involving collections through training, workshops, and outreach efforts. |

| SUMMARY OF KEY CURRENT AND PROJECTED CLIMATE HAZARD EXPOSURES AND IMPACTS | | |
|---|---|---|
| **Area of Impact or Exposure** | **Identified Climate Hazard** | **Description** |
| **Collections (cont.)** | Flooding: Impacts a subset of facilities exposed to intense precipitation. | Flooding restricts access to collection items, impedes response and recovery capabilities, and increases risks of collection item damage and personnel harm from affected electrical and other systems. |
| **Central Services** | Heat, Extreme Participation, Flooding. | The greatest impacts occur when employees are unable to get to work due to health impacts or damage to transportation systems. |
| **Facilities** | See Sections 2A and 2C. | |

While all five of the hazards analyzed (heat, intense precipitation, sea level rise, flood plain location, and wildfires) impact at least some facilities, the combination of intense precipitation and facility location in the flood plain has the most impact and is the focus of Smithsonian's climate adaptation analysis and adaptation planning. The museums on the north and southeast edges of the National Mall are the most impacted. The local stormwater infrastructure is sized only to accommodate a 15-year flood. The 17th Street levee offers good protection from riverine flooding but not from intense precipitation events and the impact of excess water flowing down to the National Mall from higher ground to the north. These facilities all include national collections on exhibit and several museums including the National Museum of American History and the National Museum of Natural History house additional storage/research collections on site. While the Smithsonian is making progress in moving stored collections from vulnerable floor levels, a potential flood sufficient to interrupt power and other utilities, damage building mechanical equipment, and/or to disrupt the refueling of our emergency generators could create high humidity levels that could degrade some types of collections, particularly those vulnerable to mold growth. A precipitation or flood event of sufficient impact to close the museums for any length of time would disrupt the educational mission, deprive visitors of what are sometimes once-in-a-lifetime visits, and post risk to the vast Smithsonian collections. Closures of museums for any reason also impact revenue from retail operations and special events that the Smithsonian relies on to supplement federal appropriations and maintain free admission.

Increasing heat impacts all locations dramatically at mid- and end-of-century scenarios, but in a more incremental way. Protecting our visitors, volunteers, contractors, and employees in the face of dramatically more hot summer days will require increased vigilance and resources. Maintaining comfortable temperatures for humans as well as collections in our care, including living animal collections, challenges the Smithsonian to make its buildings more resilient and energy sources more sustainable and affordable.

Sea level rise impacts five facilities engaged in the Institution's MarineGEO program. The Smithsonian Marine Station in Fort Pierce on Florida's Atlantic Coast is one of the smallest of Smithsonian's facilities and is particularly vulnerable. It is operated by the National Museum of Natural History and conducts important research on estuaries and marine life. This facility houses several small-scale buildings and will be increasingly vulnerable to storm surge flooding aggravated by sea level rise. Unlike most major Smithsonian assets, buildings in the MarineGEO program that do not need to be immediately adjacent to the water should be evaluated for nearby, inland relocation to mitigate this risk.

SECTION 3

# Implementation Plan

## 3A. Addressing Climate Hazard Impacts and Exposures

### 1. ADDRESSING CLIMATE HAZARD EXPOSURES AND IMPACTS AFFECTING FEDERAL BUILDINGS

| ADDRESSING CLIMATE HAZARD EXPOSURES AND IMPACTS AFFECTING FEDERAL BUILDINGS | | |
|---|---|---|
| **Climate Hazard Impact on and/or Exposure to Buildings** | **Priority Action** | **Timeline for Implementation (2024–2027)** |
| **Heat:** Impacts all facilities in the U.S., as well as the Smithsonian Tropical Research Institute locations in Panama. | Collections storage facilities implement standards developed through master plans for robust building wall systems and mechanical systems that passively maintain an appropriate preservation environment. These are being applied in Pod 6, currently under construction. | Pod 6 construction will be substantially complete in 2025. |
| | Encourage use of rating systems beyond LEED to improve the indoor environment. | This will be addressed in update to SD 422 Sustainability in Fiscal Years 2024–2025. |
| | Building and campus master plans will address heat in addition to other hazards. | Building and campus master plans that will be in progress during this timeframe include the National Museum of Natural History, the National Zoo and Conservation Biology Institute, the Cooper Hewitt Smithsonian Design Museum, and the Dulles Collections Center. |
| | Smithsonian Gardens continues to increase the shade tree canopy, native plants, and pollinator gardens. These address heat as well as stormwater management. | Smithsonian Gardens master plan will be undertaken in Fiscal Years 2026 and 2027. This Mall-wide plan will address adaptive landscape and site drainage and infrastructure improvements. |

| ADDRESSING CLIMATE HAZARD EXPOSURES AND IMPACTS AFFECTING FEDERAL BUILDINGS | | |
|---|---|---|
| **Climate Hazard Impact on and/or Exposure to Buildings** | **Priority Action** | **Timeline for Implementation (2024–2027)** |
| **Flooding:** Impacts a subset of facilities exposed to extreme precipitation. | The National Museum of American History Master Plan identified immediate, mid-term, and long-term projects to address flood risk at the most vulnerable National Mall location. A now completed feasibility study resulted in an implementation plan for site drainage and flood protection. | The National Museum of American History temporary flood barriers and drainage improvements are to be constructed in Fiscal Year 2025. Relocation of emergency power service from the lower level to the roof is planned for Fiscal Year 2027. |
| | The current National Museum of Natural History Master Plan is also addressing flood protection and stormwater management improvements.<br><br>The National Zoo and Conservation Biology Institute Comprehensive Plan includes sustainability, resiliency, and a stormwater management plan. It will include options for replacing the boiler plant that is in the floodplain. | The National Museum of Natural History and the National Zoo and Conservation Biology Institute Comprehensive Plan development will occur in this timeframe. |
| **Wildfires:** High risk impacts a small number of facilities. | The Smithsonian Astrophysical Observatory dormitory in Arizona (originally built with combustible materials) will be replaced with one built to be compliant with current codes and the Smithsonian sustainability policies. | This project is shovel ready. Construction will take place in Fiscal Years 2025 and 2026. |

To address potential impacts from heat and climate change, the Smithsonian is building on its previous pan-Institutional Collections Space Framework Plan and master planning for the Smithsonian Collections Center in Suitland, Maryland to implement the standards developed for more robust building construction and energy efficient systems able to maintain stable preservation environments. A campus plan for our Dulles Collections Center is also underway. Together, these will enable relocation of collections from vulnerable locations and encourage sustainability and resilience in site and building development.

Changes to more sustainable energy systems involving hot water instead of steam and moving away from fossil fuels for energy are being integrated into planning. Solar arrays are being implemented on appropriate museum roofs around the National Mall where they are designed to aesthetically blend into their surroundings and are also being installed at more remote facilities where land is available.

The Smithsonian Directive on Sustainable Design of Smithsonian Facilities update will promote resiliency, update the Smithsonian requirements for LEED, and

Rendering of new dormitory with improved fire resistance to be constructed at SAO-AZ observatory.

encourage the use of certification systems beyond LEED to create a healthy work environment. Use of these systems applying to buildings and sites is already being explored within current projects, particularly at the Smithsonian Environmental Research Center where there is an opportunity to become a model campus of sustainability.

LEED certification guides project teams to invest in climate adaptation strategies. The ratings category of greatest applicability to the Smithsonian's resiliency involve energy – supporting efficiency, performance, enhanced commissioning and encouraging renewable energy sources where possible. Additional categories targeting location and transportation, materials and resources, water efficiency (including metering and management), and indoor environmental quality minimize environmental harms and reduce carbon emissions. LEED Sustainable Sites credits encourage the Smithsonian priorities of habitat restoration and biodiversity.

Future flooding and extreme precipitation impacts will increase at facilities that are already most impacted by these risks along the north and southeast sides of the National Mall. The National Museum of American History site, the largest and closest Smithsonian site to the low point in the Federal Triangle, focused on flood resiliency in their 2018 Master Plan. A completed feasibility study identified four immediate projects for improved stormwater and temporary flood barriers that are ready to implement. In addition, emergency power will be relocated from the flood-prone lower level to the roof. Longer-term recommendations include building flood walls around the most vulnerable lower east side and west side with an accessible path and automatic permanent flood barriers.

The currently-underway plans for the National Museum of Natural History and the National Zoo and Conservation Biology Institute include flood protection and resiliency as principles. The National Museum of Natural History's plan is conceptualizing a sustainability plan in addition to looking at site drainage and infrastructure improvements. The National Zoo and Conservation Biology Institute's plan for both the Washington, D.C. and Front Royal, Virginia campuses include a sustainability plan addressing resiliency and a comprehensive stormwater plan for each site. A current project at the National Zoo will replace an existing boiler in the boiler plant (located in the 100-year flood plain) that serves the entire campus (including live animal collections) with two higher efficiency natural gas boilers to maintain functionality while the Master Plan considers relocation of the boiler plant to a location outside the flood plain or replacement with another non-steam energy system.

High or extreme wildfire vulnerability is confined to facilities at the Smithsonian Astrophysical Observatory in Arizona. The dormitory that houses interns, researchers, and staff will be replaced with a fire-resistant structure. The shovel-ready project is included in the Fiscal Year 2025 and 2026 plan.

## 2. ADDRESSING CLIMATE HAZARD EXPOSURES AND IMPACTS AFFECTING FEDERAL EMPLOYEES

| ADDRESSING CLIMATE HAZARD EXPOSURES AND IMPACTS AFFECTING FEDERAL EMPLOYEES | | |
|---|---|---|
| **Climate Hazard Impact on and/or Exposure to Employees** | **Priority Actions** | **Timeline for Implementation (2024–2027)** |
| **Increasing Heat** (now, mid- and late-century) impacts 100% of Smithsonian employees at all locations including those based in Washington, D.C., Virginia, Maryland, New York, Massachusetts, Florida, Arizona, and Hawaii, as well as those based in Panama. | The first step to improving the adaptive capacity of the workforce to increasing heat will be to analyze vulnerabilities and potential actions for facilities and people across the Smithsonian in the same way that the Institution previously addressed increased precipitation and sea level rise at U.S. locations subject to flooding. | Include heat in Climate Planning Phase 3 for all locations. Fiscal Years 2026–2027 |
| | In advance of completing such an analysis, the Smithsonian will incorporate planning for increased heat in individual policies, programs, budgets, and purchases for employees exposed to heat including those working outdoors in security, maintenance, construction, horticulture, animal care, research, visitor services, and educational programs. For example, consider lighter weight uniforms for security personnel assigned to outdoor locations | This work will take place in Fiscal Years 2024–2027. |
| **Increasing intense precipitation** impacts 100% of Smithsonian employees at all U.S. locations. | Implementing projects to make Smithsonian buildings more resilient as outlined in Section 3.A.1 will also benefit employees, particularly those working at facilities located within the flood plain. | This work will take place in Fiscal Years 2024–2027 and beyond. |

