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Kimball: Thanks Len. And uh thanks Amy for that uh great segue. I can uh save a lot of time in my presentation based on all your, the projections you laid out. I really wanna uh thank the group here for the opportunity to offer some perspectives as a park manager on climate change and what that means for Everglades and Dry Tortugas National Parks. It's particularly an honor to speak to such a group of esteemed scientists and Everglades restoration practitioners. And I'll be here the, the rest of the week through uh, through Friday. And Ronnie's right. GEER's the, the venue where scientists and managers can really rub shoulders and talk turkey. And uh so I look, look forward to visiting with uh with you during the, the breaks and uh, at, at the, the wonderful poster sessions. Before I start uh, forge ahead with my PowerPoint, I'd like to, to make a few brief introductory remarks. Two weeks ago, Lynn Scarlett, our deputy secretary, spoke at the National Park Services General Superintendent's Conference in Snowbird, Utah, and this was a meeting of, of all the superintendents for all the 391 units of the National Park System. And uh, Pedro Ramos, the Acting Superintendent of Big Cypress National Preserve and Mark Lewis, the Superintendent of Biscayne National Park, are both here today. So uh, I wanted to report out uh, kind of some things that Lynn told us at that meeting because her uh topic that day was on climate change. She talked about what we know, what we don't know, the complexities and the challenges, and all from the standpoint of managing and protecting national parks for this and future generations. And it was quite a, a sobering and thought provoking speech and, and I, I gather I was not able to be here yesterday afternoon but it was similar in, in caliber to the, the speech she uh presented here. And I have to tell you that Lynn's speech evoked a range of reactions from the superintendents of the National Parks System because we're all about naturalness. Our principal charge is preserving resources unimpaired for future generations. And when Lynn was talking about some of the challenges we face and some of the anthropogenic changes, I talked to one superintendent and I said what do you think? He said, "I'm headed right for the bar". Um, while there are others uh including myself that saw this as more of a, a clarion call, a, a call to action, because while climate change is is dawning and complex just as Amy talked about, I have to say that, that I'm really, I'm quite optimistic because here in South Florida we have two major things going for us. One, we have a world class ecosystem restoration effort underway. And this'll help us to adapt to climate change by creating a healthier ecosystem that is more resilient to climate change and, and as I've been saying uh in a time of climate change, ecosystem restoration is more important than ever.

Second, we have a world class science program underway that'll help us understand the nuts and bolts of climate change and assist us in defining, implementing and assessing climate change measures.

And one final point for you to consider. Uh, think about and we'll, I'll talk about this in a few minutes is the vulnerability of the natural systems here in South Florida to climate change. We have a great platform to, to talk about climate change, its impacts and importantly how ecosystem restoration can stave off the impacts of climate change. And based on the number of domestic and foreign news crews that have showed up in and around the park, it seems to me that the, the whole world is watching. They're watching South Florida and what we do here. So, with that, I'd, I'd like to give you some perspectives on climate change from the vantage point of a park manager. What we think climate change will mean to Everglades and Dry Tortugas National Parks in light of the current projections that uh Amy just went through. And I'd like to touch on some of the impacts to the natural and importantly the cultural resources uh in the built environment in these two parks. I'd like to briefly review uh what our laws and policies are that tell us how, how to proceed, how to uh manage our resources that we're charged with protecting. And then also talk a little bit about some of the actions that we're taking in a concert with a lot of you. And then finally wrap up the presentation uh with some suggestions from a, a park manager on, on research and ti…science topics uh for your consideration.

I don't think I need to spend a lot of time on this orientation map for this group but uh you can see here that Everglades is a, is a very large place. This here in this darker brown. Uh, it's a million and a half acres. The 3rd largest park in the lower 48. 1.3 million acres of wilderness. What makes it a particularly challenging place to manage is it's surrounded at the doorstep by 7 million people. We also have an area down here, Florida Bay, average depth 3 feet, and then these marine resources go all the way up here to Everglades City. I'd also like to point out Dry Tortugas National Park, 70 miles off uh Key West. It used to be just known as Ft. Jefferson National Monument and now it's 100 square mile uh marine park as well.

