CITY OF SYDNEY

ORAL HISTORY COLLECTIONS

INTERVIEWEE: John Martin

INTERVIEWER: Jo Kijas

PLACE: Royal Botanic Gardens, Sydney

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TRANSCRIPT

0.00 **JK:** **This is an interview with John Martin and Jo Kijas on the 30th of April 2012 at the Royal Botanical Gardens for the Shared Terrain Oral History Project on behalf of the City of Sydney History Unit.**

And instead of chips we are just going to start with your full name, John, if we could, and your year of birth.

JM: John ******** Martin, 1980.

JK: **So, John, you're Wildlife Management Officer. Is that the right title?**

JM: Yes.

JK: **And just to start to get a context and a bit about who you are, can you give me some of your personal background, where you came from and just some of the influences that probably have brought you to this job?**

JM: I've grown up in Sydney, in the St George area of southern Sydney. One of the reasons why I'm interested in nature and in the environment is probably because I've spent a lot of time camping and a family holiday house on the water in the bush and just enjoying being in those locations, so being close to animals, being close to the water and being amongst the trees.

JK: And so where were your family holidays?

JM: Commonly up on the Hawkesbury. So, yes, not too far from Sydney, actually, but tucked away in a national park and nice and easy to get to and spend a weekend or a week.

JK: And was that all the family, so you really had a sense of an interest right from the beginning? Is that what you feel like?

JM: Well, it was my grandparents' holiday place, so all my cousins would be there as well. We'd have a house full of ten, twenty people plus and definitely, yes, we'd all just be having fun and enjoying the water, enjoying the landscape.

2.09 **JK: So you had a Sydney sandstone landscape too, I guess. Has that been influential?**

JM: Yes, that terrain's definitely Sydney sandstone and having fire history there as well and just seeing the regeneration. So, yes, definitely a Sydney sandstone environment; and the colours and the different vegetation communities that you get in association with that landscape.

JK: And so tell me about your pathway through uni and onwards and your work history.

JM: So, I initially studied at TAFE, doing a diploma in natural resource management and then went to university, doing a degree, and then doing a PhD, both the degree and the PhD through the University of Wollongong.

JK: Science?

JM: Yes, environmental science; lived down there for a little while as part of that. And, yes, with respect to throughout that study period from the TAFE days was encouraged to volunteer and get practical experience and so did things like bush regeneration in Royal National Park and Kurnell National Park, things like whale watching and bird catching and banding and different monitoring programmes, which led to employment at Centennial Park as environmental officer there,

where I was working with native vegetation management, weed control and fauna management, both native and introduced species.

4.11 **JK: And your PhD?**

JM: So whilst working I've been studying and so the PhD's actually been working on the Australian White Ibis. And actually I first started doing work with white ibis through volunteering at Centennial Park where there have been ibis issues, large numbers of ibis and ibis encroaching on the park's landscape and the visitors as well as some concerns from Sydney Airport about the ibis interfering with the flight path by flying between, say, Centennial Park and some of the different foraging grounds to the south of the airport. So, yes, working there and researching really the basic ecology of ibis. So one of the things with ibis is that they're being managed in the urban environment as a nuisance species, which is predominantly nest and egg destruction, and so we were doing nest and egg destruction but we didn't know really the basic ecology of ibis. Was this effective; was this appropriate management action, what are the long term consequences of continued suppression of recruitment? So some of the questions that I worked on related to assessing the population size of the Sydney region. We really didn't have a good understanding of what the population was and what it was doing, both seasonally and annually, what were the birds' movements. So doing radio tracking to see where birds were moving to to forage and where they were also roosting. Were they loyal to the specific site or did they go to multiple locations and looking at site fidelity in more detail with respect to individually colour banded animals, is this their home, do they always spend their time here or do they move transiently throughout multiple locations?

6.15 And so I'm still doing research on white ibis, just as an aside but it's just in our research interest and there are still questions, working generally on small questions. So, yes, we're continuing to do some work on white ibis.

JK: So you are Dr John Martin, are you?

JM: I haven't actually submitted yet.

JK: Getting closer; you will be very soon?

JM: Very soon, yes.

JK: Well, let's talk about ibis now because I have read some fun bits of yours where an ibis shows up in all sorts of places. But could

you tell me a bit more about what they do, how do they live and what have you found out about them?

JM: So, the first thing that people when they see ibis commonly say to me is “They're not native” and so the first thing I say to them is “That’s the Australian White Ibis”. And there’s this misconception in the general population that they're actually the African Sacred Ibis, which means that people view them in a different way. They view them as an introduced pest and that puts them in the parallel with things like a rabbit and when you talk about European wild rabbits people say “Kill ‘em”. And so I’m regularly out there, surveying birds, and people will just say “Oh, they're dirty birds, they're filthy. They should just be killed”. And so there’s just this bias to these birds because of their behaviour of the fact that they do encroach on people.

8.04 Now, the interesting thing there is that people encroached on them and now they're encroaching on people. So the circumstance there is that the Murray-Darling Basin was an area where there are a lot of floodplains and wetlands and traditionally there would be cycles of flooding in different parts of the basin and large breeding events occurred where huge numbers of waterbirds, including White Ibis, would breed, forage and then move to the next flood or opportunity to forage or breed. And that’s unfortunately ceased with our water management policies and actions and so there’s really interesting and good data of the Eastern Waterbird Survey, which is a National Parks project where they do aerial surveys of the eastern states for waterbirds and they’ve identified dramatic population declines of a range of species, including White Ibis in those areas. What we’ve seen is a shift of that population to the coast and consequently the ibis are finding that there’s abundant food and water and habitat in the urban environment, so they're proliferating. That, of course, results with some conflicts, where they nest in places like people’s yards or at train stations where they continually drop crap or faeces on people’s cars and things like this. And then there’s also their behaviour of scavenging and so they’ll take some free food if you're going to give it to them and they’ll stick their heads in the bin and dig around and pull some food out and so people see them as this dirty bird.

10.00 But when you see them in the natural environment – and that can be in an urban location, such as a pond or a wetland or even an estuary, so Botany Bay – and you just see how they're made, with those long legs and with that long neck and with that long bill and how they're designed to probe in the mud and in the substrate and find the invertebrates and find food. And it’s quite a beautiful sight,

particularly after rain, when you see them in the sports fields and they're just dotted throughout this flooded or just really mushy, wet soil and they're digging out all the worms and the beetle larvae and they're just doing what comes naturally and they look quite beautiful. So I've gone on a bit of a tangent there, so what was the question again?