| ADDRESSING CLIMATE HAZARD EXPOSURES AND IMPACTS AFFECTING FEDERAL EMPLOYEES | | |
|---|---|---|
| **Climate Hazard Impact on and/or Exposure to Employees** | **Priority Actions** | **Timeline for Implementation (2024–2027)** |
| **Increasing intense precipitation** impacts 100% of Smithsonian employees at all U.S. locations. (cont.) | Additionally, resilient data systems support the work of Smithsonian staff as well as their research partners and the public audiences who rely on their availability.<br><br>The Smithsonian is continuing to strengthen its workforce ability to flexibly work from the office, home, and fieldwork locations through a cloud-first strategy for enterprise software implementations. | This work is ongoing and will continue through Fiscal Year 2027 and beyond. |
| | Smithsonian's DAMS (Digital Asset Management System) and the wider EDAN publishing ecosystem that integrates with it, allow for curators and educators to publish rich content, covering the national collections through websites, API integrations beyond the Smithsonian campus, and countless partner research sites. To ensure continued resiliency, the Smithsonian is currently exploring options to either renovate its current data center in Herndon, Virginia or to relocate to a commercial data center co-location space. | The Board of Regents decision on the data center is expected in spring 2024 with implementation to follow. |
| | Ongoing emergency planning includes preparing for events of all types including those related to climate change. When a climate event is likely to prevent employees from commuting or require their around-the-clock presence, provisions are in place for them to remain in facilities to protect collections, feed animals, and maintain building and life safety systems. | This ongoing work will continue through Fiscal Year 2027 and beyond. |

| ADDRESSING CLIMATE HAZARD EXPOSURES AND IMPACTS AFFECTING FEDERAL EMPLOYEES | | |
|---|---|---|
| **Climate Hazard Impact on and/or Exposure to Employees** | **Priority Actions** | **Timeline for Implementation (2024–2027)** |
| **Location in Flood Plain**<br><br>22% of building square footage is in the 100-year floodplain and 4% in the 500-year floodplain which includes several historic museums. | See above. Employees working at these locations are most vulnerable. In Washington, D.C., employees rely heavily on the Metro for commuting. Flooding at nearby stations and air vent structures will impact employee and visitor access to the Smithsonian as would flooding on roads and in or around buildings.<br><br>Initiate a risks analysis and updated cost estimate to evaluate the most cost-effective projects to reduce flood risk to Smithsonian facilities in the Federal Triangle, including individual building resilience projects and shared interagency infrastructure projects. | This work will take place in Fiscal Years 2024–2026. |
| **Sea Level Rise**<br><br>4.85% of employees are impacted under mid-and late-century scenarios for RCPs of 4.5 and 8.5.<br><br>Impacted employees work in Washington, D.C.; Edgewater, Maryland; New York, New York; Ft. Pierce, Florida; and Hilo, Hawaii, with the greatest number impacted based in the Washington, D.C. museums. | Actions described above for increased intense precipitation and flooding also address the added impact of sea level rise in causing higher flood levels in portions of the National Mall and for the National Museum of the American Indian-NY employees based at the GSA's Alexander Hamilton U.S. Customs House in Lower Manhattan. | This work will continue through Fiscal Year 2027 and beyond. |

| ADDRESSING CLIMATE HAZARD EXPOSURES AND IMPACTS AFFECTING FEDERAL EMPLOYEES | | |
|---|---|---|
| **Climate Hazard Impact on and/or Exposure to Employees** | **Priority Actions** | **Timeline for Implementation (2024–2027)** |
| **Wildfires**<br><br>0.3% of federal employees and 0.7% of trust employees are at high risk for wildfires.<br><br>Impacted employees are based at the Smithsonian Astrophysical Observatory located on U.S. Forest Service land in Arizona. | A new dormitory with improved fire resistance will be constructed at the Smithsonian Astrophysical Observatory in Arizona. This will provide increased safety for employees and visiting astronomers housed overnight at the facility. | This work will be addressed during Fiscal Years 2024–2026. |
| Smithsonian employees and live animal collections at the Smithsonian Conservation Biology Institute are currently at moderate risk for wildfire. This risk could increase in the future. | The Smithsonian Conservation Biology Institute's Comprehensive Facilities Plan that is currently under development will incorporate an analysis of risk to employees and any proposed mitigations. | The Smithsonian Conservation Biology Institute's Comprehensive Facilities Plan is being developed now and will continue through Fiscal Year 2025. |

While the Federal Climate Adaptation Plan template requests information with respect to impact on federal employees, the Smithsonian has included data for its trust-funded employees as well. They represent approximately 40% of the Institution's workforce. In addition, the Smithsonian's most impacted facilities host visitors who significantly outnumber employees at museum locations. Research locations host visiting scholars, fellows, and interns in addition to Smithsonian employees. Most Smithsonian museums also host some of the Institution's more than 6,000 volunteers and more than 2,000 contractors.

## 3. ADDRESSING CLIMATE HAZARD EXPOSURES AND IMPACTS AFFECTING FEDERAL LANDS, WATERS, AND CULTURAL RESOURCES

### a. Cultural Resources

| TYPE OF LAND OR WATER ASSET | CLIMATE HAZARD IMPACT ON AND/ OR EXPOSURE TO THE ASSET | PRIORITY ACTION |
|---|---|---|
| **National Zoological Park Historic District:** Stone Bridge built in 1913 and Beach Drive Bridge built in 1901. | These two historic bridges cross Rock Creek, each about twenty feet above water level. Rock Creek's shoreline is degrading from flooding and extreme precipitation. Scour occurs when water erodes the sediments around the base of structures or from the shoreline. | In Fiscal Year 2025, the Smithsonian will install riprap to curb scour which will protect the Rock Creek shoreline and the bridge abutments for these two historic bridges. |
| **Hirshhorn Museum and Sculpture Garden** | The Sculpture Garden is affected by mid-century and late-century sea level rise. Its below-grade areas regularly flood during extreme participation events. | Stormwater management will be installed in the Sculpture Garden under a project that will be completed in 2026. Stormwater management for the remainder of the campus will be improved under a project to be completed in 2030. |

Refer also to Section 3.1. Many of the Smithsonian's historic buildings and the cultural resources within, including collections, are among the properties with planned actions to address impacts from climate hazards described in that section.

## b. Conservation

The Smithsonian is actively supporting projects and activities that engage the public and local communities on inclusive and collaborative conservation and stewardship initiatives in the United States and abroad. Many individual museums and research centers have conservation of lands, waters, and wildlife as a central part of their mission including the National Zoo and Conservation Biology Institute, the National Museum of Natural History, the Smithsonian Environmental Research Center, the Smithsonian Tropical Research Institute, the Smithsonian Astrophysical Observatory, and the Anacostia Community Museum. Since the development of the Smithsonian's 2021 Climate Action Plan, the Institution launched *Life on a Sustainable Planet*. Through this initiative, the Smithsonian is investing in basic research and applications of science to solve conservation challenges, inspiring lifelong learning and leveraging the Institution's vast collections, museums, educational programs, and research to foster a deep appreciation for science, technology, innovation, and culture.

The table below summarizes the major components of *Life on a Sustainable Planet* and its overarching goals relevant to *America the Beautiful*.

| LIFE ON A SUSTAINABLE PLANET | |
|---|---|
| **In the Ocean: A Blueprint for Healthy Coasts** | The Smithsonian is elevating ocean research to protect coastal ecosystems and foster vibrant economies. By merging historic collections with cutting-edge data, the Institution is empowering the next generation to sustain our oceans' health and diversity.<br><br>Through multiple programs, most notably the Coastal Carbon Network, the Smithsonian aims to address key scientific and societal issues. Efforts focus on preserving carbon-storing ecosystems like marshes and mangroves and will develop rigorous accounting standards and recommend actionable solutions.<br><br>The Smithsonian-led MarineGEO research network tracks the vital signs of coastal marine life at sites that span the globe using standardized methods. To support communities, the Smithsonian is working to identify resilient coral and oyster species to protect estuarine cities from flooding and pollution. The Institution's partnerships with coastal communities aims to co-create robust marine policies. |
| **On the Land** | The Smithsonian is focusing on field research to understand the connections between people and landscapes with work that aims to protect ecosystems and benefits forests, grasslands, and rivers.<br><br>Smithsonian researchers and global partners aim to create a balance between nature and people for a more sustainable future. The work spans nearly every continent, with goals to conserve iconic species and ecosystems and increase resilience to the effects of climate change. The ForestGEO global network of more than 75 forest observatories throughout the world monitors more than seven million trees using consistent methods. |

| LIFE ON A SUSTAINABLE PLANET | |
|---|---|
| **On the Land (cont.)** | GEO-TREES will be the world's first ground-based, equitably developed forest biomass reference system, designed to make global satellite-based forest carbon assessments actionable. In another project, across North American grasslands, Smithsonian's research is improving 57,000 acres of land by updating day-to-day buffalo care, installing wildlife-friendly fencing, and implementing shared land monitoring strategies across four Tribal communities. This project is setting the standard for restoration efforts across neighboring grasslands with similar levels of degradation. |
| **In the Air** | The TEMPO collaboration between the Smithsonian Astrophysical Observatory and NASA is measuring North American air pollution from geostationary orbit. Tempo measures ultraviolet/visible/near-infrared spectra to determine key pollutants through hourly measurements of U.S., Canada, Mexico, Cuba, and the Bahamas at high (sub-urban) spatial resolution. Data collected has the potential to improve air quality and health and allows communities to monitor pollutants. |
| **Community-based Resilience** | The Adrienne Arsht Community-Based Resilience Solutions Initiative is a multi-year program to research tropical resilience and educate the public about the role resilience plays in shaping the world. A generous private donation funds the establishment of a center for resilience and sustainability at the Smithsonian Tropical Research Institute in Panama to study the resilience and sustainability connecting complex tropical systems, such as rainforests, and the people who depend on these systems. Program areas will include scaling up of Smithsonian programs that restore and rewild natural rainforest communities, encourage more environmentally conscious fishing practices, and work to understand the risks, triggers and tipping points in tropical forests and reefs.<br><br>Other new programs funded by this donation include a 15-stop virtual resilience tour, which will partner the Smithsonian's science units with its arts and culture museums and programs to explore different interpretations of resilience. The tour, aimed at young adults, includes virtual, 3D, augmented reality and in-person experiences focused on planetary sustainability. Another key component of this initiative is the Smithsonian Resilience Fund, an Institution-wide competitive grant program to foster resilience work across the Institution to seed its vision for sustainability. |
| **Environmental Justice** | By placing a focus on community-led and initiated work that is centered on communities most removed from access to justice, the Smithsonian is creating more adaptive and resilient climate solutions that are driven by the communities that they will be serving. This will focus the solutions on the needs of those that are most negatively impact by climate and environmental issues. |

| LIFE ON A SUSTAINABLE PLANET | |
|---|---|
| **Actions across the Universe** | Scientists and engineers at the Center for Astrophysics (Harvard and the Smithsonian) are involved in international collaborations to create the next generation of observatories and advance humanity's knowledge of the Universe we inhabit to improve life on Earth.<br><br>Researchers at the National Air and Space Museum's Center for Earth and Planetary Studies are exploring other planets to better understand Earth. Studying Mars offers insights into Earth's history and future. Mars exploration, especially analyzing its ancient lakes, reveals conditions predating Earth's oxygen-rich atmosphere, suggesting early Mars was more Earth-like than Earth itself in that era. |
| **Our Shared Health** | Human health and the health of the planet are interconnected. Successful conservation of wildlife and ecosystems benefits health for all of us.<br><br>The Smithsonian aims to advance knowledge to protect all aspects of the health of humans, plants, animals, and their shared environment. This includes the study and prevention of infectious and non-communicable diseases, as well as ecological and environmental degradations impacting the health of living organisms. An interdisciplinary group of scientists, practitioners, and educators explores environmental, human, and animal health interconnections. |