I'd like to talk a little bit about Everglades National Park from the standpoint of vulnerability and I think this sign says it all. I, I lived in Colorado for 30 years and I was talking to George Aiken, uh with USGS and uh we did Ride the Rockies Bicycles Tours and we huffed and puffed over uh 12,000 foot passes. And this is one of the passes we have on our main park road. The Rock Reef Pass, elevation 3 feet. Basically, it's a divide between Taylor Slough and, and Shark River Slough. It tells everything. 60% of the park is less than 3 feet in elevation. Our maximum elevation is 11 feet. And you can see somebody said earlier uh

Everglades is, is flat as a pancake. Uh it's a stress resource. I think most of you know what we're, we're faced with everything from uh wading bird populations reduced by 90%, 67 listed species, uh exotics uh wildlife and vegetation. Uh, it's a, it's a very vulnerable place to climate change, particularly sea level rise. We also have a couple of other areas in the park that I'd like to highlight. Florida Bay, uh I think many of you are very familiar with that. I saw Jerry Lorenz. He always talks to me. We're on the verge of collapse from algae and uh lack of freshwater. It's a half a million acres. It presents some incredible management challenges to the park and uh there's some uh climate change uh, uh variables that I think are very important to clim…to Florida Bay.

Also uh down here we have a lot of park resources uh built, built environment that's vulnerable to particular to sea level rise. This is Flamingo and I'll talk about the that a bit more in a few minutes.

Out at uh Fort Jefferson in uh Dry Tortugas National Park, we have a 19th Century uh fort and this moat wall that goes uh around the fort, is basically our last line of defense. It's uh, we got a free board depending on, on uh, the tide. I guess probably about 3 to 5 feet.

Uh, we also have a marine resource out at uh, the in the Tortugas. It's very sensitive. It's susceptible to change in temperature and uh, the prospect of acidity as well.

I think I can dispense with most of the things in this slide on uh, on, on climate change pre…predictions because Amy did a great job. I'm glad to see that our, our conclusions are uh, are the same or very close to the same. I've worked with Hal Wanless. I serve on the uh Miami-Dade's uh Climate Change Advisory Task Force with some updated numbers of a foot and a half uh by uh in 50 years and uh 3 to 5 feet by 2100. Uh, we're also looking at the uh, the surface temperature increase of, of 2 to 5 degrees and weather patterns that Amy talked about was this increase of cyclonic activity in terms of frequency intensity. One other thing is there's the prospect for extreme weather events. Uh greater intensity uh in amounts of rainfall and then the reduced precipitation that Amy talked about.

I asked the, the folks at our South Florida Natural Resource Center to just do some overlays of, of increased sea level rise in Everglades National Park and you can kind of see with this blue on the, the left, the a 7 inch that's the, and these are the IPCC numbers that Amy talked about. We're talking about an area from 10 to 55-60% of the park with the IPCC numbers. I think it's important to realize that uh it's Virginia Burkett who's on the IPCC. I showed her this and she said, "Well, be careful with those uh those renderings because we're really talking about things that could

be higher high tides". And even since I've been there, I think one thing to learn is, is that it's not a static landscape. Uh through, when Hurricane Wilma, we had 9 inches of Florida Bay marl mud come ashore and we actually built land forms so I think it's also important to realize we've got a dynamic landscape. And then of course we're thinking about what kind of changes are in store for us. Uh, a saw grass prairie going to a, a more salt water mangrove uh ecosystem. We're looking at uh changes of species, post- potentially from alligators to crocodiles, an inundation of important areas like the pinelands and also potential impacts on endangered species like the Cape Sable Seaside Sparrow.

And also uh coastal erosion, sea level rise, losing turtle nesting habitat. Down in Florida Bay is uh an interesting situation because there there was a recent report by the uh Florida and National uh Wildlife Federation. Uh it's called *An Unfavorable Tide* that really took a look at a lot of different areas around South Florida and looked at what sea level rise would mean to sea grass in terms of uh increasing uh temperature and depth. What that might mean in, in terms of uh affecting a, a world class uh, uh fishing opportunity in the park.

