Transcript 2

Participants:
Simon West (SW), interviewer
Sam (SAM), a mathematician and population modeler in the ecology department at the University, and co-leader of the Wildlands adaptive management (AM) project
Val (VAL), a statistician and population modeler in the ecology department at the University, and co-leader of the Wildlands adaptive management (AM) project

Location and timing:
A meeting room at the University, soon after the field trip

Transcript:
SW: So, the first question is: how was the trip for you guys? Was it useful? And did it meet your expectations for what you would get out of the trip?

SAM: I think it was useful and I think we learned a lot from it, but compared to other field trips I've done in the past it was quite unstructured. We didn't know what to expect when we got out there, so we planned a few methods and few different things to try, and we took less measurements than I'd expected that we would – than I'd hoped we would take. But that was the reality of the situation once we got there.

SW: What made it that way? What made us unable to do as many measurements do you think?

VAL: Lack of seedlings, essentially …

SAM: Yeah …

SW: Did you think there would be more seedlings?

VAL: Yeah. Well maybe not ironwood, not that many, but the first day I didn't see any at all. Well one maybe. So that's the thing that – in a way – blew the initial plans, because we switched from testing some ways of measuring things into "let's look for where we get evidence of regeneration and what can we learn about that and how can that help us in the future design surveys or target surveys." So that bit of information became more interesting and relevant than having ten instead of two repeats of these measurements.

SW: Do you think it was surprising for the management staff – for the Authority – do you think they would have expected more seedlings as well?

SAM: I don't think so. I think they might not have expected more. Because the person that we spoke to while we were there didn't seem aware of some of the ones that we

visited. They thought that there were fewer, or that they were in worse condition, or that they didn't exist at all. Compared to what we noticed. Yeah, I think part of the mismatch is – I can only speak for myself – but we come from the perspective of a mathematician or a statistician, and when we think of a sampling design we're thinking about sampling and getting lots of units over space so that we can build a reliable or robust picture of what's happening over the landscape. And so sometimes my mental picture of what a natural landscape looks like is not a realistic representation of what actually happens out there. So, for example, you saw from the maps and the way that we drove around that landscape too, these woodlands that we're interested in are really patchy. There's all sorts of woodland and scrub that are happening in between these pine-ironwood woodlands that we're interested in, and having someone like Logan take us around the different places too, and helping me to notice these things … So for example the way in which the pine was occurring was different in different places. So at one site we saw that it was very dense and they were almost all the same height – there'd been one big event and they'd all grown together. And in the other place we could see the pines at all different ages – from five centimeters tall to things that had been there for many many decades. And the place we went to on the first day was different again. It had a few older trees and a bunch of munched on seedlings that were easy for us to notice and count. And so thinking from a statistician's point of view it was difficult for me to reconcile this spatial variation and work out what to do with it.

SW: Yeah, that was fascinating for me as well. Just the variation of stands of vegetation, and like you say, the difference in the actual make-up of the patches. Very fragmented and very dispersed in the landscape.

VAL: So this highlights the value of these pilot trips or studies – because they can change the way you think about the landscape and therefore the way you plan to sample that landscape.

SW: Yeah, definitely. So with the sampling methods – will you be able to use the data that we got to make recommendations in the report? Was it enough for you guys?

SAM: I don't think …

VAL: … the thing is, what does "enough" mean? It's not enough to do statistics based on it. But then again, there's aspects of that that we can use.

SAM: Yeah, and part of that was just practicing the methods and learning how long they took, and learning what it is about the landscape you need to know in order to perform the measurements. So, for example, we had these two different detailed surveys that we planned. The ones where we built a big square around the central tree and we had Logan and Riley doing belt transects through the middle. Then we had the second one which was a big cross with a few subsamples. And they were both

intended to be detailed surveys but we still thought that one was going to be quicker than the other, or I think the quality of the information in one is less than the other. But they ended up taking about the same length of time to do. So I think the method with the square plot around the plant with the belt transects is a better use of time. I think that's something that we learnt that we could only have learnt by actually physically doing it in the landscape and timing it.

VAL: So they will inform the design, but not in a statistical way. We won't do an analysis because there isn't enough data.