# 3B. Climate-Resilient Operations

## 1. ACCOUNTING FOR CLIMATE RISK IN PLANNING AND DECISION MAKING

| CLIMATE RISK ASSESSMENTS | RISK ASSESSMENTS IN PRACTICE |
|---|---|
| The Smithsonian has a method of including results of climate hazard risk exposure assessments into planning and decision-making processes partially established. | Risk assessments at the Smithsonian tend to be done on a unit-by-unit or project-by-project basis. For example, all major design and construction projects such as the current major revitalizations of the National Air and Space Museum and the Smithsonian Castle include formal Risk Assessments at key design milestones. Climate considerations can be built into the scope of these as a factor potentially impacting design decisions, budget, and/or schedule. However, the Smithsonian leadership sees the benefit of developing a common tool for integrating climate change into risk assessments.<br><br>**Proposed Actions:**<br>During Fiscal Years 2024 and 2025, a team from across the Smithsonian will develop a "best practices" document for integrating climate hazard exposures in risk assessments and budget planning.<br><br>Individual units and project teams conducting risk assessments will incorporate best practices going forward (Fiscal year 2025–2027). |

For example, during the design of the current National Air and Space Museum revitalization project, the decision was made to relocate the museum's library and archives collection to the Udvar-Hazy Center where it would be less exposed to climate risk than it would be if it were located at a below-grade level of the National Mall building as initially proposed. Similarly, after considering flood water levels projected in scenarios developed in the Smithsonian's Phase 1 Climate Change Adaptation Plan, the design team elected to raise the height of the flood barrier planned for the top of the loading dock ramp. An extensive evaluation of potential stone types to reclad the museum's exterior included, among many factors, the susceptibility of different stone types to biological growth, an unsightly and deteriorating problem aggravated by intense precipitation and heat. The selected granite cladding is expected to be more resistant than limestones and marbles that were also evaluated.

For the Bezos Learning Center addition to the National Air and Space Museum, climate risk from the addition's location at the edge of the flood plain led to a decision to locate much of the building's critical mechanical equipment at an upper level with some equipment remaining at a higher level within its basement and protected by the higher flood gate.

Evaluations of sites for two new Smithsonian museums conducted in Fiscal Year 2022 incorporated climate-related hazard exposure in the analyses of each potential site and in the detailed scorecard used to compare them. Considerations included avoiding locations in the flood plain and, for both new buildings and reuse of existing buildings, the ability to provide successful, and energy efficient controlled environments for museum collections while minimizing embedded and operational carbon. The proposed "best practices" framework for assessing climate risk will be in place to guide the detailed planning, design, and construction for the National Museum of the American Latino and the Smithsonian American Women's History Museum anticipated to begin by Fiscal Year 2026.

## 2. INCORPORATING CLIMATE RISK ASSESSMENT INTO BUDGET PLANNING

| PLANNING AND BUDGET | PLANNING AND BUDGET PRACTICE |
|---|---|
| The Smithsonian incorporates climate risks in existing processes. | The Smithsonian's central Office of Planning, Management, and Budget manages both the federal and trust resources.<br><br>Climate risk will be integrated through several means:<br><br>• Budget presentations to the Smithsonian Regents include identification of budget priorities. Relevant climate factors will be integrated in future guidance and would include such priorities as continuing to relocate all collections from storage spaces vulnerable to flood risk and improving and locating mechanical and electrical systems to be more resilient in the face of increasing heat and flood risk.<br><br>• Annual guidance to individual Smithsonian units on preparing their budgets will include guidance on addressing climate risk.<br><br>• Projects to address climate risks can be highlighted in the Facilities Capital Plan. |

## 3. INCORPORATING CLIMATE RISK INTO POLICY AND PROGRAMS

| AGENCY POLICIES REVIEWED | | |
|---|---|---|
| **Climate Adaptation and Resilience** | Smithsonian polices covering the full range of the Institution's activities are incorporated in 170 Smithsonian Directives, referred to as SDs. A number of these govern activities relevant to climate adaptation including: | |
| | SD 422 Sustainable Design of Smithsonian Facilities | Currently under review to update guidance concerning sustainability and climate resilience. |
| | SD 109 Smithsonian Emergency Management | Details roles and responsibilities and principles for preparedness, response, mitigation, and recovery from emergencies of all kinds, including those related to climate change. Updated in 2023. |
| | SD 600 Collections Management | Includes policy for risk management, safety, and security. Updated in 2022. |
| | SD 212, 213 Federal and Trust Personnel Handbooks Chapter 620 | Include updated telework policies to improve resilience. Update in progress. Expected in 2024. |
| | SD 421 Mobile Asset Fleet Management | Includes minimizing fossil fuel. Currently in review by policy stakeholders. |
| | SD 312 Travel, and Travel Handbook | Updating to prioritize use of transit and EV vehicles. Currently in review by policy stakeholders. Expected in 2024. |
| **Nature-Based Solutions** | There are currently no Smithsonian Directives related to nature-based solutions. | Consider inclusion in the update of SD 422 noted above. |
| | Nature based solutions are central to many Smithsonian research initiatives. | The Rappahannock Working Lands and Seascapes team from the Smithsonian Environmental Research Center and the National Zoo and Conservation Biology Institute are conducting a project with the College of William & Mary and the Rappahannock Tribe to document Traditional Ecological Knowledge related to the use and ecology of river herring as a key resource. The long-term goal is to help advance recovery of the species and reinvigorate cultural connections to the Rappahannock River. |

| AGENCY POLICIES REVIEWED | | |
|---|---|---|
| **Nature-Based Solutions (cont.)** | Nature based solutions are considered in the design of facilities including for storm water management. | When feasible, Smithsonian Gardens and the Office of Planning, Design, and Construction are incorporating nature-based solutions to improve storm water management in its museum gardens on the National Mall and at other sites. |
| **Environmental Justice** | Environmental Justice policies will be considered in the update of SD 422. Also, Smithsonian facilities projects in Washington, D.C. are subject to National Capital Planning Commission review. They are currently updating their requirements and policies to incorporate environmental justice. | Smithsonian facilities projects subject to National Capital Planning Commission review will comply with environmental justice considerations incorporated in their Comprehensive Plan and project submission requirements. |
| | Environmental justice principles are also being incorporated when thinking about not only what communities may be most impacted by new building/design plans, but also in engaging those communities at the outset of decisions to ensure a collaborative design process. | |
| **Tribal Nations** | | See above example of The Rappahannock Working Lands and Seascapes collaboration with Rappahannock tribal nation |

**POLICIES AND PRACTICES FOR PRESERVATION ENVIRONMENTS**

The Smithsonian is committed to turning knowledge into action, including a collections risk assessment pilot project at the Smithsonian American Art Museum. The museum is looking towards models recommended by the 2023 Bizot Green Protocol for broader environmental parameters for the cultural heritage sector. Implementing new protocols would minimize environmental impact, while using scientific evidence to protect cultural heritage collections. Results of the pilot project would inform protocols that could be adopted across the Institution. A more tailed approach to setting temperature and humidity ranges in the design and operation of collections spaces can yield substantial energy savings.

## 4. CLIMATE-SMART SUPPLY CHAINS AND PROCUREMENT

Execution of the Smithsonian's mission is less dependent on supply chains than many government agencies that provide goods and services requiring large-scale delivery of items such as military or medical supplies. Our procurement needs are disbursed — restocking of food and souvenirs for museum retail, office supplies, cabinets and crates for collections, construction and exhibit project materials, small vehicle fleet parts and replacements, food for zoo animals, etc. For the Smithsonian, supply chains and procurement critically intersect in preparedness for emergencies of all kinds, include those resulting from climate hazards.

| SUPPLY CHAIN AND PROCUREMENT | |
|---|---|
| Agency has assessed climate hazard risk to critical supplies and services. | Yes. Critical supplies and services are defined as those relevant to protecting collections from climate hazards and events. |
| Agency has identified priorities, developed strategies, and established goals based on the assessment of climate hazard risks to critical supplies and services. | Yes. For example, the PRICE Program has been and will continue to train staff on how to mitigate, prepare for, recover from, respond to, and be resilient for all natural disasters with particular focus on fire, soot, smoke, and water. In 2024 and 2026, PRICE will lead a *MayDay! Water Salvage Program* for Smithsonian staff that provides collections managers and museum staff with the skills to limit damage to collections from water including climate events, as well as plumbing and roof leaks.<br><br>While Smithsonian collections are at minimal risk to wildfire, intense precipitation and flooding can contribute to electrical fires. In 2025 and 2027, PRICE will lead a *Holy Smokes! Fire Salvage Program* for Smithsonian staff in partnership with the ATF and NIST Fire Research Labs. This training would apply to building fires caused by any hazard including.<br><br>In addition, smaller tabletop courses called "Lending Libraries" are available for collecting units to host their own trainings on fire salvage, water salvage, and emergency documentation. Internal courses are available and are under development for all staff on topics including Roles and Responsibilities, Collections Prioritization, Integrated Pest Management, and others. |

*Left:* The National Postal Museum Collections Emergency Supply cabinet is opened to show the various materials and tools used to respond to collections emergencies. *Right:* PRICE collections emergency training participant carefully vacuuming soot from a faux collection item after it was exposed to a controlled fire in the NIST burn room.

| SUPPLY CHAIN AND PROCUREMENT | |
|---|---|
| Agency has developed an implementation plan to address supplies and/or services disruption from climate hazards. | Yes. Lists of recommended collections emergency response supplies are available to staff. The National Collections Program funds the purchase of those supplies for the collecting units. In addition, on the internal PRICE SharePoint site, there is an app for Collections Emergency Kit managers to update their supply lists which are visible to all managers in case there is a need to use supplies from another collecting unit.<br><br>Smithsonian's Office of Emergency Management and the Office of Contracting have emergency purchasing authorities in place. Smithsonian Real Estate and the Office of Contracting have also negotiated blanket purchase agreements with vendors to provide temporary collections storage in the event of an emergency or unexpected need, including those caused by climate events. |

| AT RISK SUPPLIES/ SERVICES | OUTLINE ACTIONS TO ADDRESS HAZARD(S) | IDENTIFY PROGRESS TOWARDS ADDRESSING HAZARD(S) |
|---|---|---|
| **Flooding from intense precipitation and sea level rise (multiple facilities)** | | |
| Temporary collections storage, emergency purchasing authorities, temporary HVAC equipment, emergency generator fuel, etc. | The National Collections Program will continue to provide emergency training for collections management and other staff. | This is an ongoing activity to train and retrain staff and integrate best practices in reducing risks to collections. |
| | Continue to implement blanket purchase agreements with providers of temporary collections storage, including vetting of vendors' capacity to meet environmental, fire safety, and security requirements. | The three current agreements have been extended to late 2027. In Fiscal Years 2025 and 2026, Smithsonian Real Estate and the National Collections Program will evaluate the current agreements and identify any actions needed. |
| | The Office of Emergency Management and Office of Contracting will continue to provide for emergency purchasing authorities. | This is an ongoing task. |
| **Wildfire Hazard (Smithsonian Astrophysical Observatory — Arizona)** | | |
| Construction Services | Construct a new, more fire-resistant dormitory for staff and visiting scientists at the Fred Lawrence Whipple Observatory on Mount Hopkins. | Design completed in Fiscal Year 2023. Construction is planned Fiscal Years 2025 and 2026. |