And then back to the built environment. The, we've got a situation of Flamingo. We have a, a bulk head down there. You can see that uh we probably have uh 4, 5 feet of freeboard and we also have 40 uh I think 44 chickees in the park. Back country uh camping uh platforms that could be uh negatively impacted by sea level rise.

Now, I always think it's important to talk about some upsides of climate change and, and sea level rise. One of those is that there may be more boating opportunities in the, the central Everglades. And uh our biggest challenge right now down in Florida Bay is uh groundings and pers…propeller scarrings. So if you put a veneer of 3 to 5 feet of water, maybe we'll have less of that but I would, I would think we probably are gonna get it somewhere else.

Another issue that we're gonna be faced with is our, the fire regime. You know we're trying to keep a, a natural fire regime in place. We had a fire last uh spring in the latter part of May where you, you may have had smoke in your neighborhood. Uh, we had a, a we don't know if it was uh intentionally or accidentally caused by it was a fire started by man. It swept to the west and then went uh to the northeast and it was probably one of the biggest fires we've had. Total 40,000 acres really uh went right towards this what we call the Wild Land Urban Interface and um it was a, very, very hot temperatures in Miami. It was breaking uh, uh the temperature records and I was kind of talking to people, maybe this is shades of things to come. We had some areas, our, our scientists are really taking a close look at it but down here in the uh, this corner right

here, we had some areas in the East Everglades that were very, very severely burned and we actually uh lost landform. We, areas were uh subsided up to, up to a foot. So one of the concerns we have is with this lower precip uh higher temperature, the, the chances for more fires like this.

Amy really covered it on, on, on uh hurricanes and cyclonic activity. I think that uh the, the jury is still out on that. One thing we do know is that with hurricanes and sea level rise, we're gonna get more storm surge and uh, this is a, a photo of when Hurricane Charley came ashore at uh at Ft. Jefferson. And this is Hurricane Wilma when it came in to, to the Flamingo area and, and uh did a number on uh the Flamingo Lodge which is still closed. We have a plan to uh rebuild uh the lodge but um we're very, very concerned about uh about storm surge and the greater impacts because of sea level rise.

Now, it wouldn't be an Everglades slide show and without giving you a python report okay. And uh, you can see up here we, I kind of laid out some of our interactions between alligators and uh and pythons and here's a, an alligator trying eating a python. Here's an interaction between a, a python and a Ford Ex…Explorer um that we extracted. If you want more information, Skip Snow is in the back. Uh we're, we're really working on this issue with con…with uh, with pythons in the park. It's a nonnative species. We're estimating now it's up to potentially up to 100 and between 130 and 150,000 of these in the park. We've got a, a number of different ways we're attacking this problem with a Don't Let It Loose campaign. We've got a little tracker dog, Python Pete, and here Skip is uh outfitting a, a, a snake with a, with a tracking device. We've also enlisted the help of Lynn Scarlett. I think she mentioned this yesterday. She found one when she was out orchid hunting. I I, I talked to John uh Ogden this morning. He was got, out orchid, looking at orchids with Lynn this morning so I was asking him if he was gonna find a python out there at Corkscrew. I got, I think more they're probably more of a likelihood of anacondas out there I think. But I always get asked the question uh, "Will, is climate change the, the silver bullet for your python problem?", and my answer is, "Well, not exactly". What it, this, what we're seeing now and this is data from the USGS. The current distribution of the pythons is down here in South Florida and I used this slide recently at a talk I gave on Capitol Hill where you can see the green here is with, with climate change in, in 2100. You can see that uh the area uh suitability for pythons goes all the way up to the DC Metro area. So um uh, not exactly.

Switching gears a little bit back to Tortugas, um we've got this moat wall. Uh we're very concerned about sea level rise and, and how it might affect the, the, the integrity of the fort. We also are concerned about the increases in, in temperature and uh acidity out at, out at the in the

Tortugas in terms of effect potential effects on coral bleaching. So those are kind of a run down of what we see some of the effects are.