SAM: Yeah, we won't be telling [the Authority] how many seedlings to expect, or – yeah, what statistical analysis to perform. But we can offer some advice, for instance, one detailed survey method looks to offer better quality information in the same amount of time. So we can recommend that to them.

SW: Was this the one with the pointing stick?

SAM: So the one with the pointing stick was the one that worked well in the end.

SW: But not the … the other version was where you drew out the quadrat, right?

SAM: Yeah, so we were drawing out two-meter square blocks, and guessing – estimating – what was in them. That method we expected would be quicker but it actually took quite some time.

VAL: And it relies a bit more heavily on an estimate – a visual estimate of cover and a few other things.

SAM: Yeah, so that relies on the expert judgment of the person doing the observation as well. And there's studies that indicate that people are pretty inconsistent – even people who are nominated as botanical experts of some sort.

SW: Yeah, I read that somewhere …

SAM: Yeah they can be quite inconsistent, so in some ways it's a really great outcome – that the slightly more objective process of measurement isn't more resource intensive.

SW: And would you have a – some kind of count of kangaroo scat with the pointing method?

VAL: Yeah that was probably one of the advantages of the quadrat one is that you could do that. While the pointing stick may just land next to the kangaroo scat, but

you can't count it because it's not literally under the stick. So it depends whether that's something you want to capture or not, yeah.

SW: Yeah, that was the interesting thing for me when you were doing methods and stuff. What is the relationship between the stuff that you think might be important and the stuff – like, obviously you can put everything in there for management, so you have to pick your variables, or pick the information that you're going to present – and I was wondering whether you found that difficult, or whether it was fairly simple?

VAL: Mmm … we haven't really completed that process I would say. So we still require to think about that.

SAM: Yeah, but I think we've gone through a couple of different stages of refinement, where – when we had the workshop right at the beginning of the project – with about twenty experts related to the problem, we brainstormed a very long list of things that could be monitored, and then we had a gathering more recently in about January or February of this year with experts on vegetation surveys. So Logan and Alex were involved with that and a couple of more senior researchers here where we took the list that was made at the workshop and tried to get more specific, and more realistic about which things could be measured simultaneously, what rules and methods would you actually use to … So I guess the first one with the big brainstorming list was people saying, "oh, well you need to think about understory cover," or very broad things like that without saying, "you need to set a plot out like this," or "you need that piece of equipment." They didn't give us that sort of information, so we refined it with some local experts, and then we had another meeting after that with Logan and Alex, and particularly the team that we knew would be going into the field to talk about actual plot layout, and what the datasheets would look like, and so on … So we called on different people – or different subsets of people at different stages to get gradually more detailed, yeah. And we are largely relying on other people to make those decisions, because I'm a mathematician and Val's a statistician, and it's not appropriate for us to decide whether understory cover is useful or not [laughs] …

SW: Because you had understory cover in the rapid survey right? I was going to ask whether you felt that was useful, the rapid method and opposed to the detailed method?

SAM: I think it … yeah …

VAL: … I think … I'm thinking ahead of where we are now, but it could be enough if what you are trying to detect is a big difference between everything that is eaten outside the fence, while you still have good cover inside the fence, for example. In that case the rapid survey may very well be enough to represent that difference

between inside and outside, and therefore detect an effect of management. But that's the type of thing that requires more thinking.

SAM: Yeah it does, and something that we had in mind when composing the rapid and detailed methods were issues of how often these things would occur in the landscape and who would be doing them. So, for example, the methodical pointing in the square points that Logan was doing, I think it's very unlikely that the site staff at Wildlands that we met on the trip would ever be expected or interested in doing that kind of survey. But something a bit quicker where you put out a big 'T' and count the seedlings in a circle – I don't know whether that's part of their common practice or not, but for me that seems much more likely to be a task that could be worked into their duties. Partly because of the training and responsibilities that they have built into their roles, and part of it is also about timescales. So they've got management timescales at the institution that they – there are basic activities that the Authority is willing to do on an annual basis, but they're also prepared to do more detailed surveys once every five years or something like that. So one of the options with having these two different levels is that – I guess one of the things the detailed survey passed relatively quickly was that Logan was doing the pointing, and Logan can glance at those plants and just knows what that is [immediately]. Whereas the difference between a herb and shrub for me – when it's two centimeters tall – is not as clear.

