

**Remarks as Prepared for Delivery for
The Honorable Lynn Scarlett,
Deputy Secretary of the Interior
National Park Service
Superintendents Summit
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*Challenges and Opportunities in National Parks:
Complexities of Climate Change*

Good morning! I am so pleased to join this gathering of national park leaders. I am entering my 8th year at the Interior Department. The Department feels like family—a family of folks who share my own enthusiasm for this magnificent world, its creatures, its peoples, their cultures, and their histories.

My own passions sprang from my mother, who taught me to discern the pendant nest of the Baltimore oriole, the “wicity, wicity” trill of the yellowthroat, and the upside down ways of the nuthatch. At the cusp of my teen years, I hiked and canoed hundreds of miles in the wilds of Canada. By college, my binoculars had become a permanent installation around my neck. Birds were my passion—and still are. From my dad came a fascination with history, art, and architecture.

These past seven years have afforded me a sweeping view of the Interior Department, the park service, indeed, all our bureaus. These years have also afforded me an opportunity to engage in particulars—policies and issues associated with concessions, cooperative agreements, condition assessments of assets, bison genetics, latrine design, even Burmese python wrestling—of sorts.

But this morning, I want to step back and consider the larger landscape of this Nation. All gathered here operate in a context of complexities of purpose, place, process, and partnerships. All engage with ‘publics’ who have competing value sets and goals that make management solutions sometimes elusive. This people factor is what makes human ecology so important in park deliberations.

At Golden Gate National Recreation area, Brian O’Neal initiated a negotiated rulemaking on dog walking in the park to incorporate “the people factor.” At Yellowstone National Park, Suzanne Lewis pioneered collaboration with neighboring communities and the states to find a consensus resolution to operations of Sylvan Pass. At Wrangell St. Elias, the park engaged inholders and the gateway communities to create an acceptable policy on inholder access. You have tough jobs that lie at the intersection of people, land, and water. That intersection renders important what Nobel laureate economist F.A. Hayek calls “experiential knowledge”—the knowledge of time, place, situation, and “learning by doing.”

Twenty-first century success of our parks also requires an engaged America. That engagement is what the Centennial Initiative is partly about. Yes, the Centennial will help us make our parks the best that they can be. But, equally, the Centennial Initiative will help us secure a Nation connected to parks and our places of history, culture, and settings of natural magnificence. The Centennial Initiative embodies park service aspirations and presents tremendous opportunities.

At the same, the 21st century presents challenges. Land fragmentation, water, fire, invasives—these are familiar challenges, though they are evolving in scope and scale. But new challenges loom.

Perhaps no subject is more intriguing than the challenges and complexities of climate change. Make no mistake—the evidence of a changing climate is significant. By the end of this century, the best estimates project warming between 3 to 7 degrees Fahrenheit. At a glance, these projected changes seem, perhaps, modest. After all, temperatures have always fluctuated over time. But even changes of a half degree—persistent changes—can make a big difference in the natural world around us.

For the Interior Department, of particular interest is the interface of climate change and its effects on the lands, waters, and wildlife we manage. The effects of a changing climate cut a broad swathe across these lands and waters. The effects are not speculative and are sometimes dramatic.

- The fire season is now 78 days longer than in the 1970s.
- We are seeing earlier snowmelt and changed precipitation patterns. Annual precipitation for most of North America is increasing, with a 25 percent increase in the eastern United States over the last 60 years. But we are seeing decreases in the southwest.
- We are experiencing collapsing permafrost—the interior Alaska permafrost temperature is now at 0 degrees Centigrade.
- We see accelerated coastline erosion in Alaska. At one location, the coast eroded 115 feet between 2001 and 2003; now the pace is 160 feet per year.
- Species are migrating northward and to higher altitudes.
- We observe accelerated intrusion of invasive species and rapid spread of pests like bark beetles—a spread unchecked by winter cold.
- Glaciers in our national parks cover 73 percent less area than in 1850.

These landscape changes are not solely the consequence of a changing climate—and not all changes necessarily present management problems. But some changes, in some locations, will present significant challenges as our park managers strive to serve the public and maintain ecosystem health. Secretary Kempthorne convened our Climate Change Task Force to identify these challenges and explore possible responses to them.

Outlining a framework for action requires understanding the character of the problem before us. Let us peer for a moment into the world of science.

Global climate models are improving our ability to project future conditions. But our ability to project at scales less than 50 kilometers with any certainty is extremely limited. Yet that scale is essential for land managers.

The effects of changing climate at local and regional levels are highly complex and varied. One Colorado River study shows decreases in summer precipitation and increases in winter precipitation. For water managers, what does this mean? One projection estimates a 20 percent increase in water shortages and their duration. Other projections are much less austere.

One thing seems certain—changes in higher latitudes are especially rapid and pronounced. But, even at higher latitudes, the climate dynamic is still fraught with complexity, even in how permafrost is melting. Actual permafrost degradation varies depending on warming rates, landscape position (wetlands, uplands), hydrology, surface ponding, water flows, soil texture, ice content, and so on.

