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REGARDING CLIMATE CHANGE

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Introduction

Chairman Dicks and Members of the Subcommittee, I am Sam Hamilton, Regional Director of the U.S. Fish and Wildlife Service's (the Service) Southeast Region. I am pleased to be with you today to discuss climate change and the Service's perspective on the habitat changes we are seeing, the impacts to trust resources, and the actions we are taking or anticipating to address some of those impacts.

Mr. Chairman, I want to thank you and your colleagues for your interest in this issue and your focus upon what is happening on the ground today. I also look forward to discussing some of the innovative steps the Service is taking to address this profound challenge to the stewardship of fish and wildlife resources.

Observations in the Natural Environment

Although debate continues over the extent to which global warming in a given region can be attributed to human activity versus natural variation, there is unambiguous scientific consensus that the earth's climate system is changing and that the related climate warming will have a significant impact on Earth's natural environment. For example, the recent contribution of Working Group II to the Intergovernmental Panel on Climate Change's (IPCC) Fourth Assessment Report concerned the impacts of climate change on the natural and human environment and the capacity of these systems to adapt. Based on observational evidence world-wide, the Assessment concluded that there "is high confidence that recent regional changes in temperature have had discernible impacts on many physical and biological systems (IPCC WGII Summary for Policymakers, 2). The Assessment included the following examples illustrating the impact on natural systems:

- changes in some Arctic and Antarctic ecosystems, including those in sea-ice biomes, and also predators high in the food chain (IPCC, 2)
- earlier timing of spring events, such as leaf-unfolding, bird migration and egg-laying (IPCC, 3)
- poleward and upward shifts in ranges in plant and animal species (IPCC, 3)
- shifts in ranges and changes in algal, plankton and fish abundance in high-altitude lakes (IPCC, 3).

As you know, the Service is a field-based organization and our field employees are observing changes in many of our natural systems that appear to be correlated with changing climate. Nowhere are these changes more acutely evident than in the Arctic and Antarctic ecosystems. In the Service's Alaska Region, observations of Arctic changes include diminishing sea ice, coastal erosion, shrinking glaciers, thawing permafrost, wetland drainage, and earlier "green-up" of Arctic vegetation. Related to the deterioration of glaciers, we are seeing changes in the hydrology of glacially-fed streams. Increased temperatures in the Arctic have also contributed to the earlier onset of snow melt and the lengthening of the melting season, resulting in decreased total ice cover at summer's end. To explore these changes and begin discussions of management strategies, the Service and the U.S. Geological Survey (USGS) co-hosted a workshop on climate change in Anchorage during March 7-9, 2007. The workshop provided the opportunity for the Service to collaborate with USGS on recommendations for research and monitoring priorities, management directions, and how to improve partner involvement.

These climatic changes in the Arctic will have profound impacts on ice-dependant wildlife like ring seals, walruses, and the polar bear. On January 9, 2007, the Service published a proposed rule to add the polar bear to the federal list of endangered and threatened species. The primary threat to this species is loss of habitat through the decrease in summer sea-ice coverage. Indeed, sea ice is essential habitat for many of the polar bear's life functions such as hunting, feeding, travel, and nurturing cubs. In collaboration with the USGS, the Service is continuing to study the polar bear's status and population trends, learning more about the polar bear's relationship to sea ice habitat and pursuing research to improve models for projecting the effects of a changing environment on the polar bear. Such research will be important in the Service's final listing determination and will play a key role in the decision about what is needed to ensure the conservation of the polar bear. Our final decision is due to be published in January 2008.