SW: Yeah, when me and Riley were doing the rapid survey on our own we even came across seedlings that we were still not sure whether they were seedlings. Ones that hadn't been chewed at all so they still had the spines on – so it suddenly becomes very difficult when you're staring at one seedling trying to figure out if it's a pine or not …

SAM: Yeah – and I'm sure the local site staff would know what a pine seedling would look like and they could do that, but … and I'm sure that many of them would be capable of the […] stuff but there'd need to be a lot more investment I guess in calibrating that survey – checking what they're doing, and that the same person is doing it again next year or the training process is consistent enough to put your trust in that data across years.

SW: Yeah, because that was another thing that came up talking to Robin [from the Authority] yesterday – Robin was talking about the different surveys that have happened down the years, and they haven't been repeatable, especially for site staff. So it's really valuable to have methods that may be repeatable over time … So you said at the start that you had learned a lot – what were the main things that came out for you?

SAM: Well certainly the main thing for me was the patchiness of the landscape and the different profiles that the woodland can have, with the different kinds of pine populations that we saw was very striking for me.

VAL: And just the realization that we won't be counting seedlings every time, or every year, because they may not be there in the plot. And that – we have to think about that, and how to make recommendations that have that aspect in – we have to take that into account.

SAM: Yeah, and Val and I had the beginning of a ten-minute conversation that is going to take several months I think, about the kind of survey design that we might be able to recommend to them in the future, and how we really need to revisit what their objectives are with the monitoring – what it is we need to learn from the monitoring. Because the statistical standard would be – I think – to choose some locations for the plots, and fix them, and go back to exactly the same places year after year after year, but the profile of where seedlings are and aren't is clearly going to change in that landscape. And they had a very big fire this summer that also wiped out a lot of the seedlings. Which is also part of the why we saw so few. And so – yeah, just the question of whether we should be fixing plots in space or moving them around achieves the objectives of the monitoring program – we haven't solved that issue yet.

SW: Yeah, does that relate to the issue of weighing up whether you are trying to learn about the system or whether you are trying to conserve seedlings as well?

SAM: I think it could…

VAL: Yeah, well that's a distinction that is good to take into account, but it's moving away from the idea of adaptive management. I mean if you have seedlings and you want to conserve these seedlings in particular – that could be an effective way of conserving them. Or at least giving them a chance, but that's not necessarily part of the structure of adaptive management. That's just a one-off decision or a decision or way of doing things, but that type of fence is not necessarily related to a fence that you would use to learn about the system. So I think separating these two ideas may be a good thing at some point in time … Because you could have a very small fence around the small plot, just because there's seedlings you want to keep there or give a chance at least. But it might not be small enough or contain all the seedlings in an area, and it might not be useful for learning about outside – if outside there is no seedlings, for example. So some types of fences for conservation purposes may not help us, or not necessarily help us, learn about the system. You know, about whether culling quotas are being set in the right way or not. It's just something to keep in mind…

SW: Yeah, talking about objectives, do you think the main objective would be to establish this link between kangaroo culling and vegetation response?

SAM: That's the objective for our research project. The objective for the Authority's pine-ironwood management would be different to that I think. So in the broadest terms their objective is a "fully-functioning landscape." I think that was the phrase

that someone used at the workshop. And that's something that would be achieved, if all goes well, on the timescale of fifty to one hundred years. That's a very long-term aspirational – I guess it's more like a mission statement or a vision rather than something you can quantify.

SW: Yeah, has that been defined – what that would look like?

SAM: Um … So during that workshop we got to drill down to more specific factors, and things that would respond over different timescales. So for example if we were successful in improving the landscape – the woodland condition in the next five years – you'd hope to see less weeds and more perennials or something. So they made a series of statements of that kind.

SW: So performance measures …

SAM: Yeah that's right. And so having less weeds and more perennials might be – that isn't actually going to get you more adult pines or more ironwood, but it's part of that broader picture of restoring that landscape to something that it might have looked like before European settlement, I think.