# 3C. Climate Training and Capacity Building for Climate Informed Workforce

| TRAINING AND CAPACITY BUILDING | |
|---|---|
| **Agency Climate Training Efforts** | |
| **Smithsonian-wide Climate Training** | The Smithsonian does not currently offer or require a Climate 101 course for all staff, but it is exploring opportunities to initiate one based on educational content developed by others for this purpose. |
| **Discipline-specific Climate training** | The Smithsonian incorporates climate training in more discipline-specific skills training and knowledge sharing for collections management staff, facilities staff, and others. For example, the National Zoo and Conservation Biology Institute offers sustainable purchasing training for products they utilize. Collections and exhibit staff collaborate on reducing waste and utilizing more sustainable materials. |
| **Senior Leadership Training** | The Smithsonian has not tracked the percentage of senior leaders who have completed any climate adaptation training. Most of the individuals in this group are highly knowledgeable. Leaders across the Smithsonian contribute to this plan and are responsible for its implementation |
| **Budget Officials Training** | The Smithsonian has not tracked the percentage of budget officials that have received climate adaptation related training. Like other senior leaders, budget officials contribute to this plan and its implementation. |
| **Sustainable Purchasing** | Sustainable purchasing is now part of the required training for all the staff who make purchases on behalf of the Smithsonian. |
| **Other Workforce Training** | The Smithsonian has many individual discipline groups which convene a variety of workforce development programs related to climate including the C3 group that brings together Collections Management staff and the Office of Planning, Design and Construction staff Lunch and Learn programs where sustainability and climate resilience are frequent topics. |
| **Agency Capacity** | |
| The Smithsonian has not documented or tracked the number of full-time employees that work on tasks relevant to climate adaptation. | |

**WORKFORCE DEVELOPMENT**

The Smithsonian has several ongoing programs that provide targeted workforce development, including for disciplines critical to building climate resilience and adaptive capacity as well as trainings for those communicating with the public about climate change. Examples include:

- C3 (Collections Collaboration Community), representing collections staff across the Smithsonian, incorporates climate change training during their regular sessions. A 2023 conference attended by nearly 200 staff members from across the Institution focused on Sustainable Practices in Collections Care. C3 recordings and summary information are available to all staff. Smithsonian staff are also invited to attend Watch Parties to view webinar recordings and engage in collaborative question and answer session often with the original webinar presenter.
- The Office of Planning, Design, and Construction Lunch and Learns are monthly trainings designed to meet continuing education credit requirements for architectural and engineering professionals. These sessions increasingly include topics relevant to climate change adaptation including design of museums to reduce emissions in both construction and operations, commissioning existing and new building mechanical systems to maximize efficiency, and identifying potential renewable sources of energy for buildings including capturing heat from adjacent sewer lines.
- Smithsonian Gardens holds educational programs for its 50-person staff. Their annual February in-service training days frequently address topics relevant to climate change including the care and selection of plants for a warming climate and climate science research that informs horticultural practice. Other stewards of public landscapes and gardens in the Washington, D.C. area, including federal agency and Architect of the Capitol staff, are invited to these sessions.
- The Office of Academic Appointments and Internships — *Our Shared Future* coordinates two different fellowship programs that leverage the Smithsonian's vast resources and expertise to conduct independent research. The Smithsonian Climate Change Postdoctoral Fellowship is focused on understanding and informing solutions to climate change while the Smithsonian Environmental Justice Fellowship is focused on the study of environmental injustice and solutions. The Smithsonian Tropical Research Institute also offers the Adrienne Arsht Community-Based Resilience Solutions Initiative which fosters innovative, interdisciplinary, use-inspired resilience science.
- Four different pan-institutional working groups; PEEPS Sustainability; C3 Reducing Plastics; Cornell University Sustainability Working Group; and the Climate Collaborators group are making changes in internal culture, communication, and sustainable practices related to communications, audience research, informal and formal education and engagement, exhibition design and production, product purchase and public engagement.

## 3D. Summary of Major Milestones

| SUMMARY OF MAJOR MILESTONES | | | |
|---|---|---|---|
| **Section of the Implementation Plan** | **Description of Milestone** | **Climate Risk Addressed** | **Indicators for Success** |
| **3A.1 Address Impacts on and Exposures to Federal Buildings** | Substantially completed construction of Pod 6 in Fiscal Year 2025. Shelving will be installed and collections moved in during Fiscal Years 2026 and 2027. | Addresses multiple risks including risk of flooding due to intense precipitation and sea level rise at buildings where some collections are currently stored. Also improves resiliency to increasing heat. | Construction and move-in progress being tracked by Program Manager for Suitland Collections Center and National Collections Program staff. |
| | Conduct additional climate hazard analyses for heat (all locations), all hazards (Panama), wildfire (Smithsonian Astrophysical Observatory-AZ and Smithsonian Conservation Biology Institute) to be done during Fiscal Years 2026–2027. | Multiple hazards. | The Office of Planning, Design, and Construction Planning Manager will monitor progress and report it to the Chief Sustainability Officer. |
| | Prepare Smithsonian Gardens Master Plan, Fiscal Years 2026 and 2027. | Multiple hazards including intense precipitation, heat, sea level rise, and flooding. | The Office of Planning, Design, and Construction Planning Manager will monitor progress in collaboration with Smithsonian Gardens staff. |
| | Complete master plans for National Museum of Natural History, National Zoo and Conservation Biology Institute, and Dulles Collections Center, Fiscal Years 2024–2026. | Multiple hazards including intense precipitation, heat, sea level rise, and flooding. | The Office of Planning, Design, and Construction Planning Manager will monitor progress with stakeholder units and will produce plans for projects for a 20-year period. |

| SUMMARY OF MAJOR MILESTONES | | | |
|---|---|---|---|
| **Section of the Implementation Plan** | **Description of Milestone** | **Climate Risk Addressed** | **Indicators for Success** |
| **3A.1 Address Impacts on and Exposures to Federal Buildings (cont.)** | Install drainage improvements and temporary flood barriers at the National Museum of American History, Fiscal Year 2025. | Intense precipitation, sea level rise, and flooding. | National Museum of American History Program Manager will monitor progress through completion and final testing. |
| | Relocate emergency power service from lower level to roof of the National Museum of American History, Fiscal Year 2027. | Intense precipitation, sea level rise, and flooding. | National Museum of American History Program Manager will monitor progress through completion and final testing. |
| | Construct new dormitory at Smithsonian Astrophysical Observatory-AZ, Fiscal Years 2025–2026. | Wildfire. | Smithsonian Astrophysical Observatory Program Manager will monitor progress through completion and occupancy. |
| **3A.2 Impacts on and Exposures to Federal Employees** | Note — 3A.1 projects benefit employees at impacted facilities. | Multiple hazards. | See above projects |
| | Continue to strengthen capacity of Smithsonian workforce to work remotely through cloud-first strategy for enterprise software implementations; continue to strengthen the DAMS system to support digital publishing and sharing of Smithsonian data and content. Fiscal Years 2024–2027 and ongoing. | Multiple hazards that require continuity of operations and meeting educational mission. | Office of the Chief Information Officer will be responsible for monitoring progress. |

| SUMMARY OF MAJOR MILESTONES | | | |
|---|---|---|---|
| **Section of the Implementation Plan** | **Description of Milestone** | **Climate Risk Addressed** | **Indicators for Success** |
| **3A.2 Impacts on and Exposures to Federal Employees (cont.)** | Conduct Federal Triangle Risk Analysis. Fiscal years 2024–2026. | Intense precipitation, sea level rise, and flooding. | Will facilitate decision making regarding potential benefits of shared infrastructure solution in addition to individual building flood-proofing and other measures. |
| **3A.3a Impacts on and Exposure to Cultural Resources** | Construct protection for historic bridges and Rock Creek shoreline at National Zoo. Fiscal Year 2025. | Intense precipitation, flooding. | Smithsonian Structural Engineer/Design Manager and National Zoo and Conservation Biology Institute Program Manager will monitor progress. |
| | Install improved stormwater management at Hirshhorn Museum and Sculpture Garden — Fiscal Years 2024–2026. | Intense precipitation, flooding. | Office of Planning, Design, and Construction Program Manager and Design Manager will monitor Progress. |
| | Design and construct improved storm water management at museum building and plaza — Fiscal Years 2024–2030. | | Associate Director for Architectural History and Historic Preservation monitors all projects involving historic properties. |
| **3A.3b Conservation to increase Climate Adaptation and Resilience** | Smithsonian-wide *Life on a Sustainable Planet* initiatives. Fiscal Years 2024–2027 and ongoing. | Address multiple climate hazards. Includes environmental justice initiatives and tribal nation collaborations. | Under Secretary for Science and Research and Chief Sustainability Officer responsible for monitoring progress including completion of new and ongoing research projects. |

| SUMMARY OF MAJOR MILESTONES | | | |
|---|---|---|---|
| **Section of the Implementation Plan** | **Description of Milestone** | **Climate Risk Addressed** | **Indicators for Success** |
| **3B.1 Accounting for Climate Risk in Planning and Decision Making** | Prepare "best practices" document for integrating climate hazard exposure in risk assessments and budget planning. Fiscal Years 2024–2025.<br><br>Implement in unit and project risk assessments in Fiscal Year 2026 and ongoing. | Addresses multiple climate hazards. | The Smithsonian's Enterprise Risk Council will approve the best practices document developed by unit stakeholders. |
| **3B.2 Incorporating Climate Risk Assessment into Budget Planning** | Include climate considerations in guidance provided to Board of Regents and to unit director. Fiscal Years 2025–2027 and ongoing.<br><br>Highlight projects in the Capital Plan that addresses climate risk. Fiscal Years 2026–2027 and ongoing. | Addresses multiple hazards. | The Director of the Office of Planning, Management, and Budget is responsible for monitoring progress and providing guidance. |
| **3B.3 Incorporating Climate Risk into Policy and Programs** | Continue to include climate risk considerations in relevant Smithsonian Directives. Complete the update of SD 422 Sustainable Design of Smithsonian Facilities to include Climate Adaptation and updated sustainability guidance, environmental justice, and nature-based solutions. Fiscal Years 2024–2026. | | |

| SUMMARY OF MAJOR MILESTONES | | | |
|---|---|---|---|
| **Section of the Implementation Plan** | **Description of Milestone** | **Climate Risk Addressed** | **Indicators for Success** |
| **3B.3 Incorporating Climate Risk into Policy and Programs (cont.)** | Continue Smithsonian American Art project to consider adopting the wider range of environmental fluctuation included in the 2023 Bizot Green Protocol and implementing comparable changes at additional units. Fiscal Years 2024–2027 and ongoing. | Potential to address multiple hazards, particularly heat and flooding events. | |
| | Continue collaboration with Tribal Nations in research projects. Fiscal Years 2024–2027 and ongoing. | | |
| **3B.4 Climate Smart Supply Chain and Procurement** | Continue PRICE projects to train collections and other staff in emergency preparedness skills, including for climate caused emergencies.<br><br>Fiscal Years 2024–2027 and ongoing. | Addresses multiple hazards at all locations. | The National Collections Program will monitor progress. |
| | Continue to maintain blanket purchase agreements for emergency storage space for collections. Fiscal Years 2024–2027 and ongoing. | Addresses multiple climate hazards and other emergency needs for Washington, D.C. area collections. | Smithsonian Real Estate and the Office of Contracting will maintain agreements with input from National Collections Program staff. Progress requires monitoring renewal terms to exercise options and update pricing. |

| SUMMARY OF MAJOR MILESTONES | | | |
|---|---|---|---|
| **Section of the Implementation Plan** | **Description of Milestone** | **Climate Risk Addressed** | **Indicators for Success** |
| **3B.4 Climate Smart Supply Chain and Procurement (cont.)** | Continue to maintain emergency purchasing authorities. Ongoing. | Addresses multiple hazards at all locations. | The Office of Emergency Management will work with the Office of Contracting to maintain purchasing authorities. |
| **3C Climate Training and Capacity Building for a Climate Informed Workforce** | Study implementation of Smithsonian-wide Climate 101 training class using existing course content developed by others. Fiscal Years 2024–2025.<br><br>If approved and funded, begin implementing course in Fiscal Year 2027. | Addresses all hazards. | The Chief Sustainability Officer will be responsible for progress monitoring with implementation support from the Office of Human Resources and the Office of the Chief Information Officer. |
| **4B Adaptation in Action** | Continue implementing public programs described in Section 4B. Ongoing. | Addresses all hazards. | Progress will be monitored by the Chief Sustainability Officer through frameworks for unit collaboration established in the *Life on a Sustainable Planet* initiative. |