JK: No, no, that's all part of it. Well, because we're talking about City of Sydney and the urban landscape, what have you found about where they go and do they stay in the one plot?

JM: That's all right. O.K. So one of the interesting things that we've identified that the population is highly variable in relation to the breeding season so we see a large influx of birds to the Sydney region – and by that I mean much bigger than just the City of Sydney boundaries. So let's say we have a baseline population of something like three thousand ibis in Sydney and then in the breeding season that'll double so there's say six thousand adult ibis in Sydney and then reproduction occurs and then over through winter, through spring and then summer you get a couple of thousand additional fledglings join the population at foraging sites. The fledglings we know and we've known for quite a while that they move out of say the Sydney region where they've been born, they disperse, and so there are historical records from say fifty years ago of birds from Victoria moving as far as Papua New Guinea in say an eleven month period.

12.09 And so there are a series of these large movements from the south to the north. From the City of Sydney region we've actually had some juveniles move as far as Townsville. And so one of the interesting things is do they return? And so that's some of the work we're working on; it requires large samples sizes and time. At a more localised scale, you've got the population that's seasonally fluctuating, so it's ebbing and flowing up and down with the breeding behaviour but on a day to day basis you've got birds moving from places like Hyde Park through different locations in the city, so to Woolloomooloo, to the fish markets, to Kings Cross, to Sydney Park and foraging in those various locations. Of course, they're also moving within Hyde Park and if you're there at lunch you'll find there's ibis looking at all the business crowd, getting some food. But then they do also make those larger movements and there's the major foraging resources aren't your natural estuaries and things like this, they're landfills. And so we've seen birds from the colonies in the eastern suburbs, including Hyde Park and Cook & Phillip Park move to say Belrose where there's a landfill, to twenty kilometres to the north. They'll fly up there and fly back; they can make multiple

movements in a day. There's a major landfill out to the west of Sydney, Eastern Creek, so it's about thirty five kilometres from the City of Sydney and so they'll make that flight as well. And then there's another landfill down at Lucas Heights and so they move between those locations literally on a day to day basis. They'll fly from, for instance, Hyde Park to Eastern Creek, have a feed and fly back again and then have a bit of a forage in the urban environment.

JK: And will they roost – where do they roost?

JM: Yes. They'll be roosting in Hyde Park, predominantly. So some of those birds, they might be Hyde Park today or for a month, then they move to another colony, say in Bankstown and then they're back here at different time of year.

14.10 What we've found with the detailed assessment of the banded birds – so known individuals through a number of years – is that roughly twenty five per cent of the birds show a very high level of site fidelity and are pretty much here all the time, so to speak. Now, that doesn't mean that they don't also go to other locations. They definitely move around and they definitely make those daytime foraging journeys long distances. But, yes, you could almost say that twenty five per cent of them are here all the time.

JK: And so you would assume that this not an issue that's going to go away, the ibis are here to stay? Right.

JM: Yes. So, a lot of people talk about the concept that if the natural environment in the western wetlands improves, that the birds might shift back to there and they might and if they do they probably will temporarily and then when things aren't so good out there – so there's another drought – they'll all be back on the coast again. I don't think they're all going to go and it remains to be seen how many of them would go. So the population in the City of Sydney and then the Sydney region is annually variable and we don't have a great understanding as to why. In some of the sites like Hyde Park there seems to be a fairly consistent population of birds because there is that consistent resource always there, there's a lot of people providing food. You've also got those grassed areas where when it rains they can forage naturally and there's a lot of nearby resources. So the Domain is a nice, big grass patch for them to forage in and there's a lot of bins in the city, so there's a lot of food around.

16.08 **JK: And so what are the management issues about living in an urban environment where you have that cohabitation, I suppose,**

people and ibis and how are they also cohabiting with their other wildlife colleagues? I don't know how you put it.

JM: Yes. Look, I think that word “cohabiting” is an important term. People, I don’t think, have the view that they cohabit with wildlife or with nature, they cohabit with humans, and we obviously know there are issue when it comes to human relations in various different circumstances, which means that if you can’t resolve a human issue you automatically throw the animal issue into the category of “Manage it, actually have an impact on it. Don’t negotiate with it. Let’s not discuss with the ibis how we’re going to live side by side”. I don’t think anyone’s taken that approach yet, not successfully anyway. So, yes, it’s a matter of people living with the wildlife. One of the things is identifying where are appropriate locations for them and trying to discourage them from areas where we deem to be inappropriate and allowing them to be as they wish in areas where we deem to be appropriate. That’s a tough one in the city where there’s such high intensity land use and, yes, it’s not an easy one to resolve with respect to ibis and other fauna and whether or not there’s an impact there. Within the city of Sydney, I wouldn’t have thought so. There is the potential that in locations where you’ve got breeding colonies and there’s multiple species and a large increase in the number of ibis could have a negative impact on other species because they're competing for habitat, for the space and ibis are generally a bigger bird than most of the other birds, so they might muscle them out and sheer numbers.

18.19 But that is an interesting question which is difficult to assess and requires time series data before the ibis were there and then after and unfortunately we really don’t have good data on it but what we do see is definitely that there is breeding of other species occurring where there are ibis. So here in the Botanic Gardens there are moorhens breeding and there are Pacific Black Ducks breeding and there are wood ducks breeding and there are Grey Teal breeding, there’s Little Pied Cormorants and Little Black Cormorants breeding as well and, yes, they're all in there, finding their own little niche and succeeding.

JK: And from the perspective of management strategies with the ibis/human issues, are there ways forward that, say, the Botanic Gardens or yourselves have been working on?

JM: One of the things that I think most people would agree on is education, so as soon as people understand what the situation is they can make an educated decision on what their position is. So that first

comment that I made, that all these people see ibis as a non-native species, the first challenge is to let them know that they are a native species and I would hope that that would change most people's initial reaction from "kill them" to "O.K, they've got a right to be here. How are we going to live with them?" And National Parks and Wildlife have a programme called 'Living with Nature'. So they've got an information sheet on ibis and it's one of these things that I guess isn't really proactively engaged except for where there is a localised issued.