Changes along coasts are also notable—up to 21 percent of remaining coastal wetlands in the mid-Atlantic are at risk of inundation this century. Within our park system, we manage 74 ocean and coastal sites that cover 34 million acres of land and 92 million acres of coral reefs.

I'd like, for a moment, to amplify this science saga with a few brief vignettes. First I will turn to the tale of migrating warblers.

Warblers migrating from South America to the north are sensitive to photoperiod as the trigger for their trip north. These warblers depend on caterpillar larva as their food source. These larvae—and the vegetation upon which they dine—emerge through the temperature cues of warming weather. In the northern reaches of the Great Lakes, temperatures are warming and resulting in the earlier emergence of budding plants and caterpillar larvae. In the southern reaches below the Great Lakes, no significant temperature changes and the associated early emergence of larvae are occurring.

What is the result of these complex changes? We are seeing an uncoupling of the warblers' spring arrival based on length of day with food availability in northern Minnesota, which is changing as temperatures change. The birds have as much as 20 fewer days to get to northern Minnesota to exploit optimal habitat conditions that are now emerging earlier than in the past.

Let me turn to a second brief tale, this time focused on one species of frog in Costa Rica subject to mortality from a particular parasite. The parasite prefers, perhaps requires, a band of low temperatures. Seemingly, a warming climate would diminish its prospects. Scientists, thus, perceived a paradox: why, with a warming climate, is the parasite thriving and resulting in over a 60 percent decline in this particular frog species?

It turns out that the changing climate is resulting in increases in nighttime low temperatures, but these nighttime lows are still within the tolerated temperature range for

the parasite. At the same time, as nighttime lows increase, daytime cloud cover is also increasing, resulting in slightly lower daytime temperatures. Hence, conditions, day and night, are suitable for the parasite. The moral of this brief tale is that “reality is tricky.”

Let us now turn to a third tale, a tale of the mountain pine beetle. Many of you know that pine beetle infestations are part of the natural processes in lodgepole pine forests of the West. Periodically, especially during variable, naturally occurring warm periods in the past, the beetle has spread and killed trees. But their spread, historically, was checked by cold winters that affect the beetle’s life cycle.

Warmer temperatures are now producing two phenomena: First, the beetles are moving higher up and attacking whitebark pine. Second, they are now able to complete a full life cycle in a single year, resulting in an unchecked spread from year to year. One beetle outbreak in British Columbia has devastated 10 million acres—an area the size of Switzerland.

I could tell many more tales, but I want to tease out some lessons from these several tales. These lessons are important as we think about the nexus of climate change, wildlife, and land management.

The first lesson is that changes underway are incredibly complex. Think of Costa Rica, where nighttime low temperatures are rising but daytime temperatures are actually cooling. Think, too, of the complexities of species interaction with their surroundings.

Second—and related to complexity—is the variability over time, space, and species of the changes unfolding. Many effects of climate change are highly location specific. Think about the caterpillar larvae. We are seeing major changes in the timing of their hatching in northern Minnesota but no change just several hundred miles to the south.

Yet, to date, much information that we have related to the effects of a changing climate is coarse-scale—at regional or even continental scales. Relevant information for managers is fine-scale and location-specific—and we generally lack this information.

The third lesson is the ever-presence of change. We live in a very dynamic world. But changes appear to be especially rapid in northern latitudes such as the Arctic.

A fourth lesson is the tremendous diversity of effects on species and places. Some places are becoming drier, some wetter; some places are becoming warmer, some not. For species, several scientific overviews report that climate is affecting the range of species, generally pushing them toward the poles and to higher elevations. Climate is affecting phenology—the timing of flowering, egg-laying, and migration. Climate is affecting morphology—body size and animal behavior. As we looked at the polar bear in the recent decision to list it as threatened, we learned that, in an area with longer ice-free periods, bear skull size and weight are diminishing. Climate may also result in shifting genetic frequencies.

With these characteristics—complexity, variability, dynamism, and diversity, we face tremendous uncertainties. We know general trends but the devil is in the details—and details matter. Yet the details themselves are in flux and our knowledge base is limited.

Addressing the effects of a changing climate complicates decision making. Adaptation strategies are imperative as scientists tell us that currently accumulated levels of greenhouse gases will result in a changing climate out many decades, even if we completely turned off the greenhouse gas switch tomorrow.

As we think about management responses to the landscape effects of a changing climate, this backdrop sets the stage. But have I painted a hopeless picture? No—but realistically in the near term, the challenge before us is one of adaptation, not prevention.

What adaptation options are available to us? In many ways, we need to continue using long-standing conservation tools. Those tools include the imperative of land conservation and protection of interconnecting wildlife corridors. We must continue to tackle invasives and reduce the risks of catastrophic fires through hazardous fuels reduction, as both strategies enhance landscape health and build ecosystem resilience. We need to manage and conserve diverse conditions and habitats. We need to protect coastal wetlands and sea marshes to build resilience to storm intensity and storm surge. Consider the Louisiana coast: each 2.7 miles of sea marsh reduces storm surge by one foot. We have already lost some 100 miles of sea marsh by channeling the great Mississippi River, so that sediment that once continuously rebuilt coastal marsh is now thrust far out to sea.