Now let me turn to a, another institution that I call the institutional ecosystem. Uh, talk a little bit about what our park service laws say about how to deal with these kind of problems. And I've, it's kind of a busy slide but basically that the, the first paragraph is our Organic Act and that basically tells us to preserve and protect natural resources and processes and leave these unimpaired for future generations. And the key here is, is really these natural uh objects, these natural systems. And these next two paragraphs deal with the enabling legislation for Everglades and the next for Dry Tortugas National Park. And really there's this sense of uh encouraging and, and protecting for naturalness.

Now what do our management policies say about climate change? Well, they really don't say much. We've got, I did a search on our management policies for uh the National Park Service and it mentions the word climate change in one place. And us, and that first uh paragraph that talks about the uh yours climates change through history? We're supposed to protect naturally evolving places. Uh, and if we but there's a chance now that uh accelerated climate change may significantly alter park ecosystems and our management policies direct us to uh gather information and maintain baseline uh climal…climatological data for reference. That's pretty much what it says. We have a task force in Interior that's taking a look at our management policies to uh go back and really make some major changes to these cause this is the extent of the guidance we have on climate change. Now, they're talking about a director's order that would further uh elaborate on this but our management policies do go on to state that the will reestablish natural functions and processes but landscapes that are disturbed by natural phenomena will be allowed to recover naturally. And then it goes on to say that impacts on natural systems resulting from these human disturbances uh will seek to return those disturbed areas to natural conditions. And then it also says in that 3rd paragraph that we'll, we'll try to do the same thing with culture resources. So there's really a charge for us if we have a human induced change to take action and, and restore a natural ecosystem. I think one thing we're gonna get asked all the time is, "are we dealing with a natural evolving ecosystem or are we dealing with a human or anthropogenically caused uh change? Or is it a combo of both?" And I think that goes to what Amy was talking about with attribution. I think that's gonna be really important for the, the Park Service to, to try to sort out.

So what have we been doing about all this? Well, probably the number one thing is we've been working with all of you and the uh Comprehensive Everglades Restoration Plan to get the water right, the quality, quantity, time and the distribution. Getting the habitat right. Dealing with the

exotics and the TNE species and doing all this to be compatible with the built environment and that big swoosh, the, the plan flow, is that big flow with that fresh water pulse that we're all hoping it'll keep that, that salt water at bay.

We're also taking some specific actions out at Cape Sable. A number of you are familiar with a couple plugs out there that were put in with some canals that were put in in the 1920s that are allowing uh salt water and, and perhaps more with, with, with sea level rise to go into the freshwater marsh and we're in the process right now of designing new plugs. Uh, we're gonna forge ahead with the plan to reinstall those plugs.

And out at Tortugas, we, we've installed a, what we call a natural uh research natural area, a marine protected area where we've banned recreational fishing and also we only allow uh anchoring with buoys to try to protect the, the, the, the coral system. What we're really trying to do here is to try to get a, a healthier and uh more resilient uh ecosystem so it's an action, this is an action we've taken out at Dry Tortugas.

We also are working hard at out at the fort to do everything we can to make the, the fort uh more uh climate change resistant. We're working hard on our uh moat wall. We sustained quite a bit of damage, particularly to the brick culping uh through the, the storms in, in 2004-2005 and uh all that, the spalling off the side of the fort that you may have seen if you've been out, out there, we've got a $7 million project to go and uh with scaffolding to uh, to restore the uh restabilize the, the fort walls and make it more resistant to uh to hurricanes and, and other elements of climate change.

We're also looking at uh as we look at facilities. We're trying to make them more climate change friendly. Uh, we've, we sustained damage to cottages down at Flamingo and now we're looking at elevated cottages. We also sustained a lot of uh, uh damage to our marina, to our docks and now we're going to a, a floating dock setup like this to accommodate uh increases in sea level.