20.08 So, within the Botanic Gardens we don't have a lot of interpretive information about the white ibis and it's something that we would like to potentially address in the future, a bit more of a fauna focus because something that visitors, particularly we get a lot of international visitors come in here, I can tell you they all love the ibis, they all think that they're really interesting and so you see a lot of tourists taking photos of ibis and you don't see Sydneysiders taking photos of ibis. So, yes, a lot of the information would be read by those tourists that aren't being impacted by the birds and so it's a matter of how do we engage with the actual target audience. And, so, yes, perhaps some of the areas like Hyde Park where it's more high profile and it's no one's backyard, it's everyone's space, might be a more appropriate place for just a sign that says "The Australian White Ibis is a native bird" or just a picture of the bird with the name; it's right there in three words, "Australian White Ibis" and you could have a sign and a few more words underneath "Not an introduced species". But of course, yes, there's more detail that you probably want to go into in that circumstance.

JK: To -?

JM: To educate the community. So, yes, I think a lot of the management actions are behind the scenes, they're not engaging. So for instance you change the bins so that the ibis can't stick their heads in them, you do things like pruning of vegetation like palm trees so that they can't nest in them and most everyday people aren't going to notice those two very subtle changes that actually have a really substantial effect because it changes the behaviour of the birds.

22.16 It means that there isn't as much food and habitat for them in that location, it's likely to reduce the numbers of birds; people aren't likely to see that. So there isn't necessarily education going on there but there is management, so I think that's predominantly what's been happening for I'd say the last twenty five years in Sydney, there's been management going on and not a lot of education. And so we've

done a few things, newspaper articles and stories in like different magazines but again apart from say the Reader's Digest, which was a very small story, things like the Birds Australia magazine and the Australian Museum magazine, the target audience that read them aren't your target audience for seeing these birds in Hyde Park every day and wondering why that pest species is hanging around, so it's a tough one.

JK: And I'm just thinking that moving from birds to animals, if you stop an ibis from putting its face in a bin, would you stop a possum putting its face in a bin? I mean, possums are another native problem for some.

JM: Yes. Oh, look, definitely. Here in the Botanic Gardens we have a very large number of Brush-tailed Possums and also Ring-tailed Possums and we actually have all closed lid bins here so they can't get in the bins. Within places like Hyde Park it would definitely be something that you would look at but most of the bins are the ones that a possum could probably still get in and out of. The exclusion is normally that there's the big sort of dome over the top with a space for you to place rubbish in but a possum could climb in and out of that.

24.01 And, yes, I think a lot of people don't realise that possums are omnivorous, so they'll eat meat as well and so any scrap is food for a possum. So, yes, it's an interesting one. It's one of those ones where people don't really see the damage from possums. Unless they're in their house they're unlikely to be concerned about possums so again it's a very localised management issue. Here within the Botanic Gardens one of the issues we have is the damage that the possums cause to the flora that we've got on display, so there are a number of trees with possum guards to stop them climbing up into the canopy of those trees because they literally strip the trees of leaves. They do eat leaves as well and if they're after a particular fruit – there's actually a mango tree here in the Botanic Gardens; it almost looks like its trunk's made of plastic, there's so many branches on it that all have these possum barriers but they just love the mangoes so just that tree wouldn't be alive if all those barriers weren't on it. And we've had to change our behaviour as well, so we used to plant a lot of annuals and different species that were seasonal and you'd put them in and they just got eaten overnight, so we just stopped putting them in, there wasn't any point.

JK: We'll come back to possums again but let's actually look at your job and could you tell me when you came to it and how long this job's been around, this particular role?

JM: So, my position at the Botanic Gardens is to project manage the flying fox relocation and so I've been here for two years now. The position was created in 2007, late 2007, and we've had an approval from the state government since 2009 to implement a relocation.

26.03 We then needed to get an approval from the Commonwealth, which we got in 2010 to relocate the flying foxes. The idea is to have no flying foxes on the site. If there are any flying foxes that will attract more flying foxes. So that is the challenge, is to encourage them to leave this site and discourage them from returning subsequently. So both the state and the Commonwealth government have given us conditional approvals, which means that there are a series of conditions which we have to comply with as to how we implement the relocation and when we implement the relocation, reporting on what we've done and conducting monitoring so that we can assess the success or the failure of the relocation.

JK: So what are the key issues and if you're explaining this whole issue to an audience that wants to listen, what are the things that you want to tell them?

JM: So one of the interesting things with flying foxes is that they've had a change in their behaviour. So there are parallels to a number of species that we'll talk about, so the white ibis, the Sulphur-crested Cockatoo, the possums. The flying foxes again are a native species – as are all the ones I just mentioned – so the flying foxes are a native species that always came to the Sydney region to forage. This is within the foraging range, the distribution of the Grey-headed Flying-fox, has been forever and a day. However, European habitation of Australia has changed the resources available and flying foxes have stopped coming to Sydney seasonally and are here throughout the year.

28.00 And some people have suggested that's because of the redistribution of resources, particularly foraging resources, and that's a very likely answer, reason for why they're here.

JK: You mean beyond Sydney?

JM: Yes, I mean throughout the range. So the Grey-headed Flying-fox currently occurs between Melbourne and Bundaberg. It actually does occur slightly above Bundaberg but sporadically and infrequently.

Melbourne has a very similar story to Sydney, in that flying foxes first established a colony in the mid 1980s and the colony here at the Botanic Gardens actually established in 1989. However, there are historical records throughout the southern part of eastern Australia – so Sydney down to Melbourne – of flying foxes roosting at different locations seasonally. So here on this side of the Botanic Gardens there are records throughout the 1800s – there's three or four records and a couple of records from the early 1900s – of flying foxes roosting on site. Now, that's associated with foraging resources - so eucalyptus tereticornis flowering, the banksias flowering – and they would seasonally come to the Sydney region, forage and move off again. The change occurred that they were coming to the Sydney region and they didn't leave and so the population in the Sydney region has now developed an annual and seasonally variable cycle. So here in the Botanic Gardens for example in 2010 we had twenty three thousand flying foxes approximately at the peak of the season, which was April, which is when they breed. And so then through winter the population decreases and it went down to three thousand flying foxes and in late September and through October flying foxes return to this site and to give birth and then the population increases over the summer to the breeding season peak.