SECTION 4

# Demonstrating Progress

## 4A. Measuring Progress

While the Smithsonian is not an executive branch government agency, we participate in reporting progress metrics on sustainability and climate change to the extent possible and applicable.

| KEY PERFORMANCE INDICATOR: Climate adaptation and resilience objectives and performance measures are incorporated in agency program planning and budgeting by 2027. | | |
|---|---|---|
| **Section of the CAP** | **Process Metric** | **Agency Response** |
| **3A: Addressing Climate Hazard Impacts and Exposure** | Step 1: Agency has an implementation plan for 2024 that connects climate hazard impacts and exposures to discrete actions that must be taken. (Y/N/Partially) | Partial. The Smithsonian has completed an approach for hazards contributing to flooding. The Institution needs to better integrate heat impacts and exposures across the organization and analyze and address all exposures at facilities in Panama. |
| | Step 2: Agency has a list of discrete actions that will be taken through 2027 as part of their implementation plan. (Y/N/Partially) | Partially. The Smithsonian has been including the heat assessments and Panama assessments in this plan. |
| **3B.1 : Accounting for Climate Risk in Decision-making** | Agency has an established method of including results of climate hazard risk exposure assessments into planning and decision-making processes. (Y/N/Partially) | Partially. As described in 3B.1, work is needed to identify and communicate best practices in risk assessment across the Smithsonian. |
| **3B.2: Incorporating Climate Risk Assessment into Budget Planning** | Agency has an agency-wide process and/or tools that incorporate climate risk into planning and budget decisions. (Y/N/Partially) | Partially. As described in 3B.2, additional direction will be included in future budget communications to Regents and unit directors for both federal and trust resources. |

| KEY PERFORMANCE INDICATOR: Data management systems and analytical tools are updated to incorporate relevant climate change information by 2027. | | |
|---|---|---|
| **Section of the CAP** | **Process Metric** | **Agency Response** |
| **3A: Addressing Climate Hazard Impacts and Exposure** | Agency has identified the information systems that need to incorporate climate change data and information, and will incorporate climate change information into those systems by 2027. (Y/N/Partially) | Partial. Some key databases incorporate relevant climate change information including some supporting facilities and research. There is not an agencywide approach. |
| **KEY PERFORMANCE INDICATOR: Agency CAPs address multiple climate hazard impacts and other stressors, and demonstrate nature-based solutions, equitable approaches, and mitigation co-benefits to adaptation and resilience objectives.** | | |
| **Section of the CAP** | **Process Metric** | **Agency Response** |
| **3B.3: Incorporating Climate Risk into Policy and Programs** | By July 2025, 100% of climate adaptation and resilience policies have been reviewed and revised to (as relevant) incorporate nature-based solutions, mitigation co-benefits, and equity principles. (Y/N/Partially) | Yes. The *Life on a Sustainable Planet* is a Smithsonian-wide initiative that incorporates these as a central component. Facilities projects incorporate nature-based solutions where feasible |
| **KEY PERFORMANCE INDICATOR: Federal assets and supply chains are evaluated for risk to climate hazards and other stressors through existing protocols and/or the development of new protocols; response protocols for extreme events are updated by 2027.** | | |
| **Section of the CAP** | **Process Metric** | **Agency Response** |
| **3B.4: Climate- Smart Supply Chains and Procurement** | Step 1: Agency has assessed climate exposure to its top 5 most mission-critical supply chains. (Y/N/Partially) | Yes. |
| | Step 2: By July 2026, agency has assessed services and established a plan for addressing/overcoming disruption from climate hazards. (Y/N/Partially) | Yes, addressed in Smithsonian-wide multi-hazard emergency planning. |
| | Agency has identified priorities, developed strategies, and established goals based on the assessment of climate hazard risks to critical supplies and services. (Y/N/Partially) | Partially. As described in Section 3B.4, addressing risks to collections has been a priority in this area. |

| KEY PERFORMANCE INDICATOR: By 2027, agency staff are trained in climate adaptation and resilience and related agency protocols and procedures. | | |
|---|---|---|
| **Section of the CAP** | **Process Metric** | **Agency Response** |
| **3C: Climate Training and Capacity Building for a Climate Informed Workforce** | Step 1: By December 2024 100% of agency leadership have been briefed on current agency climate adaptation efforts and actions outlined in their 2024 CAP. (Y/N/Partially) | Anticipated — Yes. |
| | Step 2: Does the agency have a Climate 101 training for your workforce? (Y/N/Partially) If yes, what percent of staff have completed the training? | No. This is in an early stage of planning under the direction of the Under Secretary for Science and Research and the Chief Sustainability Officer. |
| | Step 3: By July 2025, 100% employees have completed climate 101 trainings. (Y/N/Partially) | Partially. The Smithsonian does not expect to meet this metric based on the current stage of planning. |

## 4B. Adaptation in Action

In November 2022, the Smithsonian launched its *Life on a Sustainable Planet* initiative to facilitate research and promote sustainable solutions across the Smithsonian and beyond. This major effort is collecting new data about the changing planet, implementing holistic and multi-scale approaches to environmental conservation, and educating the public about why and how sustainable solutions to climate change can benefit people and nature.

Through *Life on a Sustainable Planet*, the Smithsonian aims to promote evidence-based decision making, working in concert with local communities, to address the climate crisis. *Life on a Sustainable Planet* uses the Institution's 176-year history of scientific research and data gathering across a global network of research centers, its expansive museum collection, and its diverse set of exhibits and educational programs to produce, curate, and communicate strategies for adapting to and mitigating the impacts of climate.

*Life on a Sustainable Planet* coalesces the Smithsonian's global resources to promote sustainable living and conservation across five focus areas:

- Conserving complex forests and grassland ecosystems.
- Recognizing that the health of humans, domestic and wild animals, plants, and the wider environment are closely linked and inter-dependent.
- Safeguarding oceans and working seascapes.
- Promoting public engagement on environmental justice.
- Improving the sustainability of the Smithsonian's facilities and operations.

Progress on the five key areas of climate adaptation included in our 2021 plan is summarized below.

**MUSEUMS, EDUCATIONAL PROGRAMS, AND PUBLIC ENGAGEMENT**

Because of Smithsonian's mission to increase and diffuse knowledge, climate change is an important topic for the Smithsonian's exhibits, educational programs, and public engagement efforts. Examples include:

- In furtherance of Smithsonian's goal to improve internal communications and collaboration across the Institution, the Climate Collaborators Group was established in 2022.
- The Smithsonian joined with NOAA, CLEAN, and Beyond 100K to host climate-themed sessions for the Smithsonian National Education Summit in July 2023.
- In March 2023, the Anacostia Community Museum welcomed its first cohort to the Youth for Environmental Justice Academy, an annual program for students living along the Anacostia River.
- The Smithsonian Astrophysical Observatory (SAO) is conducting public pollution monitoring programs that benefit from the April 2023 launch of its TEMPO instrument to monitor air pollutants from space, empowering the public to gain a detailed understanding of air pollution in their neighborhood through access to this data.
- SAO offers an opportunity for communities across the U.S. to contribute leaf observations to the Ozone Bioindicator Garden project that will be combined with pollution data from the TEMPO air quality measuring instrument to better understand how ozone pollution impacts plant health.
- Smithsonian Science Education Center's global InterAcademy Partnership is drafting three new community research guides for youth: "Clean Energy!", "Climate Action!", and "Ocean!".
- The Smithsonian Science Education Center is piloting a program in North Carolina with five other Smithsonian units on the Smithsonian STEAM Schools of Distinction, to recognize schools who are integrating sustainable development into their STEAM programming.
- Working with NOAA, the Smithsonian is updating the Essential Principles of Climate Literacy Guide under the umbrella of the U.S. Global Change Research Program Climate Engagement and Capacity. The Smithsonian also co-hosted and supported three focus groups targeting youth, indigenous populations, Smithsonian scientists, and educators to gather public feedback.

- The Smithsonian Environmental Research Center's Participatory Science Programs volunteers assist researchers with projects that are investigating a wide range of topics, including wetland response to climate change, forest biodiversity, invasive species distributions, and water quality issues.
- Smithsonian exhibitions are presenting important climate stories and content through their innovative approaches and storytelling for diverse audiences.
    - The David H. Koch Hall of Fossils — *Deep Time* exhibit at the National Museum of Natural History show visitors how Earth's distant past is connected to the present and informs our future. Other permanent exhibit halls at the museum, including the Sant Ocean Hall and the Hall of Human Origins; and temporary exhibits, including *Our Places: Connecting People & Nature, Lights Out: Recovering Our Night Sky*, and *Cellphone: Unseen Connections* each incorporate climate-related messaging.
    - The Anacostia Community Museum, Hirshhorn Museum and Sculpture Garden, Smithsonian American Art Museum, and the National Portrait Gallery feature interdisciplinary approaches to climate change and climate action through culture, community, art, and history for diverse audiences. These include *To Live and Breathe, Forces of Nature: Voices that Shaped Environmentalism,* and *Purple.*
    - Smithsonian Traveling Exhibits and Museum on Main Street make a variety of climate-related traveling exhibits available to museums, schools, libraries, and other institutions across the country, in rural underserved communities, and around the world. These include *Narwhal: Revealing an Arctic Legend, H20 Today, Waterways,* and the newest *Knowing Nature: Stories of the Boreal Forest,* each of which connect people to human impacts on our environments.
    - The Smithsonian Tropical Research Institute's Museo del Canal Interoceanico and the National Museum of Natural History partnered to present a bilingual exhibit *Barro Colorado Island: 100 Years of Discovery and Wonder* that highlights some of the climate research conducted in Panama.

2022 PRICE MayDay Wet Salvage Workshop participants examine and document faux collection items that have been affected by a "flood event" before beginning triage. The flood event is simulated by a puppy pool that was filled with water, faux items, dye and coffee grounds at 8am ahead of the recovery at 12:30pm.

    - In March 2023, the National Zoo and Conservation Biology Institute opened the revitalized Bird House at the National Zoo with live collections programs and exhibits focusing on migratory birds and habitat conservation.
- The Center for Environmental Justice at the Anacostia Community Museum was opened in 2023 and will center community, raise awareness of systemic injustice, craft community-driven solutions, and encourage others to create a more equitable, healthy, and just environment.
- Public programming in and associated with different Smithsonian exhibitions and current research expand visitor experiences through climate-focused conversations, object explorations, interactions with experts, and activities. Q?rioso, a hands-on learning space at the Smithsonian Tropical Research Institute, Smithsonian's Environmental Research Center's Education Center, the National Museum of Natural

Museum Support Center Pod 6 Construction underway at the Suitland Collections Center will reduce risks to collections stored at museums in the 100-year flood plain.