Out at, we're also doing a lot of, lot of work on inventory and monitoring uh both within the Everglades and out at Dry Tortugas and we're very fortunate in the Park Service. We have a nationwide inventory and monitoring program. Matt Patterson who's here heads up our uh the South Florida Caribbean uh Inventory and Monitoring Network and they're really focusing a lot on, on climate change.

Let me run through very quickly some of the other actions we've taken. We're, we are part of a climate friendly parks program where we're doing everything we can within the park to lead by example. We've inventoried

our emissions. We're trying to improve our, our fleet. We've got a recycling program, a green procurement program. We're also part of the uh, uh Department of Interior's uh Climate Change Task Force. Uh particularly looking at some of those management policies to, so that as we, as we uh, what, what we've worked with climate change and we experience a better guidance for park managers and really take a hard look at our management policies.

We're also spending a lot of time on education and outreach. And uh, one of the publications that we have here, we're very proud of our Alice Clark and her science uh publications team is here. *South Florida, Climate Change and the South Florida National Parks*. We're really trying to get this uh these kind of publications out cause we get a lot of questions at the park. And we're also dealing with a lot of uh media, those magazines uh, uh in the, the TV media as well. And we're all, we also have a lot of uh, we really try to spend time with our interpreters because the, the public is coming to the park and they're interested in this issue.

So, let me wrap up here by talking a little bit about some of the, the climate change research and, and science topic areas that I think should be uh important for your consideration. One, um I was talking to uh Margo Schwadron last night with uh, with SEAC who's here and um I think she said Inventory, Inventory, Inventory! And I think that's really an important thing. We need to see what uh, what resource is out there and what their condition is. I think also another, another uh challenge we have is that uh we can't monitor everything. We need to look at a vital signs monitoring program. We're doing that across the National Park Service but we also need to look at it from the standpoint of climate change. And finally, data management. We're dealing with a long term issue here and I can't underscore how important it is for uh robust data management systems to keep track of all this information and changes over the years. I've listed a whole number of things here in terms of, of climate change effects. And Amy mentioned that one of the things we needed to focus on is taking a lot of these uh global models and bring them down to the, to the regional and local levels. That's gonna be really important for park managers and scientists like Bob Johnson who are leading the charge for us and our South Florida Natural Resource Center.

Um, there are issues with surface water and ground water, quality, quantity, timing and distribution. I think one of the issues that I've talked to Ronnie Best about you know we've talked about the, the plan and the big swoosh to bring more water down to the south end of the system. I think it's really important from a groundwater modeling standpoint to really look at that to make sure that the amount of water that's coming uh particularly with some of the things we're seeing with reduced precipitation. Um how

much water is coming and can we really keep that uh that saltwater at bay?

Uh, just a whole bunch of other effects on vegetation and wildlife. Uh wetlands and coastal uh geomorphology, marine resources, fire regime of course, recreation. I think one thing we can't forget is kind of, some of the socioeconomic effects of climate change. What is the effect on, on visitor enjoyment, on fishing and boating and importantly, we also need to think about what are the effects on cultural resources in the, in the park and also what the bill, in terms of the built environment.

Finally, there's this whole thing we've, we are recently directed by the uh World Heritage Committee to do climate change vulnerability assessments for the park.

And finally, the really taking a hard look at adaptation measures. We're gonna try a lot of different things. Are they working? Are there new things we should be trying? And the, also look at any kind of uh research on how do we educate the public on these kind of issues? What kind of outreach tools work?

And finally, I'll go back to this granddaddy issue that, that I keep kind of wrestling with, this whole assessment of naturally changed client caused climate change versus this human induced climate change. I think that's gonna be an issue that we're gonna have to struggle with so hopefully we can uh get through that quickly.

And I'll summarize uh very vulnerable place. We're learning as much as we can. We're taking adaptation measures. We've got a robust education and outreach activities. And finally, I believe there are a, a wealth of climate change related research and scientop…science topics. They're really important to Everglades and Dry Tortugas National Parks as we face uh climate change in the in future generations. Thank you very much.