30.09 In 2011 we had at the breeding season peak of April sixteen thousand flying foxes, and again it dropped down to about three thousand animals. This year in 2012 in April we had about eight thousand flying foxes and then it dropped down to actually two and a half thousand flying foxes and so that has to do with the regional population. So we know that there's a lot of Spotted Gum flowering going on down on the South Coast near Batemans Bay and up in the Hunter and we know that there are very large numbers of flying foxes in both of those areas and that the Sydney region, these flying foxes have left. There are a small number still here but historically – so over the last twenty two years, twenty three years since '89 – the population across the Sydney region has gradually increased so that throughout the year there's a larger number of animals here throughout the year and also in association with those peaks of breeding – so April – and also giving birth - so sort of September/October – one of the reasons proposed is that there are readily available food supplies here in the urban environment. And so here on site at the Botanic Gardens and in the Domain we've got these massive Moreton Bay Figs and Port Jackson Figs that were planted in the mid 1800s – they're over a hundred and fifty years old now – and they produce a lot of fruit. There's a lot of figs throughout the eastern suburbs, over to Centennial Park, along the Anzac

Parade, throughout Centennial Park. There's also quite a few over in the inner west, so the Balmain area, and then over in the north side, Manly and whatnot. Of course, in addition to that in the Sydney region you've got Ku-ring-gai Chase National Park and Royal National Park, so large tracts of native eucalypt which seasonally flower and so they're also an attraction.

32.04 So the population would seasonally be moving through the Sydney region, say from let's say southeast Queensland down to Melbourne, so they move through Sydney and then back again. So you've got animals moving through this region throughout the year and so on-site the issue is that the flying foxes have increased in number and they've been having a significant impact on the historic landscape. So we've had twenty eight trees die, we've had thirty palms die and we've got an additional sixty trees and palms considered to be in a critical condition; they're likely to die in the next five to ten years. One of the issues that we face on site is that we have a lot of visitors, both Australians as well as international tourists, and we have a duty of care to provide a safe site for them to move through and, of course, our aim is for them to learn about flora, learn about plants, in particular learn about conservation of plants and plant communities. And so we have actually about 3.5 million people come to this site a year, we have over a hundred thousand different groups of say school kids, university kids come on site and do education classes and we have an issue of managing all the trees on site, not just the trees that the flying foxes are using, to ensure that there's a minimal risk of those trees causing any health issues or fatalities. So we have arborists on site who routinely monitor the safety of the trees and manage the trees as required, so pruning limbs, removing trees if they're deemed to be unsafe. And so we've had to remove a couple of the trees within the flying foxes colony because they were deemed to be unsafe, dead branches hanging over paths and things like this.

34.05 So it's a long term issue for us with respect to the loss of significant heritage species. Some of them are botanically significant, so they were type specimens that were collected and then described here on site, grown and described, and a number of them, of course, just form part of the historic nature of the site, so plantings that have been made in the 1800s and really were the foundation of the Botanic Gardens in Sydney. So beyond that this site has heritage from two aspects, of course the Gadigal people, the traditional owners of this land, and European first settlement. So literally on this site was where the First Farm, the first European agriculture was commenced

and failed but it's actually a Sydney sandstone site, as we mentioned earlier, and there are port soils here and whatnot.

JK: I keep calling them bats. Are they bats?

JM: "Bats" is a generic term.

JK: I am allowed to call them a bat, really?

JM: No one would be overly upset.

JK: All right, thanks. One of the things about them coming in, I hadn't realised that the figs and the abundance of planted trees has had a major effect. What about the environments that they have had out beyond? What impact has that had on their population in the cities?

JM: With respect to the food availability in the urban environment, during the 1970s and perhaps even slightly earlier there was a big push of the greening of the environment, so street tree plantings as well as beautification of your backyard, your front yard.

36.11 So as much as there's the plantings that have happened a hundred and fifty years ago, there's also been a big push recently for an increase in flora across the urban landscape and that's increased the amount of foraging resources available. So in particular things like Cocos Palms and Canary Island Date Palms and all these natives recently, so hybrid natives like grevilleas and eucalypts that have abundant nectar flow throughout the year, there's a range of different food available nowadays and one of the things that has been identified is that a lot of the food in the urban environment is available when native food wouldn't be seasonably available in the Sydney region, so you're providing a food, a supplement, at a time of year when there normally wouldn't be a lot of food.

JK: And what about the impact of clearing, etcetera, outside of the city?

JM: Yes. So one of the important things about the flying foxes is that they are highly mobile and that they're identified as being an important pollinator and seed disperser, so the point being that they can fly five, ten, thirty kilometres, fifty kilometres between stands of trees and cross-pollinate, provide cross-pollination, so that's really important for genetic diversity. With respect to seed dispersal, it's believed to be on a shorter distance, so sort of maybe more the five to ten kilometres that they might be defecating seeds out but that's

important for also dispersing seeds across the landscape of native species.

38.00 With respect to the impacts that have occurred to the native stand of vegetation, I think land clearing is one of the first answer almost to say whenever we talk about whether it's a plant or an animal or a community of plants that are listed or are potentially going to be listed because of the fact that they're being lost. For the flying foxes, the loss of habitat relates to urban development, agriculture, of course, all these things, the standard reasons for clearing vegetation, forestry, but in the current context – and I'm talking like the last five, ten years, a lot of land clearing has actually ceased. However, there is still a lot of urban development and so they're still actually losing primary foraging habitat through urban development and things like Melaleuca swamps on the coastland which are being cleared and reclaimed so to speak and turned into – whether it's a golf course or New Housing World still actually have a significant impact on the flying foxes and it's a challenge because a lot of those areas have already been earmarked for development in the context of clearing and turning into residential areas generally. So the impact of loss of habitat hasn't been addressed yet, I would suggest, with flying foxes. I don't have the hard data but there's some people that are into this industry have talked to me about it and saying there still is an ongoing loss of habitat, so there is an impact to their potential foraging resources there. I think one of the other key things is one of their major foraging resources, of course, are eucalypts and they don't flower every year.

40.01 So they have seasonally abundant resources which can occur every five or six years and so every year there's something on but whether it's enough, and we're talking about over a two thousand kilometre distribution, so there's a big area for them to move within to find food and so that in itself would be a challenge.

JK: And talking about education, I've certainly found that it's quite hard to convince people that they are an endangered species because of their observations of numbers and things.

JM: Yes.

JK: Can you talk to that a bit?