We also need to maintain ongoing pollution reduction strategies. Consider that climate change could result in releases of phosphorous from sediments, which amplifies the importance of existing pollution reduction strategies. Wetlands restoration strategies—as in the Everglades Restoration—have increased importance as these efforts can build resilience to sea level rises and saltwater intrusion into freshwater supplies.

But this portfolio of actions is not merely old wine in new bottles. We need to broaden our management horizons. We need to recognize the effects of a changing climate on landscapes and water management. We cannot simply look at historic data as we plan our land management. We need to peer into the future and that can be difficult. Already our Bureau of Reclamation is re-evaluating its water models to take into account changed timing of snow melt and altered precipitation patterns as it develops its annual operating plans.

We need to maintain genetically diverse populations across multiple locations. In part, we already do so with our many wildlife refuges and parks. But are these lands sufficiently diverse and interconnected? Do we have wildlife corridors along north-south dimensions? The importance of interconnections underscores the continued relevance of partnerships and cooperative conservation. And how might we maintain ecosystem processes such as seed dispersal if pollination and dispersal are interrupted?

We also need some policy reflection. What are our goals? In conservation, we have tended to use retrospective benchmarks, defining success as a return to some past condition. Yet retrospection in a rapidly changing environment may not be a relevant target.

Climate change for land, water, and wildlife managers puts a premium on resilience and nimbleness. We need monitoring, course corrections, and adaptive management. Climate change also puts a premium on holistic thinking—avoiding unintended consequences. Consider reforestation and carbon sequestration. Carbon sequestration may be maximized by planting fast-growing monocultures—but that strategy would not be good for species diversity and ecosystem health. Or consider infrastructure placement and design. If coastlines are changing, what strategies ought we to implement for coastal assets?

The climate change context reinforces the importance of what author Gretchen Daly has called “Nature’s Capital,” in which we explore the use of management strategies premised on bioengineering. Can we enhance landscape resilience through maintaining permeable surfaces in the built environment? Can we restore natural hydrology along the coasts we manage to enhance sediment deposition where feasible? How can we use natural wetland systems to purify water and maintain buffers against coastal flooding?

Above all, we need to better assess the vulnerabilities of the lands and waters we manage to changes. Some scientists suggest that North America is more sensitive to extremes than to changes in average conditions. We have some tools to assess—in part—average changing conditions. We don’t generally have tools to assess what some have called “tipping points”—extreme changes that result in a series of domino effects.

Climate, of course, affects how we think about energy, too. The National Park Service can play a significant role in propelling forward a portfolio of renewable energy, green design for assets, and environmental management. The Park Service, through “smart energy” strategies, can pave the way for the Nation to restructure its energy portfolio in transportation, buildings, and overall consumption patterns.

There is much more to contemplate with respect to climate change, but let me summarize the thoughts of Michael White of the Conservation Biology Institute. In the context of a changing climate, Michael White has suggested that “building the conservation Ark” requires landscape heterogeneity, connectivity, structural complexity, and ecosystem integrity. For the park service, I believe these qualities affirm the imperative of partnerships with other agencies, states, Tribes, and gateway communities.

Our parks are a microcosm of the world around us. Your challenges mirror the world’s challenges. Your responses to those challenges can help set the course for the Nation.

I would like to conclude by thanking each of you for your service to the Nation. I thank you for ensuring that we, our children, and their children thereafter—all the Mias and Sydneys and Brodies, will have opportunities to touch the history, culture and natural world around us.

Our children need to touch Nature that they might wonder at the intricacies and interconnections of flora and fauna and landscapes and oceans. From that wonder will spring our next generation of scientists, artists, and environmental engineers.

They need to touch Nature that they might seek what lay beyond the next turn, or that they might climb a tree or swim in a stream—activities that nurture body and soul.

They need to touch Nature that they might care about the world around them and grow to become citizen stewards of the next generation.

Chronicler of the West C.L. Rawlins observed that the best way to know a country “is not to hunker down and dig in, but like the pronghorn and bison and coyote, to stretch out and go.” Those gathered have a great responsibility—and a great opportunity—to inspire this Nation to “step out and go.”

Yet, for some, this opportunity is still remote. My daughter taught in East Oakland, a place of extreme social and economic disadvantage. She proposed to take her students to the Golden Gate National Recreation Area to hike. But the kids did not want to go. Why? They were afraid. Most had never walked on surface other than asphalt or sidewalks. They wondered about snakes and bears and mountain lions.

In the end, my daughter took them to the Nature Center—a place more familiar with its four walls. But it was a place, too, with a field, a wetland, and pathways.

These are the children of the future. I believe we need to touch them with a dusting of Nature, a personal sense of history, a celebration of cultures. Each of you—in our national parks—has the opportunity to reach out and touch these children.