Like the polar regions, the Northeast, Northwest, and the Mountain-West, have also been experiencing reductions in annual snowpack. According to the USGS, climate changes of the last 50 years in these areas of the country have led to as much as a 17 percent decline in annual winter snowpack. The result is a diminished replenishment of ground water systems, increased stress to public water systems, changes in the timing of river ice-outs, and reduced river flows that impact spawning environments for fish such as Pacific and Atlantic salmon. Snowpack declines also have been accompanied by earlier annual peaks in river run-off, as documented in stream gage monitoring and analyses across the lower 48 states and throughout Alaska. As wildlife managers, we have managed around and through weather patterns like drought, which occur annually and can last years. However, now we are beginning to face growing certainty that these recent observations are not part of an annual or even decadal change in weather pattern, but are potentially linked to a long-term change in the climate system itself. If so, the implications for wildlife and fisheries management are consequential.

Apart from hydrology changes associated with increased warming, we are also noting changes in abundance and distribution of species. These changes in species' geographic ranges have also included the expansion of pests and invasive species. For example, we are seeing the expansion of the pine bark beetle into higher latitudes, areas that were once too cold to support it. These expansions are increasingly impacting our forest habitats, not just killing trees, but making these landscapes more susceptible to catastrophic wildfires. In turn, those wildfires could then drive fundamental shifts in ecosystem function.

Even if some species adapt or succeed in a world that is slowly warming, the fact remains that many will not. Species most at risk are those that are unable to generalize or adapt. Long-distance migrants and birds with limited geographical ranges, for instance, may not be able to adjust to the changes caused by rising temperatures. Increased competition for habitat and the lack of suitable or available food in new locations also means that the shift northward will not be a permanent solution for bird populations adapting to climate change.

Other significant changes associated with increased warming concern rising sea levels and water temperatures that pose threats to marine habitats, coastal wetlands, and estuaries, which are part of more than 160 national wildlife refuges we manage along the nation's coastline. For example, Pea Island National Wildlife Refuge is part of the Alligator River National Wildlife Refuge Complex along the North Carolina coast adjacent to the Albemarle peninsula. This refuge is losing ground annually to the Atlantic Ocean and the projected rise in sea level over the next 50 to 100 years will likely transform large chunks of marsh to open water, forest into marsh, and complicate habitat needs for species including the federally endangered red wolf, as well as other species of birds and wildlife.

Similar threats are facing other refuges, like Merritt Island National Wildlife Refuge, which overlays and surrounds the Kennedy Space Center in Cape Canaveral, Florida and serves as a home to more than 300 species of birds. At this refuge, projected sea level rise over the next few decades threaten to engulf much of the refuge. The Oregon Islands National Wildlife Refuge, which supports significant seabird nesting and the Aransas National Wildlife Refuge along the Texas coast are also expected to experience substantial sea rise and subsequent loss of habitat for wildlife.

We are also seeing the consequences of rising temperatures in the Gulf of Mexico and elsewhere. Surface water temperatures in the Gulf of Mexico are exceeding 80 degrees for longer periods. Researchers believe these higher water temperatures are accelerating the intensity of algae blooms and incidents of red tide. Red tides are caused by marine phytoplankton that produce potent chemical toxins, which can cause significant fish kills, contaminate shellfish, and create severe respiratory irritation to humans along the shore. Some research also suggests a linkage between sea surface warming and increased hurricane wind strength.

Warmer ocean temperatures are also increasing the prevalence of bleaching in coral reefs globally. In reefs along the Florida Keys and elsewhere, increasing sea surface temperatures are generating more frequent and more intense events of coral bleaching and disease. Under thermal stress, coral expel the algae that live symbiotically in its tissues. The symbiotic algae gives the coral its color and without the algae, the translucent coral animal exposes the color of its skeleton and appears white – or bleached. Severe bleaching episodes can kill corals. Weakened by bleaching episodes, corals are more susceptible to disease and may have reduced growth and lower competitive ability with algae. Coral reefs managed by the National Wildlife Refuge System, like other reefs world-wide, are already being negatively impacted by bleaching episodes - most recently the reefs of Navassa National Wildlife Refuge were affected by the extreme Caribbean bleaching episode of 2005.