JM: So the Grey-headed Flying-fox is listed as vulnerable at the state and the Commonwealth level because of the fact that the population was observed to be declining. Under the IUCN Red List criteria, within a ten year period which was three generations for the flying foxes, the

population was believed to have declined by thirty per cent, so they got listed. In addition to that, there was the issue of loss of habitat. One of the big issues is that we really don't have a good understanding of what the size of the population is. Historically, a hundred years ago how many were there? Two hundred years ago how many were there? And one of the big issues is that right this minute we still don't have a good idea of how many flying foxes there are. There have been a number of national counts, which are coordinated. A lot of volunteers go out and they count lots of colonies across a large geographic area but they don't count all of them and it's difficult to count flying foxes, particularly if there's lots of them; when you've got to count fifty thousand animals in twenty minutes it's a big estimate, so there is a huge amount of error associated with how many flying foxes there are.

42.02 One of the issues is that different members of the community – and, for example, people who are growing crops in orchards, orchardists - they might be impacted by flying foxes at different seasons, different years; it might happen every other year or something like this. If there aren't abundant food resources in the localised area they'll go and take advantage of the food that's available. In that context, there's commonly the perception that there are a lot of flying foxes and there can be a lot of flying foxes in that small geographic area but it doesn't necessarily mean there are a lot of flying foxes in the population. And having long term data is an important way of being able to describe that so that people can observe it and unfortunately there are few locations where there are long term data. One of the sites that probably is the best in Sydney for long term data would be the Ku-ring-gai colony – otherwise known as located in the suburb of Gordon – and they've been doing counts there for probably about twenty years. Now, they know that the population there has fluctuated between no animals and eighty thousand animals and they annually get a peak of up to thirty five thousand is the normal peak but they can have more than twice as many animals on site and it's generally in response to abundant flowering or is simply that the animals are moving through the region. And we were talking a moment ago about the large Spotted Gum flowering happening at the moment and so the counts that are going on at that site at the moment observed that in March there was approximately twenty five thousand flying foxes and in April there was six hundred and the week before the six hundred count some people walked through the colony to see if there were any animals there and they didn't find any, so they said there was zero; a week later there was six hundred.

44.10 It's very likely those six hundred were just moving through. So it's a perception of what you can see and what you can't see is an awful lot. So when people say there is a large number of flying foxes because they've moved to Orange or they've moved to Bathurst, they've moved there temporarily and they've moved there because they're searching for food. It doesn't necessarily mean there are so many flying foxes everywhere else, that they've been pushed out there. So, yes, there is some plans underway – and it hasn't been confirmed that it's definitely going to happen – to do another national census and try and get a better understanding of what the size of the population is. That won't necessarily result with a delisting even if they found out that there were a lot of flying foxes because they don't have good data to have a baseline to say what it was. They have numbers but they don't necessarily have a time series of data so if this programme can get up and running and then they can have ten years of data collection and they can identify trends in what the population is doing and how many flying foxes there are then with some certainty they could make an educated decision on should the species be listed, is there a lot of flying foxes?

JK: Of course, there are some people who do know about the vulnerability and your plans for moving the flying foxes from here have met with some challenge, haven't they? So, can you tell me about some of the contested views about your plans to move them on?

46.03 JM: Yes. So the Royal Botanic Gardens and Domain Trust has planned to relocate the flying foxes from this site in order to conserve the significant heritage value of the site, particularly the growing collection. Not everyone agrees that that is the best way to manage the flying foxes and there's definitely been people who have opposed what we're proposing. The most significant action opposing it was a group called Bat Advocacy actually took the Commonwealth government to the Federal Court to challenge their approval. The Federal Court deemed that their challenge wasn't valid, that the assessment by the Commonwealth government was adequate and that there were stringent enough conditions in place to ensure that a successful relocation would go ahead or could be implemented. That was then challenged to the full Federal Court and again the decision of the Commonwealth was upheld – or I should say that the appeal was upheld. But, yes, I mean, in general there are people within the community who don't support the relocation and that's understandable from an animal conservation perspective but a lot of people, I think, don't take into consideration what this site is and what

this site means, they're just thinking of the flying foxes. In particular, a lot of people suggest managing the site differently and that is an option but it's currently not the plan.

JK: And that's partly to do with the heritage value and the way that the garden's been planned, is that correct?

48.03 JM: Definitely, yes. So people talk about just growing a whole lot of trees within the existing colony or a lot of people actually suggest growing a lot of trees somewhere else on site and then moving them to those trees and the first comment is "Well, that requires you to move them from where they are, so that's a relocation, and the second thing is it requires you to stop them going back because they already like where they are. I don't see that they're necessarily going to want to go somewhere else just because we suggest it to them" – on site, that is. But there's a huge challenge to move them within the location in that context and the point that you make, yes, is exactly correct. The site is managed as according to the master plan and the heritage of the site and there are significant challenges with respect to changing how we actually managed the site because of the heritage listing of it so there aren't necessarily plans to make those changes.

JK: And you have a plan to relocate them to various sites within the broader Sydney area – I think that's right. When I was looking at – this is a question – when I was looking at some of the material, in say 2010 there seemed to be more site that were suggested than perhaps alternative sites today. Is that right? Have there been some sites that had previously been suggested that they could be located to that have been taken off that list? I just thought I'd seen sort of six or seven sites, perhaps, and now if you look on the website it's down to sort of three or four alternative sites.

50.11 JM: The Botanic Gardens has an agreement with National Parks and Wildlife and there are five national parks that are listed and in addition we have an agreement with the Ku-ring-gai Council in relation to the Gordon colony. Those sites have all said if the flying foxes move to those locations they will be able to stay there. Separate to that, there are a number of sites around Sydney where we know they're likely to move to and they're existing flying foxes colonies. The reality of that situation is that the flying foxes move to those colonies as they please already, so through various monitoring of banded animals and radio tracking and satellite tracking, we see movements of animals from this site to, say, Centennial Park or to Wolli Creek. We've also seen movements of animals to pretty much every colony in the Sydney

region. We've also seen movements of animals to colonies between here and Brisbane through doing aerial radio tracking and satellite tracking. So we know that the animals move throughout these colonies, you know, the flying foxes here on site at the Botanic Gardens aren't the Botanic Gardens' flying foxes, they don't think the Botanic Gardens is the greatest place in the world. They're just here because it's a resource; they do and they can move to these alternate colonies. The number of sites that are approved for them to move to hasn't changed.

JK: O.K, because I was wondering if there was a growing concern from some of those non-national park areas about what will happen to their local government areas or wherever it is.