History's Q?rius Education Center, and other spaces host different climate related programming including live feeds with research vessels studying climate change, cart programs featuring interactions with climate experts, lectures, film screenings, symposia, and habitat explorations.

- Connecting children, student, and teacher audiences to climate change learning continues to grow and evolve. The Smithsonian Science Education Center, through the Smithsonian Science for Global Goals Project curriculum, is providing youth with the knowledge and skills to understand the world's most pressing issues to become agents for change in their communities. The Smithsonian works with Affiliate museums across the country to help youth develop and implement action plans tailored to their communities through the National Earth Optimism Youth Action and Leadership project. For local communities, the Anacostia Community Museum leads an annual Environmental Justice Youth Academy that promotes environmental justice in communities of color by providing spaces and opportunities for youth to engage and learn about environmental justice work. This experience is primarily from the perspective of communities with environmental justice concerns and from underserved communities to explore the intersections of community, justice, and environment.
    - For student groups planning visits to its museums, the Smithsonian American Art Museum designed a middle school program centered on the Manifest Destiny painting that fosters contemplation about the role humans play in creating and tackling the climate crisis. The National Museum of Natural History hosts *Hot Potato: Climate Change, Food Systems, and You* and *Reefs Unleashed* that spark solution-focused conversations based on understanding climate impacts through analysis of different data sets. The Smithsonian Science Education Center launched a fully integrated STEM curriculum with lessons centered on climate change.
- Teachers have opportunities to participate in training programs working alongside Smithsonian experts connected to climate change research. These include the Environmental Literacy Educator Training Program, the Research Experience for Teachers program, Marine Biodiversity Workshop, and Environmental Literacy Educator Training Program. Additionally, the Smithsonian Science Education Center and the Office of International Relations have collaborated to conduct ongoing programs that pair classrooms in France and Iraq with classrooms in the United States to learn together about climate change, sustainability, and environmental justice and inclusion.
- The Smithsonian is increasingly reaching people through several online resources. These include the Ocean Portal (https://ocean.si.edu/), Age of Humans videos on the National Museum of Natural History YouTube channel and Climate Change Teacher Resources page (https://naturalhistory.si.edu/education/teaching-resources?keywords=climate+change), and the Smithsonian Environmental Research Center's Climate Learning Resources (https://serc.si.edu/education/resources). Visitors to these sites can access a range of videos, recorded webinars and lectures, teaching materials, subject guides, hands-on activities, and articles. The Smithsonian Science Education Center curriculum materials also offer a variety of digital offerings (https://ssec.si.edu/explore-our-curriculum-resources).

**RESEARCH**

In addition to, and under the umbrella of *Life on a Sustainable Planet*, the Smithsonian has made progress in its long-term research efforts as well as launching new initiatives. The Smithsonian continues to lead key, ongoing

research networks contributing to our understanding of climate change. This work includes:

- ForestGEO, providing long-term data collection from a group of representative global forests.
- MarineGEO, understanding how coastal systems work to keep them healthy.
- The Coastal Carbon Network is a trusted source of data, data products, and expertise dedicated to serving a global need for actionable knowledge on coastal ecosystems, habitats, and biodiversity.
- GEO-Trees, a global biomass reference system for remote sensing of forest responses to climate change, was launched in December 2023.
- In February 2024, NOAA and the Smithsonian announced a formal agreement to collaborate on ocean biodiversity research and education motivated by the urgent need to protect and restore marine ecosystems faced with climate change.
- Increased public access to Smithsonian's research collections and long-term data relevant to climate change including through contribution of 63 new datasets to the public repository space on FigShare.
- Developed new sensors to collect climate-related data including the launch of the TEMPO satellite for monitoring air pollution and the launch of a Coastal sensor system funded by DOE which is completing its second year of operation in Chesapeake Bay and Lake Erie.
- Continued long-term experimental manipulations related to understanding how organisms and ecosystems will respond to further climate change including:
    - Completion of the Fossil Ginkgo Leaves study for reconstructing past atmospheric carbon dioxide levels.
    - Ongoing experiments that include global warming effects on bamboo growth in giant panda habitats; effects of warming on lowland tropical forests; and potential bird adaptation to climate change.
    - A new experiment on the effects of storm surge and sea level in coastal forests is completing its second year.
- Developed partnerships that leverage Smithsonian scholarship to inform natural climate solutions including partnership with the Pew Charitable Trusts and Conservation International that is making forest carbon data available to the Intergovernmental Panel on Climate Change.

**COLLECTIONS**

The Smithsonian continued to mitigate risks to collections from extreme weather, including increased precipitation and flooding, by moving collections or by improving storage enclosures and spaces to make them flood safe, energy efficient, and protected from extreme weather events.

- Continued to install high-quality gasketed collections storage cabinets in at-risk locations.
- Additional storage cabinets are planned to be installed in 2024 at National Museum of Natural History, National Museum of American History, National Museum of Asian Art, National Museum of African American History and Culture, National Portrait Gallery, and Smithsonian Libraries and Archives. High-quality cabinets will also be installed after the completion of Pod 6.
- Partnered with the National Gallery of Art to commence construction of Pod 6 in Suitland, MD, that will relocate at-risk collections from the National Museum of Natural History and the National Museum of American History.

The National Collections Program prepared staff to respond to extreme weather events via collections emergency preparedness training:

- From May 2022 through the end of 2023, the Smithsonian's Preparedness and Response in Collections Emergencies (PRICE) team conducted 13 collections emergency preparedness trainings for 271 students.
- The National Collections Program partnered with the Cornell Sustainable Design program to advance sustainable practices related to environmental monitoring for collections care.

- The National Collections Program hosted webinars and conference sessions, including the fall 2023 internal Collections Collaboration Community conference dedicated to sustainability topics relevant for collections care, and year-long discussion groups.

**CENTRAL SERVICES: PROGRESS SINCE 2021**

- The Smithsonian continued to promote purchases of environmental-friendly and climate resilient products and has encouraged the purchases of environmental and climate-friendly products via Smithsonian's Amazon Business accountholders. In Fiscal Year 2023, 756 orders were placed for goods with Sustainability Certification Categories.
- Existing staff training classes incorporated sustainability topics where applicable.
- The Smithsonian included sustainability clauses in blanket purchase agreements for all janitorial supplies.
- Smithsonian contracting policies and procedures were updated to include elements of sustainable and climate-pledge friendly products.
- Smithsonian Directives (policies) were updated to promote the purchase of goods and services that conform to Smithsonian sustainability and climate resilience plans.
- The Office of Contracting hosted an annual forum for Smithsonian purchasers on resources for sustainable and climate-pledge-friendly products and travel.
- Promoted Landfill Avoidance by providing the staff with disposal and reutilization options including disposal of electronic assets through certified recyclers and UNICOR (the Federal Prison Industries Program).
- Collaboratively worked with GSA to transfer furniture and IT assets for reutilization at other government agencies or via sale.
- Donated usable electronics to schools through the Computers for Learning program.
- Assisted in Fleet Modernization and acquisition of e-vehicles.
- Implemented changes that reduce greenhouse gas emissions through travel and telework policies that reduce commuting-related emissions and use office space more efficiently.

**FACILITIES**

The Smithsonian is implementing capital projects across the Institution to address climate vulnerabilities beginning with master plans that incorporate climate resilience and in individual new building and major revitalization projects' design and construction. Progress on projects that support climate resilience and adaptive capacity include:

- National Museum of American History Site Drainage Improvements and Flood Protection
  - Phase 1 — Installation of backflow preventer in existing north side manhole connecting with major storm sewer lines was completed in FY2023. The installation of temporary flood barriers on the east and west side are shovel ready and are included in Fiscal Year 2025's capital plan.
  - Phases 2 and 3 — The design of permanent site walls and regrading of north, west, and east sides will take place in Fiscal Years 2025–2027. Construction will take place from Fiscal Year 2028-–2029.
- National Museum of Natural History West Wing Basement Drainage
  - The construction contract was awarded in May 2023.
  - Construction completion is anticipated early 2024.
- Natural History Building Master Plan is in progress.
- National Zoo Renew Central Boiler Plant
  - The construction contract was awarded in Fiscal Year 2023.
  - Construction is anticipated in Fiscal Year 2024.
  - The current Comprehensive Plan update will identify the long-term boiler location.

- National Museum of the American Indian — New York: Design of the relocated emergency generator will be completed in 2024. GSA is coordinating construction of a water infiltration mediation project with the Smithsonian.
- SI Explorer Enhancements
    - Improvements were completed in 2023.
    - FEMA flood hazard information is now provided in Facilities Center and SI Explorer at building, floor, and space level.
    - FEMA flood maps available to Smithsonian staff and contractors through an online GIS portal.
- The New Smithsonian Museums Site Evaluation Study (completed in Fiscal Year 2023) included climate factors in evaluation of sites for the National Museum of the American Latino and the Smithsonian American Women's History Museum (site designations pending).

APPENDIX A

# Risk Assessment Data

The Federal Mapping App uses the following data:

**BUILDINGS**

Buildings data comes from the publicly available Federal Real Property Profile (FRPP). The General Services Administration (GSA) maintains FRPP data and federal agencies are responsible for submitting detailed asset-level data to GSA on an annual basis. Although FRPP data is limited — for example, not all agencies submit complete asset-level data to GSA, building locations are denoted by a single point and do not represent the entirety of a structure or could represent multiple structures, and properties may be excluded on the basis of national security determinations — it is the best available public dataset for federal real property. Despite these limitations, this data is sufficient for screening-level exposure assessments to provide a sense of potential exposure of federal buildings to climate hazards.

**PERSONNEL**

Because the Smithsonian does not submit federal or trust employment data to the GSA, the Federal Mapping App does not integrate locations of employees in the tool. The Smithsonian used internal data provided by its Office of Human Resources in November of 2023 to assess impacts on Smithsonian federal and trust employees by location.

**CLIMATE HAZARDS**

The climate data used in the risk assessment comes from the data in Climate Mapping for Resilience and Adaptation (CMRA) Assessment Tool. When agency climate adaptation plans were initiated in 2023, CMRA data included climate data prepared for NCA4. Additional details on this data can be found on the CMRA Assessment Tool Data Sources page. Due to limited data availability, exposure analyses using the Federal Mapping App are largely limited to the contiguous United States (CONUS). Additional information regarding Alaska, Hawaii, U.S. Territories, and marine environments has been included as available.

In addition to this data, the Smithsonian used data from internal climate adaptation assessments completed between 2015 and 2019 to assess climate hazard exposures and impacts from intense precipitation, flooding, and sea level rise to tis facilities in Washington, D.C.; New York, New York; Edgewater, Maryland; and Ft. Pierce, Florida.

Sources for the Smithsonian's internal Climate Change Adaptation Plan Phase 1 (2019) for facilities in Washington DC subject intense precipitation, sea level rise and flooding include city and regional environmental studies and plans, flood assessment reports, historic and current maps, Smithsonian staff interviews, and data from local government and Smithsonian databases.