VAL: Yeah, and that's a long-term aspiration. So in previous documents they've even put these objectives into 'short-term,' 'medium term' and 'long-term,' because you don't expect to get the full benefit – sorry you don't expect to get the long-term benefit in one year or so, that's why it's called a long-term objective, so in order to track progress towards that, they have some intermediate objectives. Like the relationship between native weeds to invasive weeds or something? I don't remember but there's a series of measures that indicate you are going in the right direction.

SAM: I think an example of a mid-term one would have been "successful recruitment of *some* pine and *some* ironwood." And then the longer-term one was something like, "having a full range of age classes in the landscape." So evidence that there are adults, young adults and juveniles all present.

SW: And would – whereabouts would this project be geared towards? Would it be towards short-term term?

SAM: I think we want to capture short- and medium-term information in the recommendations that we provide. So for example the seedling counts – if you can find some seedlings now that's good news, but they're still vulnerable and they could be grazed and disappear or not progress to the next stage, so if we – it seems important that we're counting the adult trees and tracking the young adults as well because that's the medium-term sign of success. If you've got these things that have escaped the grazing height and are big enough now that a kangaroo can't topple them, that's a sign of the type of medium-term success they've defined, I think.

SW: And are these objectives in the management plan – in the Regional Parks Management Plan – or somewhere else?

VAL: There are vague objectives in some of the documents, and I think at the very least in the Regional Parks – the overall … Now, The Authority were not – I mean the guys we're dealing with were not completely happy with these – I think there some people in the workshop that said they were too vague, essentially … That they were aspirational goals.

SAM: Yeah, I guess one of the challenges too is that we have this set of documents that have been produced over a timeline over ten or fifteen years with different people in leadership roles or different people authoring at different times. It can be challenging sometimes to work out which of those principles are still very important to the organization, and which ones the Authority might have let go of along the way. So typically we consult with Robin and Leslie along the way to check that we are on the right track or not [laughs] …

SW: Right. And a couple of clarification questions: firstly, the identification of the problem with pine – where it began, in terms of when they realized there was a problem with pine recruitment?

VAL: I don't really know – it really predates our arrival to the project, so … From our point of view the issue is that they know there is a problem. I don't know when that was flagged up for the first time. It's been mentioned in all the documents, definitely.

SW: Right, and there's not a problem with the other pine, right? The other species …

VAL: No.

SAM: Not one that they're sharing with us. They're not expressing concern to us about …

VAL: I know it's an issue in other parks and other places, because I know someone who is working with the other pine species – especially in places where they have [here there was background noise that interrupted Val's speech] … and fire regimes. But I've never heard any concern about them in Wildlands, so …

SAM: Yeah, I think there's a previous Authority staff member called Blake, and Blake was the environmental programs manager in that region for a very long time and was a real champion of the restoration process there for a very long time, but just retired about one to two years ago. And Blake wrote some of the early reports about vegetation condition within the Park, and I suspect that it was Blake's personal observations in the Park that generated concerns and prompted revisions of the

kangaroo cull program. That would be my best guess based on who I've met and the timeline of reporting.

SW: The other clarification was this idea of the "switch" in kangaroo grazing that I think we were talking about when we were out there – and where that idea has come from, the idea that there is some sort of switch in kangaroo grazing? Because I remember you [indicating Val] mentioned you were not entirely convinced by it, you thought it might be more of a gradual movement …

VAL: Yeah, and I don't have any evidence for that, it's just an idea that has been mentioned to us. That overall it can be seen as a switch.

SAM: And would that have come from Kelsey primarily?

VAL: Probably, it was after the workshop I first thought seriously about that idea, so it must have been them in there.

SAM: Or someone present in the workshop…

VAL: Or someone else there, yeah. Um…

SAM: So one of the experts we consulted in the early stages would have framed things in those terms.

SW: Do you think that would be something pursuing?