52.12 JM: Neighbouring land managers that have flying foxes colonies have expressed concerns. The big concern that they commonly express is about carrying capacity, so how many flying foxes can sustainably be on a site. As per the example of Gordon that I gave and even this site, we know that the population is annually and seasonally variable and at any site the number of flying foxes could be twice as many in one year as it was the previous year and so it's a very challenging thing to manage what is the appropriate carrying capacity and, yes, it's something that you sort of have to deal with at the time.

JK: So it'll be an ongoing management issue?

JM: The ongoing management of the flying foxes will be to keep them out of this site, definitely. With respect to neighbour relations, we're committed to working with our neighbouring land managers as required and it's something that we're all going to wait and see and learn from and come up with solutions as required.

JK: And I think there was an attempt in the 1990s, is that right, to relocate them? Why wasn't that successful?

JM: Throughout the 1990s there were actually multiple relocations implemented on site. A number of them were successful: they relocated, let's say, a thousand or two thousand animals and they all left. Why they weren't successful in the long run is because they weren't maintained. So they got the flying foxes to leave, six months later a couple came back, they gradually increased in number.

54.09 Someone again decided "O.K, there are too many on site again. Move them again". And that was the mistake: the mistake was to not maintain a zero presence of flying foxes because flying foxes attract flying foxes.

JK: So what's the next move? I think you're relocating, you're going to have a go fairly soon?

JM: Yes. So the state and the Commonwealth approvals allow the relocation to be commenced between the 1st of May and the 31st of July.

JK: Tomorrow.

JM: Tomorrow would be the theoretical first date. We'll probably start late May. There's a few things that we have to do prior to commencing and, yes, so late May is the starting date that we've got planned.

JK: And so does that mean that you have a job for the foreseeable future? Because it's going to be ongoing maintenance or management, I suppose, issue about not repeating the mistakes.

JM: Yes and no. On site the Royal Botanic Gardens is definitely to have no flying foxes on site so my role of wildlife officer will be something that will coordinate those actions for at least the next few years. As we discussed, there are some unknowns associated with this project and we will have to make decisions as required.

55.56 **JK: Because I think that, yes, that probably wasn't quite the right question. Anyway, what have been some of the changes of philosophy about wildlife or have there been? Because this was a place that was set up for the plants and there have been a number of changes of understandings about habitat and biodiversity and things like that and, after all, it is a very big green space in the middle of the city. How has that relationship between wildlife and fauna and flora developed in the Botanic Gardens?**

JM: That's a tough one because I don't know the history of the site entirely.

JK: More recently.

JM: Yes. So wildlife on the site within the Botanic Gardens and the Domain is seen as part and parcel, it's something that occurs here naturally and that's to be encouraged. The site isn't managed specifically for wildlife though and so there are definitely some challenges there if there were species that you were trying to encourage. However, on site we have an abundance of common species so to speak. So there isn't anything that's considered overly – now I think about it, there's also the Powerful Owls; they're considered rare but they're considered more of a novelty than

anything, in the sense that they're becoming more common across the Sydney region. So they initially were a novelty because of the fact that they hadn't been seen in this sort of location for quite a while and so in the circumstance of how to manage this landscape to encourage different fauna, the Powerful Owl is probably the only example where we've recently proactively installed a nest box to try and encourage them to breed on site because we believe there potentially aren't any large enough hollows for them.

58.23 That relates back to tree management from a safety perspective and also the age of the trees. So, despite the fact we've got trees here that have been planted almost two hundred years ago - and there are definitely some trees that were here prior to that, so some native eucalypts that are still growing – there aren't these large hollows which a Powerful Owl would use, so we've put a nest box in. All of the other species are actually fairly common native species and they're managed more in the opposite direction of they're abundant and they're having a negative impact on the flora. So we do things like removing ibis nests and eggs to deter them to try and decrease their numbers on site. So, yes, it's one of the issues that I've had in Centennial Park as well, where you're managing an urban green space, you're not managing a national park, and so the flora is really what's being managed and the fauna are generally reactively being managed in the sense of if they're there that's fine, if there's too many of them or they're causing a problem then you go what you can about it to try and have a better balance from the landscape perspective.

JK: And I think there was a possum cull in 2008, was there? I read some article from a Daily Telegraph journalist suggesting that because of that there were more possums in his house. I thought perhaps that was a little bit far for a possum to travel but would there be an impact in neighbours from the sorts of actions that you might take in the Botanic Gardens, like trying to get rid of the possums for example, that would impact on people beyond?

60.25 JM: With respect to possums I wouldn't have thought so.

JK: And why is that?

JM: So possum management on site that we were trapping some possums and then they were taken to a vet to be euthanised. The reason for that was because of the large number of possums on site. There was a study conducted by a student at the University of Sydney that identified that there was something like fifty or sixty per

cent of the possum population on site were juvenile males. That was strongly suggesting that a lot of people in the neighbouring areas were dumping their possums here on site. And possums can actually be quite aggressive to each other when they invade each other's territories. So we had a lot of very sick possums on site that were being euthanised, one from a management perspective of the fact that we had a significant issue with vegetation being damaged but also from the aspect that we had a lot of sick animals. Yes, so if we say the Botanic Gardens is an area that provides abundant habitat for possums and there are a large number of possums and we remove a small number of those possums through a trapping programme, I don't see that they're going to then get the hint and run away from here to someone else's house. I don't know where that journalist lives but he'd want to live very close.

JK: Surry Hills.

JM: Yes, I think that's too far personally. But, yes, with other species there's the potential of displacement but say for instance ibis, you remove their habitat here they're going to go and find habitat somewhere else.

62.19 And we've done that on site and we've removed some of their habitat and they've moved to other habitat within our site where it's deemed to be more appropriate. In general, yes, I wouldn't see that there is a huge impact on the neighbours from the management that we're implementing on site for fauna. In particular, most of those locations that are neighbouring us aren't going to provide any habitat for that fauna so where else are they going to go?

JK: And we haven't talked about the cockatoos yet.

JM: Sulphur-crested Cockatoos are a similar story to ibis and flying foxes in that they weren't a very common species in the Sydney region thirty-odd years ago and there are reports in western Sydney, Richmond area and they're observed in the Blue Mountains. And there are historical records of observations of them in Sydney but not large numbers and the cockatoo population has increased across the Sydney region, so again parallels of both ibis and flying foxes. On site, cockatoos are a very interesting species, there are a very charismatic species and in particular both locals and tourists enjoy the interaction with cockatoos because the cockatoos will let you get very close to them.