Sources heavily used include the following:

- **Flood Studies**
  - The Federal Triangle Stormwater Drainage Study (2011) was commissioned by multiple federal, regional, and local agencies under the auspices of the Federal Triangle Stormwater Study Working Group. It assesses the capacity of the existing sewer system in the Federal Triangle area, provides predications of ponding levels from high-intensity storms, evaluates the impact of interior drainage flooding, assesses the probability and impact of concurrent riverine and interior flooding, and looks at flood mitigation alternatives.
  - NCPC issued its Report on Flooding and Stormwater in Washington, D.C. (2008) 10 in response to the major flood event on the National Mall in 2006. It provides an overview of flood risks in the downtown D.C. area, explores flood mitigation options, and defines the roles of different levels of government for flood protection and stormwater control.

- The GSA's Flood Mitigation and Prevention Study (2007) was also conducted in response to the 2006 flood, and seeks to identify the factors behind the significant flooding in the Federal Triangle area and to examine future flood mitigation options.
- FEMA's Flood Insurance Study: District of Columbia (revised 2010) is the source of data used to inform flood insurance rates and flood plain regulations.

- **Climate Change Projections and Adaptation**
  - Climate Projections and Scenario Development: Climate Change Adaptation Plan for the District of Columbia (2015) was prepared for the D.C. DOEE to support adaptation planning. It includes localized projections for temperature and precipitation, and summarizes storm surge and sea level rise projections from other agencies.
  - The USACE North Atlantic Coast Comprehensive Study: Resilient Adaptation to Increasing Risk (2015) evaluates future risks from storm surge and sea level rise in the coastal region extending from southern Virginia to Maine; it examines multiple flood scenarios.
  - The Metropolitan Washington Council of Governments' Summary of Potential Climate Change Impacts, Vulnerabilities, and Adaptation Strategies (2013) presents a synopsis of conclusions from the Council's climate adaptation planning initiatives in 2010–12.
- **Flood Response Operations**
  - Flood Emergency Manual for Washington, D.C. and Vicinity (2013) 16, also from USACE, outlines emergency flood response measures and identifies the agencies responsible for implementation.
- **Smithsonian Data**
  - Smithsonian Facilities Management's Geospatial Division compiles the data on property characteristics used in this study.
  - Smithsonian Office of Protection Services has conducted multiple risk assessment studies, including All Hazard Risk Assessment Reports and two 2013 studies on flood risks to NMAH and NMNH, respectively, that looked at 15-year, 100-year, and 500-year flood events.
  - Facility Condition Reports provided information on facility maintenance and repair needs.

Sources for Phase 2 Climate Change Adaptation Plan, Phase 2: Smithsonian Marine Station (SMS) Vulnerability Assessment, 2018. (Ft. Pierce, FL).

Sources for this report include city and regional environmental studies and plans, flood assessment reports, historic and current maps, staff interviews and data from local government and Smithsonian databases.

Resources heavily used include the following:

- **Flood Studies**
  - East Central Florida Regional Planning Council. 2004. Land Use Impacts and Solutions to Sea Level Rise in East Central Florida. http://research3.fit.edu/sealevelriselibrary/documents/doc_mgr/446/East_Central_SLR_Adaptation_-_ECFRPC_2004.pdf and Use Impacts and Solutions to Sea Level Rise in East Central Florida.
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  - Climate Change Impacts in the United States: Third National Climate Assessment.
- **Smithsonian Data**
  - Emergency Plans
  - OPS All Hazard Report
  - Flood Studies
  - Facility Condition Reports
  - Smithsonian Marine Station Biennial Report

Sources for Climate Change Adaptation Plan Phase 2: Smithsonian Environmental Research Center (SERC), Vulnerability Assessment, 2018 (Edgewater, MD).

- **Flood Studies**
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- **Climate Change Projections**
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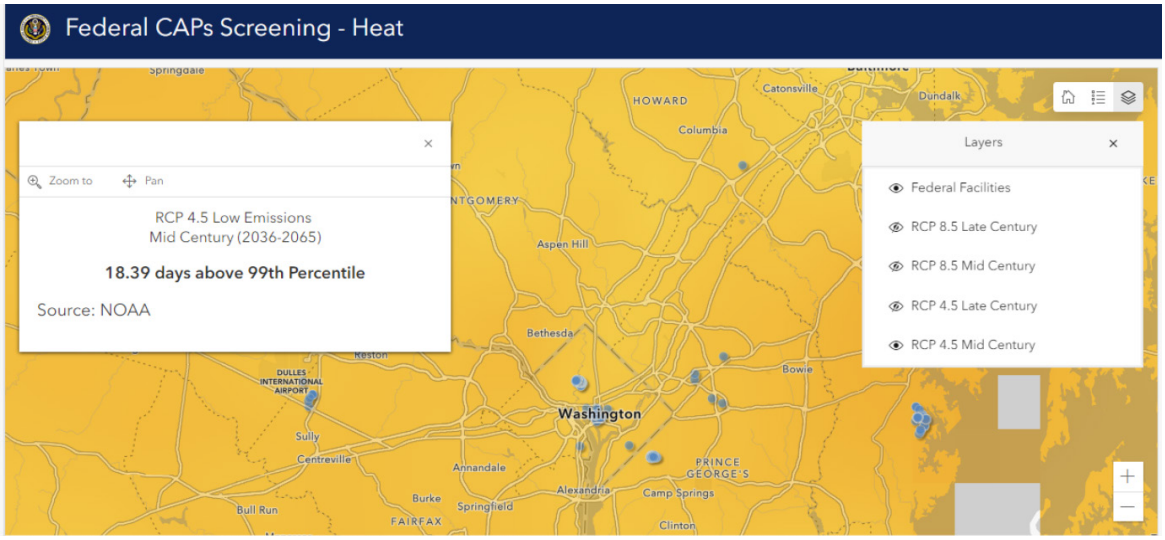
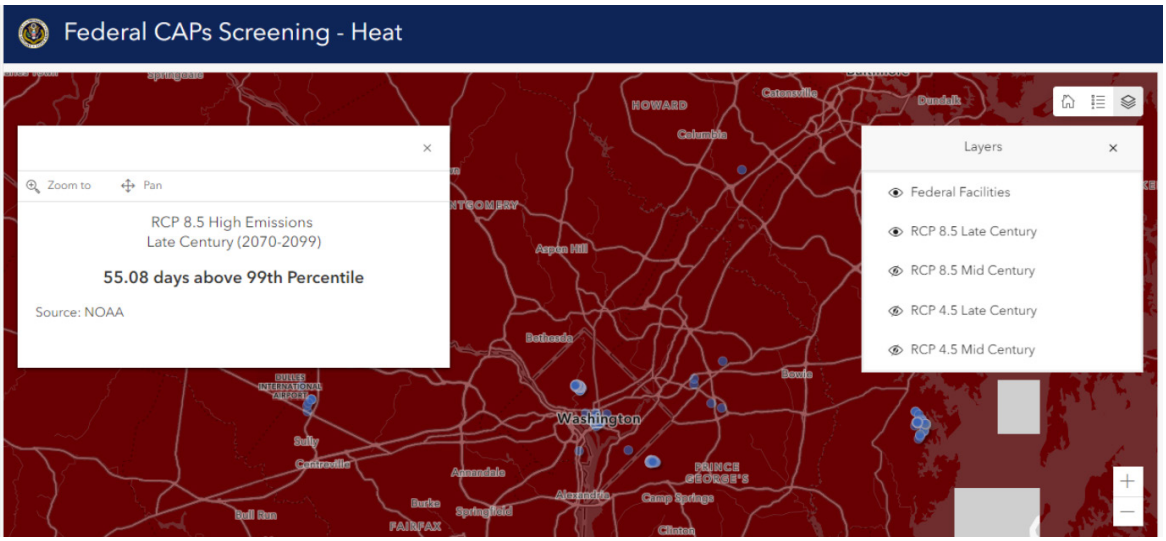
- **Smithsonian Data**
  - Facilities Management Geospatial Division
  - Office of Protection Services (OPS) All Hazard Risk Assessment Reports
  - Hurricane Sandy After Action Report