VAL: It may change a little bit, or not that little bit, the way we think about the problem. It's about a threshold or a moment at which kangaroos would switch to this other, non-preferred source of food. Because then the problem becomes controlling the kangaroo population versus the availability of food, so that that switch doesn't happen. Instead of: there is a gradual amount of grazing on things we don't want to be grazed, and we just have to control that grazing on a continuous scale, you know, to some point. So you can see it as a different problem, or a different way of formulating the problem. So avoiding that threshold. From that point of view, if you simplify it completely and you make for a perfect switch – actually it wouldn't even matter where you are, or how close you get to the switch, as long as you don't trigger that switching. But of course that's what I meant – that it's a bit … that I doubt it's a complete idealistic switch. There's gonna be some level of browsing and then at some point at time most of them switch because there's nothing else to be eaten. But how much that system looks like a switch, I don't know.

SW: Yeah, I guess it would alter the nature of the problem in the sense of recommendations for management. When they decide to cull and not decide to cull.

VAL: Yeah, the problem can be framed in a different way, but we're still not sure that's a useful way of framing it.

SW: And so drawing on the field trip, and this decision to be made between sampling random trees in the landscape, which I guess relates to what you were saying [indicates Sam] about a statistically friendly way of doing it, where you would have just a completely random selection – or whether we went for trees with seedlings, whether we went after seedlings. And I was wondering how you balance that tension, or that decision to be made?

SAM: Yeah. I think once I accepted that we were not going to perform a statistical analysis on the data that we were collecting I felt more relaxed that the important thing for us to do was to practice the methods. And the methods are – the methods and data in the future are going to be most interesting when there are seedlings to count. And also that's going to be the time that the methods are going to take some time to perform too – if you had a fixed plot and you had nothing in it, you'd draw out your plot and you'd go, "zero, zero seedlings" and then write it in your data sheet. Whereas if you've got some seedlings to count it might take you a good twenty minutes or an hour depending on your plot design to get through the procedure. So yeah, once I'd realized that we were not performing an analysis on the data that we were collecting during this trip, I think the selection was based more on "let's get some practice" and "let's understand what weird things you might notice when there are actually seedlings." And check whether the method works under seedling conditions.

SW: Yeah, like when you have to negotiate all the fallen branches and all the other things you find in there…

SAM: Yeah… That was the thought process that I was internally going through anyway. Val, did you have other thoughts as well?

VAL: Yeah, I can see we would have more benefit from that.

SAM: And I mean that the kind of recommendation we give the Authority in the future is: "look for a place with seedlings, and do your survey there." In which case this absolutely applies – the choice that we made to look for trees with seedlings around them, is a good reflection of that. Yeah …

VAL: In a way – and I think we discussed this during the trip – it's a reflection of the fact that we are not necessarily interested in the ecology of the regeneration, unless it brings information on how to conserve and how to manage that landscape. So it's an interesting ecological question, but if it's not gonna help you set cull quotas then it's not relevant in the context of this adaptive management project. So, of course, if you wanted to understand how regeneration happens, you would have – you would

probably sample at random, because you're trying to capture the variation in that … If you wanted the means to study the impact of your management actions then you might as well go to the place where there is some seedlings, establish a plot there and then see what happens outside the fence. That is a simple example. Again trying to keep the objective in mind …

SW: Yeah, how important is it for you, doing an adaptive management project, to be clear on where the adaptive management is taking place. Because it's difficult for me to keep in mind. In theory you have these experiments on a landscape scale or on an ecosystem scale, but it seems like this is much more targeted towards a specific question – and that is where the adaptive management is taking place. I wondered if you could confirm for me where you think adaptive management is taking place in this particular problem?

VAL: I think in this case it's quite clear – at least as it was defined from the beginning even before we came into the project – that they wanted to learn how to set these cull … how to control this population of kangaroos so that their objectives could be met. And as they were unsure about the relationship between population control and the objectives, something they could learn about. So I think the case is about: they want to learn how to set these quotas to control population, or whether you even need that or not. To have this objective of vegetation condition and regeneration.

SW: And a couple of other decisions that we were making … So they're all pretty related, but we have this decision between getting the spatial distribution of seedlings under trees against getting the proportion of trees with seedlings. So the first one might be useful for understanding the factors affecting the recruitment of seeds, and the second one might be important for understanding how many seedlings there are in total.

SAM: Yeah.