64.01 And occasionally people feed them, which we discourage, but they will literally land on people's arms and things and feed from their

hands. I'm really surprised that no one's been hurt by a cockatoo yet. I admit that they are gentle but you see them next to people with these earrings in their ears and I'm surprised that someone hasn't had one pulled out. On site with respect to the flora the cockatoos do cause some damage because they nest on site in hollows and they create hollows; that's one of their natural behaviours. So they will chew away at a fork in a tree and what would naturally happen is that that branch would actually give way which provides the start of a hollow or alternately they will literally burrow a hollow into the tree where the fork is; there's a bit of a weak point there. So in addition to that they forage on site; they are an inquisitive, interesting species. You'll see them actually eating grass like wheat in the First Farm. So we're growing these different species of oats and wheat as a display of what the first colonisers of Australia were doing and the cockatoos destroy that in a matter of moments. We have an annual spring walk display with a lot of tulips and you'll see them pruning the tulips, so you've got a lot of green stalks sticking up out of the ground. And they do cause damage to a multitude of established trees but one of the big issues is actually that they occasionally will ringbark new trees.

66.02 So they're just playing and they're not eating. I don't know why they're doing it but it's a bit of an issue so we put collars and guards on trees to try and deter that from happening. And so, yes, on site we've just commenced a research project to try and get a better understanding of the cockatoos. We're individually marking the birds so that we can do surveys and identify if an individual is on site and so then we can using that data estimate what the size of the population is. So the first thing is that we're wondering how many cockatoos actually come to the Botanic Gardens and we're expecting that it's a very large number. Despite the fact you might see sixty or eighty birds in a day, in a flock how many of those birds are here the next day, how many of those birds are here in a week and how many of those birds are here in three months? And so being such a highly mobile species – and they do have a tendency to be transient – we've got movement records of birds from across the Sydney region, so down to Como and out to Riverview and out to Dee Why and a lot of localised movements to Kirribilli, The Rocks, Potts Point. And, interestingly, pretty much all of those movements are being reported by people who are feeding cockatoos and so they have cockatoos that literally land on their balconies or on their windowsill and they give them a Sao or a cracker and they see the tags. Fortunately for us they're inquisitive and they say "Why has that bird got a tag on it?" they go to their friendly internet server and do a search and come up

with some information about us. We've actually got a Facebook page on the cockatoos, which has been really successful because we've given all the cockatoos silly names and so everyone really likes that.

68.03 From a reporting perspective, now I do surveys and I see "005" and "041" but people report back "I saw Pina Colada and I saw Sunny" and so it's really interesting; people really love the fact that they've been named. And so through time we'll be able to get a good understanding of what the size of the population is and what the behaviour of the population is and so it'll be interesting to do some monitoring through the breeding season this year. So look into hollow competition within the cockatoos but also between species and then particularly to look at the fledging success, so be able to mark those fledglings and have known age birds and see what their behaviour is: do they stay on this site, do they move out across the Sydney region, are they here in five years' time.

JK: Your wildlife management officer job, does that actually include everything else or is there somebody else doing the cockatoos, the ibis, everybody but flying foxes?

JM: No, I do all those.

JK: Right, O.K. So the job was set up specifically to deal with the flying fox issue but you've also got all these other animals?

JM: Prior to this job being created, there was a position of environmental officer and that person did a range of different things relating to fauna and water quality and weed management. That position ceased to exist, the person left and it evolved into the project officer for the flying fox relocation but, yes, that involves the management of fauna in general.

70.15 The other fauna aren't necessarily the priority. The senior arborist actually coordinates most of the ibis management on site and things like the possum guards and things like this because they're all tree related actions and he's responsible for tree management. Myself, I do some monitoring of things like what's the population and then do some research into marking those birds so that we can actually follow individuals and assess detailed information statistically.

JK: And I was just wondering about other habitats, the Booth sculpture for example. Tell me about that.

JM: O.K. A donation was bequested to create a sculpture overlooking the harbour and the sculptor that was selected was Chris Booth and the proposal was to have a sculpture that reflected the Sydney sandstone

environment and also provided habitat. In the end, there were two sculptures that were made. One involves indigenous symbolism and the other one is meant to replicate a sandstone outcrop and both of which were intended to have plants living – well, the dome one which represents the Aboriginal symbolism is aimed to provide habitat for microbats so within the dome there is actually a box which microbats can nest in or live in.

72.12 Thus far we haven't confirmed the presence of any microbats but it's one of those things. It's been there for twelve months and if it gets used in five to ten years then that's a success. So there's no rush; we'll see. The neighbouring sculpture is meant to look a bit like a waveform, so flowing and moving but made of sandstone so there's that reflection of the water here but also the sandstone outcrops and that one's designed to have plants growing on it and around it so that it could provide habitat for fauna. And being a sculpture they're a bit of an island, so they're surrounded by grass, there isn't a connected vegetation so there's limited potential for fauna on that sculpture. The dome, we'll wait and see if the microbats colonise it. When the plants get established on the wave, then birds will of course use that site and birds already do use that site but, yes, it's probably going to be a bunch of invertebrates and some birds, maybe a few lizards if we're lucky. But, yes, it's an island in an island.

JK: And part of that conversation about changing philosophies, have there been any changes in the ways that some of the plantings have happened, have there been any deliberate attempts to create some more habitat. You might have answered that question before but I just noticed that there were just sort of some more slightly wild-looking places than there had been in the past. I'm not sure if that's my imagination or not.

74.11 JM: There is definitely acknowledgement by a lot of the staff of the fact that flora and fauna are a combination and that there is a place on site for the fauna and so providing logs and providing microhabitat for things like Blue-tongued Lizards is something that occurs. It generally occurs in fairly discrete locations because a lot of those different fauna have been on site for a number of years and there's a vaster range of microhabitats on site because of the landscaped nature of the site and those animals have been able to survive in that context. So where there's additional things, like small ponds or a log, they're generally used or have been placed there more for an educational perspective. So I think one of the locations you might be thinking of is near the First Farm and so right there there's an

interpretive walk and on one side you've got the First Farm, on the other side you've got traditional plants which occurred in this area, which is known as Eastern Suburbs Banksia Scrub, and there's a lot of education goes on there with school groups. So there would be different things in those locations specifically because of the fact that they can be used to demonstrate and show visitors to the site what's actually happening and what happens in the natural environment where you do have logs on the floor and you do have fires go through, and so you've got a half-burnt log and things like this.