APPENDIX B

# Risk Assessment Maps

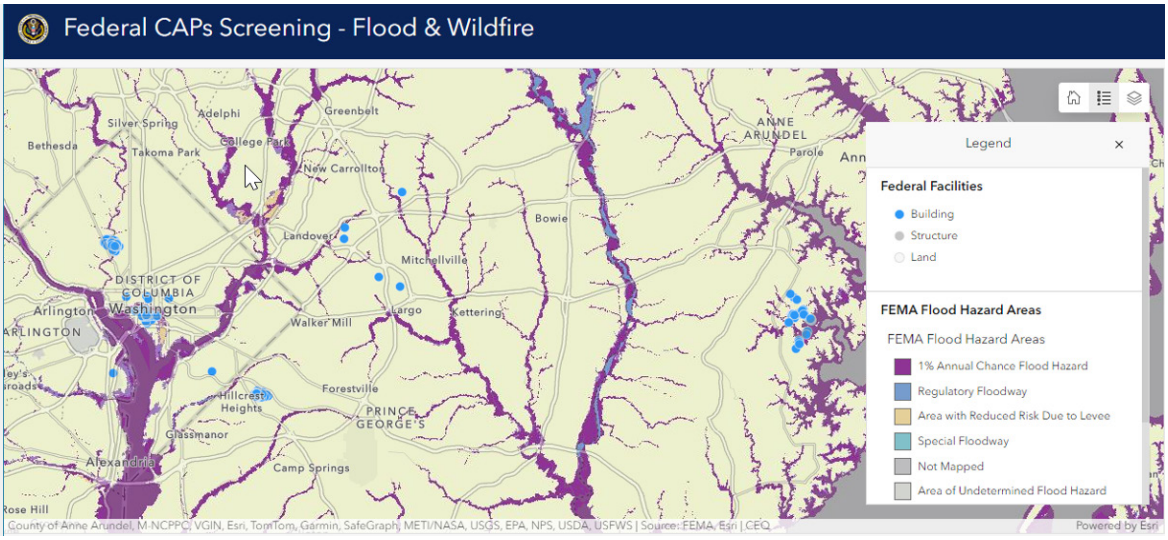



DC Heat RCP 4.5 Mid Century Map

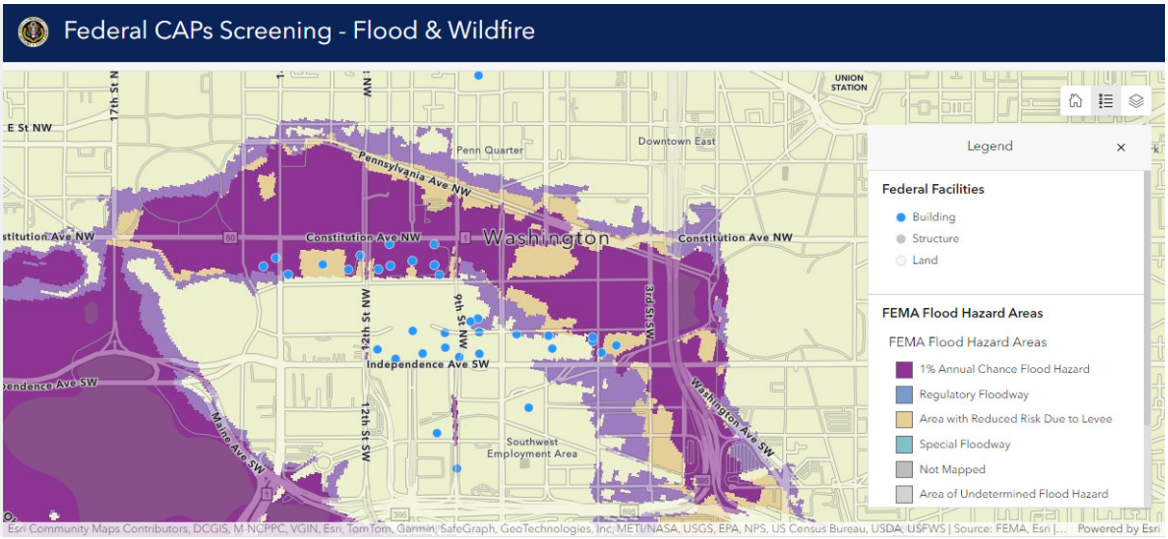



DC Heat RCP 8.5 Late Century Map

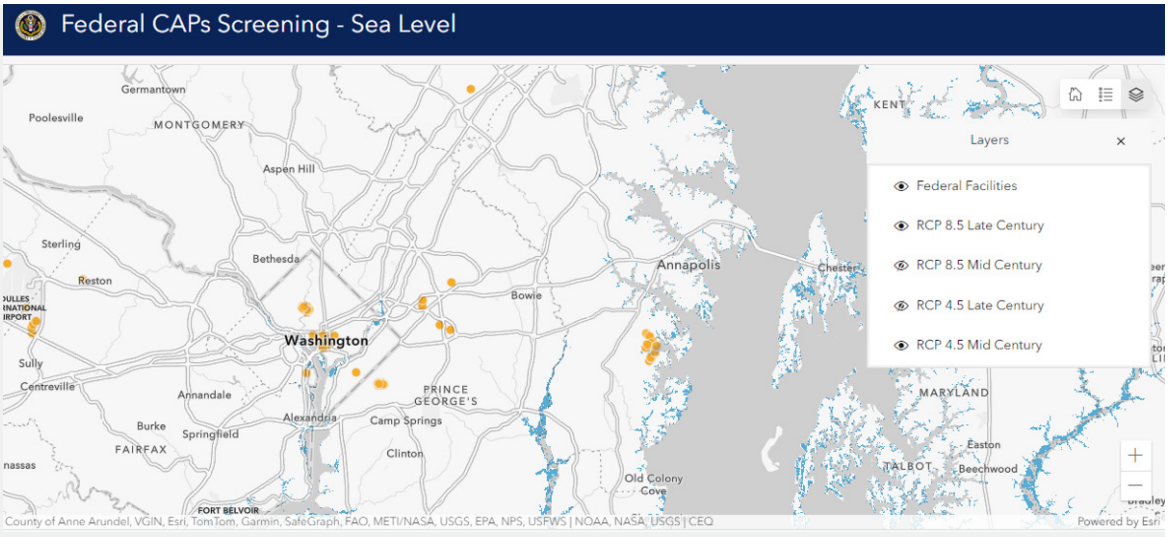
**DC MD Current FEMA Flood Map**



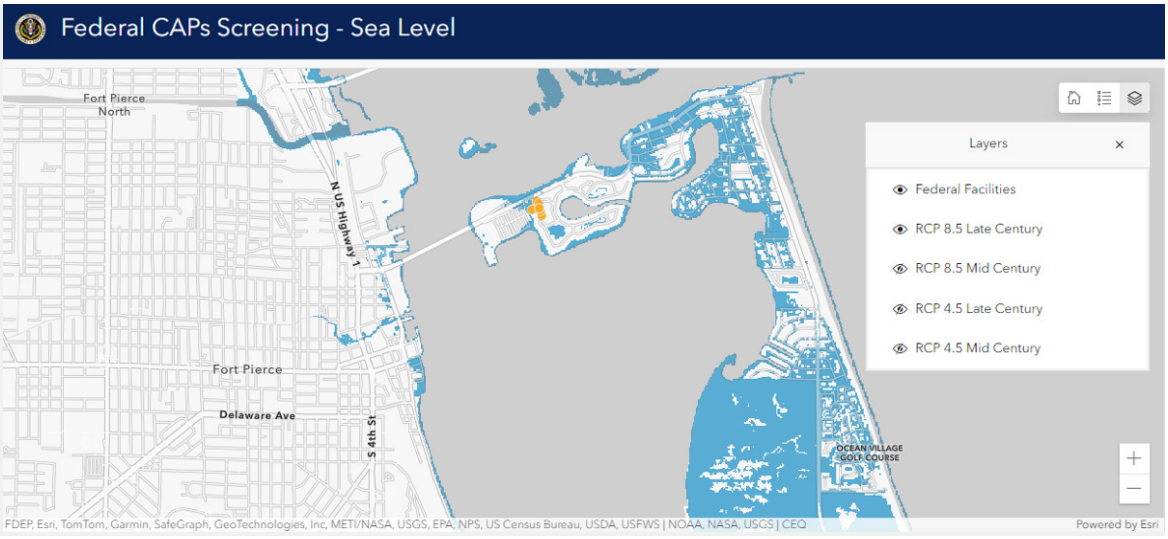

**DC National Mall Current FEMA Flood Map**



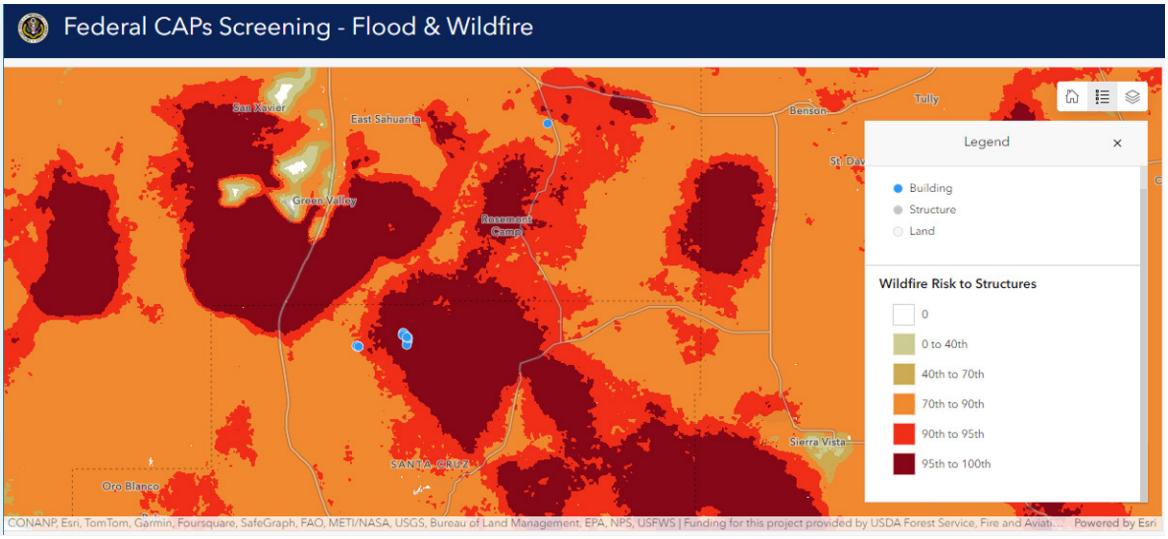

**DC SLR RCP 8.5 Late Century Map**



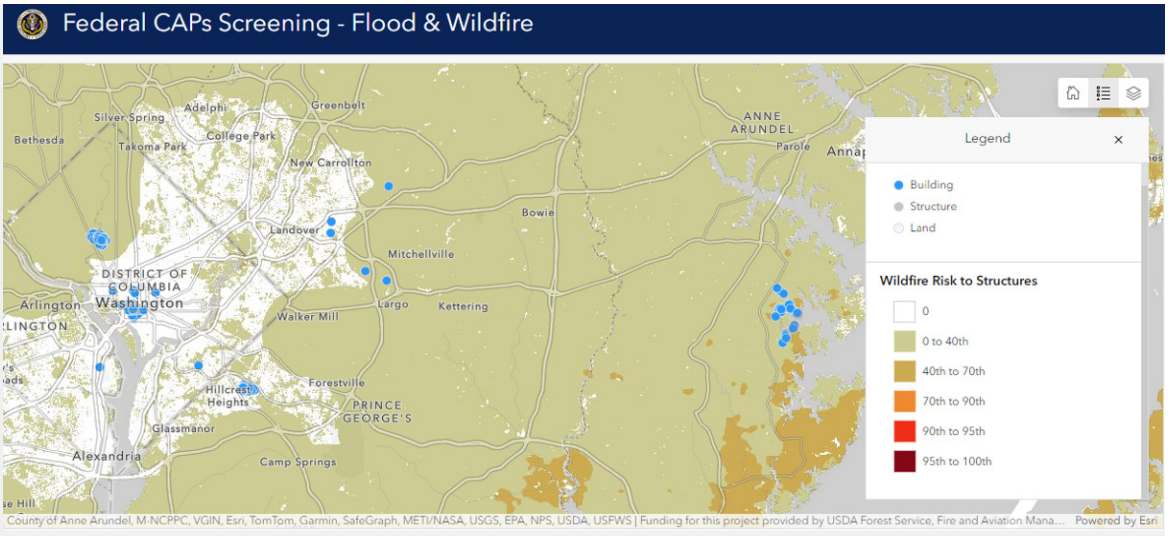
**Florida RCP SLR 8.5 Late Century Map**



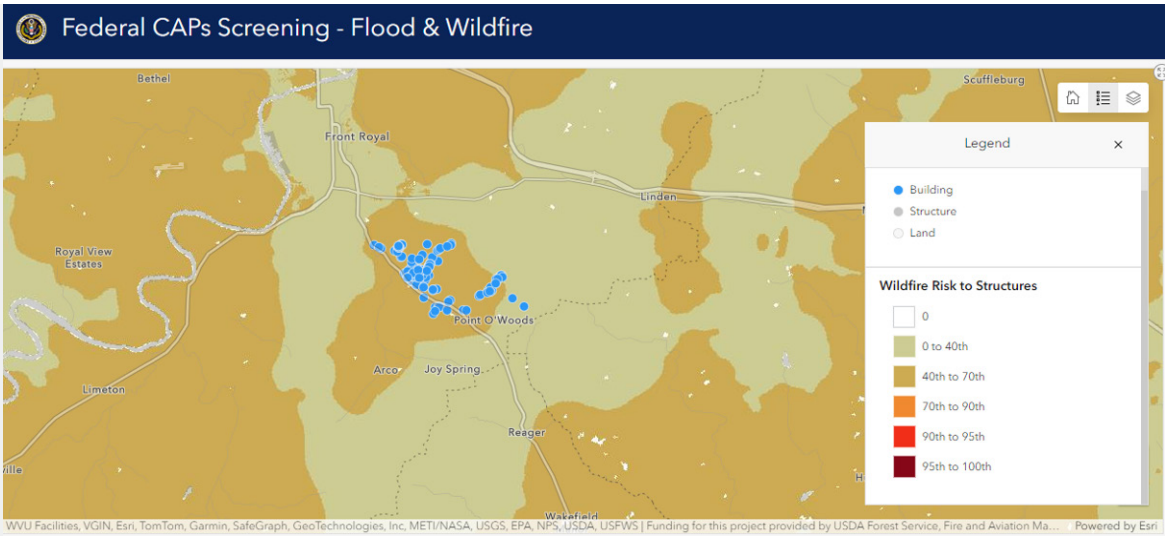

**Arizona Current Wildfire Risk Map**




**DC & MD Current Wildfire Risk Map**



**Virginia Current Wildfire Risk Map**



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