VAL: There was a practical purpose for getting at the distribution of seedlings under the trees, which was to potentially influence the design of the fence – the design of the plot, the exclosure. So how far away from the tree you could find seedlings. Or in which density would affect the power to detect differences inside and outside the fence. And therefore how big an area you should have. And now I think about it after the trip it's quite idealistic from the statistics point of view: "I'm going to design the size of the fence based on the …!" Anyway … [laughs] … Yeah, so there was that aspect of that particular type of study, which could help design the size of the plots … And knowing how many trees have seedlings, or what proportion of trees with seedlings doesn't really help with that aspect, for example.

SW: And I guess we haven't got to this point yet in your project, but how you are going to construct experimental sites, without having this direct comparability between them.

VAL: What do you mean?

SW: If you were going to choose these exclosures within the landscape – basically, how would you choose them?

VAL: As you say we haven't got to that point! And there is a range of practical reasons, for instance accessibility, after all you have to construct a fence which requires bringing all the materials and stuff like that, and there's going to be a mix of practical things and willingness to understand the variation, or having the power to represent the landscape properly. But we haven't got to that yet, I would say.

SAM: Yeah, and I think we would need to have further discussions with the Authority partners about that – and some of them would be about the speaking to the people in the regional office about who is paying for what and who is going to look after it. So for example, we might be able to generate funding to set up a fence but someone has to check whether the fence is … Exclusion fences break and they are imperfect. Animals can burrow and jump at things, and people can turn up and create havoc and so on. So fences need to be maintained continuously by local staff, which will always be a negotiation about whether that is enough of a priority for the regional Authority staff – whether they can allocate people to do that job. And yeah, second, who pays for the material and who erects that fence in the first place. Whether that's a University job, whether there's funding at a high level – whether for example in the Authority's head office additional funding is granted to do that job or whether they scrape the money out of their existing budget to do something like that. So there are some practical and political discussions to be had. But there's also, I guess, discussions to be had about what the purpose of the fence is. There's the potential purpose of pure protection: you see some seedlings that are important to you, and you want to protect them. But then there's auditing type purposes – so you want to keep track of how the system is changing, and you can learn something more about that when you've got, "what's happening inside the fence and what's happening outside the fence," as a direct comparison. And then that could be extended to a quite scientifically experimental design in which you're manipulating different things in different places, or seeking to learn very specific ecological feedbacks.

SW: Yeah, because there's already – it's interesting to see the exclosures that had already been set up, especially in the southern parts [of Wildlands] …

SAM: Mmm … and it seemed as if they were for the protective purpose. That was my interpretation of the conversations. People weren't explicitly monitoring – I mean they weren't explicitly measuring what was happening inside or outside those fences.

They had been put up to protect something and it was just assumed they were doing the job.

VAL: And at the end the decision of building this exclosures, or using old ones or whatever, it's the Authority's. Because in the end it's up to them mostly to keep them in order and monitor them and so on. So what we can do is provide recommendations and try to explain as much as we can the benefit that they can obtain from having those exclosures, those control sites. And then the decision is theirs to weigh up whether that's the way they want to proceed … So as we said the other day, we provide the idea of this adaptive management – how it can work – but they have to implement it, it's up to them.

SW: Yeah, it was interesting to relate it to the trade-offs of monitoring as well. You mentioned that in the original theory there was no account that you would trade-off the benefits that you can get through monitoring with other considerations – the fencing and stuff like that, the experimentation things. So balancing the costs and benefits in a way.

SAM: Yeah, and that's because they don't have well established monitoring regimes at all for the woodlands. And that's completely open and up for debate – what levels of monitoring would be beneficial for them and what they have the capacity to do.

VAL: And the Authority definitely have their own trade-offs because they have to take care of different aspects of the Park, and this is one of them, and they have a limited budget and resources. But again that's outside of our area …

SW: Yeah, the responsibilities for the barbecues and the picnic areas and …

SAM: [Laughs]… Yeah and nuking the weeds based on what was in the back of Tony's truck [a member of the site staff at Wildlands].

SW: Yeah I found a book online that was a history book about Wildlands – have you seen that? By members of the Wildlands volunteer group I think.