76.08 **JK: And I would just like to ask you what – it's a very obvious question in some ways – but what do you understand by nature, that concept of nature and given where you work how nature can work within the city environment?**

JM: It's an interesting question, the concept of nature, because it almost asks the question "Are we separate to nature?" And it's a fundamental issue which I think we're trying to overcome and given time I think there is this natural cycle where you live at a grassroots level so to speak, literally hand to mouth with nature, and then things change and you get further away from nature and then hopefully you learn that you're actually not further away from nature, you're just in a different form of nature and that generally contains a lot of concrete and asphalt but there's still plants, there's still birds, there's still lizards and so we're surrounded by it here in the city of Sydney. People do comment that in particular birdlife, when you go to different capital cities or major cities around the world you don't necessarily always have such diversity of birds literally in the heart of a city. A lot of tourists, I think, appreciate that in a big way when they come to the Botanic Gardens because of the fact that they can get very close to things like Rainbow Lorikeets and Sulphur-crested Cockatoos.

78.05 There are different birds like ibis walking around. They get to see baby ducks and baby Moorhens and they get to see nesting birds like Cormorants quite prominently. From a tourist perspective, you see the tourists stop and look at things like Golden Orb-Weaver spiders; they have very big webs and they're interesting and they're colourful. The attentive tourists will also see things like the lizards and there are Water Dragons on site and so they can just be sunbaking on a path and not too fussed. It's a little bit of a shame that they don't get to see the possums, the ringtails and the brushtails but being nocturnal that's just unfortunate because when you go through the list of what's here I think there is actually quite a diverse range of fauna. There is, of course, frogs here as well and so if people are checking out different ponds they'll see tadpoles and things like this. There are a

small number of fish but in the main pond you'll see Australian Long-finned eels and Mullet and so Mullet actually come from the ocean into the ponds when the king tides. So they'll see the various levels from a muddy wetland with a bunch of lotuses growing out of it through to birds flying around and even the big things like a Powerful Owl, a bird of prey, which we do get a lot of tourists particularly coming to try and see that bird because it's on bird forums and things that it's quite easy to see here as opposed to going for a bushwalk and hoping that you might see something to actually know that it's going to be in this general area is a major attraction.

79.56 So, yes, the idea that we are within nature and that we are surrounded by nature, that everything we do has an impact on nature, I think's obvious to myself anyway every day and I think the more we can engage with people the more we can raise that as a topic and it's something that definitely could be described as core business for the Botanic Gardens and so it's why we're here. It's a garden, it's not a park, is a key criteria and one of the criteria there is that we're actually here to educate people, not just about native tracts of land, which is an important component, but also about horticulture and agriculture to some degree and human land use.

JK: Are there any other things that you want to comment on that we've perhaps missed? You'll think of them as soon as we leave.

JM: The only thing that's coming to mind is, I guess, the history of the site and I don't know how much that relates to the entire project but, of course, we've got Government House on site and there is a lot of heritage to this site, such as things like Mrs Macquarie's Chair out on the point there. Even the Andrew Boy Charlton Pool, that pool has had over a hundred and fifty year history in that location of swimming, the history of the Domain being a parkland for gentlemen, so to speak, back in the day and the exclusion of riffraff and then the change of how it's used today where there are things like the Sydney Festival, which is a fantastic event where the free concerts are put on and you get thousands of people turning up and just enjoying a beautiful summer's evening.

82.28 And the future land use of this site is also one of the interesting ones. In the current context, we have this requirement to, I guess, commercialise to some degree in the sense of to make money because government funding is going to continue to decrease and to provide a level of service we require a certain amount of money. So the other day we had an opera, which was on a stage in the harbour

and so everyone's sitting in the area near Fleet Steps and prior to that we have the open air cinema and it's an interesting one what the future's going to hold in the context of getting people on site for both having them engage with nature, having them learn about the environment but then also have them be a paying customer without having an entry fee or anything like that. So, yes, I guess the only other critical thing that we do that we haven't touched on or we touched on very, very briefly was botanical research and, of course, from the very early days the aim of this place was to learn about plants and so that's done both from a botanical position of describing new plants and researching the ecology of plant communities through to horticulture, so growing new species and displaying them and the full gamut of options there. But, yes, I don't think there's anything more from my perspective but, yes, there's a lot on this site.

84.24 **JK: Enormous, enormous. Look, I think that's been fantastic. Thank you very much. O.K, we're just talking about little birds.**

JM: The flora on the site hasn't been specifically managed for habitat creation for animals and, interestingly, there has been an observed decline in some of the small birds on site and that's a common observation in urban environments and there are a number of proposed reasons for this. One of the main ones that I think is a key one and has been proposed is the loss of connectivity, so the whole green corridors so that these birds can safely travel from one patch to the next patch. And I've said it a couple of times without defining it but the Botanic Gardens is an island in the sense that there isn't a green corridor connecting it to the Royal National Park and Ku-ring-gai Chase National Park so to speak, let alone to the nearest leafy, bush patch. Hyde Park, there is a little connection so to speak there but Hyde Park doesn't have a whole lot of structural diversity; it has tall canopy trees, it has grass and it has some small ground covers. There's a very similar situation here at the Botanic Gardens where we have only a small amount of area that has structural diversity and that's actually one of the reasons why the flying foxes are where they are because that area has your ground covers, your mid canopy and your upper canopy and that's what they prefer.

86.20 It's that sort of structural diversity that's necessary for your small birds and being a garden surrounded by the Domain, which is predominantly a park, you've got a lot of tall trees and mown grass and interspersed amongst the actual Botanic Gardens are clusters of displays which are predominantly shrubs, small trees and ground covers and so they provide that structural diversity in pockets throughout the island of the Botanic Gardens. So there are other

factors which people talk about, such as competition and predation, predominantly predation, so such as things like other birds, so magpies, currawongs destroying nests, things like cats and even foxes, and then exclusion, so things like Noisy Miners or some of even your magpies. And in this environment where we don't have that connectivity when you've only got a small number of birds in a certain location and then they've got a discrete location for them to occur and then you've got competition and predation then unfortunately these things disappear. And, yes, it's something within the position of how do you manage flora for that? On this site it's almost impossible because without connectivity for more animals to colonise the area and for genetic diversity to continue, there are significant challenges so that would be one of the issues that we could face in the long run.

88.10 **JK:** **Yes, great. Thanks.**

Interview ends