SAM: Oh I think Logan sent it to me, but I haven't had a good look at it yet.

SW: But there's also pictures in there of people nuking different kinds of weeds, so I think it's a long tradition.

VAL: And the rabbit war.

SAM: Ah, the rabbit war, yes that's right.

VAL: Many different ways of killing rabbits.

SW: Yeah that's true they also talk about that in the book – baiting, fumigating, and all these different things … And in terms of the tools that you have to address the problem: you've got things like kangaroo culling, exclosures, and then planting of seedlings and things like that. There were about three tools that I could see. Did any other ways of addressing the problem jump out at you during the trip?

VAL: Well I think the culling is the management lever – the way they control the system. I mean they do other things, but they've always been a bit 'on the side' – like controlling rabbits, goats and weeds. So in principle, strictly speaking, our project is about the culling quotas.

SAM: Yeah, but the rabbits and the goat control are both – they relate to the grazing pressure and what might happen to the woodland. So I think planting and planned burns are the other two things that were … So I've build a conceptual model, a flow-chart, of the system and shared it with the Authority folks at the end of last year. And yeah, their fire management was the other thing that came up as an issue. And I don't, yeah, fire doesn't help either of these species, but I guess their choices about where they allow and avoid burning has some impact on the seedlings.

VAL: So for example the other things you mentioned like fences, or planting things inside fences [if there's no regeneration?] … that's part of a potential strategy for accelerating the learning. So the other ones are management actions – that type of fence is not really an action, it's a way of learning faster than just observing how the system goes over decades. It's just trying to accelerate that. Although you can have also conservation fences if you want, or a conservation purpose for those fences, but that's a different story.

SW: And has the trip made you reflect on the theory of adaptive management?

VAL: Say it again?

SW: Has the trip caused you to reflect on the theory of adaptive management?

VAL: Not on the theory I would say – on the practice [laughs] rather than the theory. You know what I mean? Unsurprisingly, because as you learn more about the system you always improve the way you think about it … I think as Sam said at the beginning it was a good learning experience for us and that obviously translates – hopefully – in terms of better ideas about adaptive management and proposals and so on …

SAM: … yeah, I think Logan for example was really good at hatching hypotheses as we were going, and hatching these questions about, "well, does recruitment work like this?" or "does recruitment look like that?" or "I noticed that this" … And that was

really useful – Logan is not someone who is obliged to think in terms of adaptive management as Val and I are, yet was still putting things in those terms, which was good. And the nature of the hypotheses that Logan composed were different to what I would because Logan is an ecologist and could think quite mechanistically about what are the ecological processes that could be creating successes and failures in recruitment … I mean, yeah, I guess – as we spoke about in our previous meeting as well – this glib way in which adaptive management can treat monitoring that's massively important, but "let's assume it's perfect and doesn't cost anything." This project is very much in direct contrast to that – what it is that we should be monitoring? Who should be doing it and how much effort is it gonna take? – is actually very very unclear I think, still, and I think we've whittled down the options a little bit, and we can make increasingly realistic suggestions, but we are still not certain that you can get a strong signal on the things that you are interested in.

SW: Because of the monitoring?

SAM: Yeah, because of the monitoring, yeah.

SW: And what will be the next steps in terms of interaction with management and also analysis of the data – and your trajectory over the next few months.

VAL: We haven't really discussed that in detail, for the simple reason that we're going to be on conference trips …

SAM: Yeah, we've both got other commitments over the next few months or so, and there's other aspects of this project that we're each going to work on separately in that time. So for that reason we've postponed detailed discussion of these results until July. Yeah, we were going to arrange a meeting with Robin in July – so that was more about the report as a whole. So our next step is actually to go to Robin, our Authority contact, and review with them what kind of information they want from us, and what format it will be in. And what format we can best deliver it to them in. So we can frame what we do next in the most useful terms for them.

SW: Is that in September or November time?

SAM: Yeah so hopefully we'll have the meeting in July, get lots of work done over August, and then by September have a report to return to them.

SW: Yeah it'll be really cool to see that final report, to see the whole trajectory.

SAM: Oh sure.

VAL: I feel the same! I can't wait to see it! [Laughs] …

[End of Interview]