Through research sponsored by NOAA and the Climate Change Science Program, we are also learning that rising atmospheric carbon dioxide levels are making the ocean more acidic. Oceans are the largest absorbers of atmospheric carbon dioxide. As they absorb more carbon dioxide, the availability of carbonate ions is reduced. Reef-building organisms require an abundance of carbonate ions to build their skeletons and shells. As carbonate is reduced, coral and other species are less able to build their skeletons, maintain their structure, and battle erosion.

Adaptation and Mitigation Strategies

Floodplain and coastal wetland restoration are an important part of an emerging adaptive strategy to better position our collective agencies to effectively conserve trust resources. Barrier islands and coastal wetlands are our first line of defense against extreme weather events, serving to slow down the speed and intensity of hurricanes and storm surge and thereby reducing the damage and loss of life that can occur. For nearly four decades, the Service, in cooperation with NOAA and others, has chronicled the loss of coastal wetlands along the Gulf Coast, particularly along Louisiana's coast. Unfortunately, Hurricanes Katrina and Rita combined to transform more than 200 square miles of coastal wetlands, marsh, and barrier islands to open water and accelerated projected wetland losses by a staggering 45 years to levels not expected before 2050. Notably, about two-thirds of Breton Island National Wildlife Refuge, part of a chain of barrier islands known as the Chandeleur Islands located off the coast of Southeastern Louisiana, disappeared in the wake of Katrina. In fact, Katrina shrunk this important chain of barrier islands – an important wintering ground for migratory waterfowl and neotropical birds – to about half its size before the storm.

In an effort to restore the Louisiana and Mississippi coastline, we will continue our work with the U.S. Army Corps of Engineers, which is leading the development of both the Louisiana Coastal Protection and Restoration Project and the Mississippi Coastal Improvement Project. These two projects are examining options and needs aimed at providing protection from future storm events through restoration of the coastal ecosystem and structural improvements such as levees.

Through the Coastal Wetlands Planning, Protection, and Restoration Act, funded through the Aquatic Resources Trust Fund, a joint federal-state task force, made up of representatives from the Departments of Interior, Commerce, and Agriculture, the Environmental Protection Agency, the Louisiana Governor's office, and the Corps of Engineers, has approved more than 78 wetland restoration projects for construction and allocated $625 million toward their completion since its inception 15 years ago. To date, the task force's work has protected, restored and enhanced nearly 400,000 acres of important coastal wetlands along the Gulf Coast.

In addition to coastal wetland restoration, the Service is learning to be more strategic in rebuilding facilities that were lost in the wake of Hurricanes Katrina and Rita. As a result, the Service is currently working to repair or replace dozens of facilities at refuges along the coast. As part of this effort, we are not replacing some facilities and are relocating others to more secure locations. We are well on our way to rebuilding our facilities for people across the region to enjoy as they once did.

Another strategy that the Service is pursuing is carbon sequestration. In the Service's Southeast Region, an innovative partnership was launched eight years ago aimed at restoring native habitats to bolster populations of wildlife and migratory birds through a terrestrial carbon sequestration initiative. We're working with The Conservation Fund, the Trust for Public Land, and energy companies like Detroit Edison, American Electric Power, and Energy to add 40,000 acres of habitat to our refuge system and reforest a total of 80,000 acres with more than 22 million trees sequestering 30 million tons of carbon over 70 years.

Last month, we announced a new partnership with The Conservation Fund and its Go Zero^{SM} initiative that gives individuals and organizations a way to offset their own carbon emissions annually by calculating carbon emissions based on daily commuting patterns and home energy usage among other things. The Conservation Fund then offsets the carbon footprint by working with the Service to plant native trees on refuges. It's voluntary, non-regulatory, and represents a positive step towards reducing carbon emissions.

The next frontier for this effort is to figure out how we can create an incentive to engage private landowners to restore native habitats that sequester carbon. In addition, the Service is working with the Department of Agriculture and others members of the U.S. Coral Reef Task Force to replicate this sequestration initiative in other state and federal land management agencies as well as territories.

Increasing Our Knowledge Base

An improved ability to understand and model future abrupt climate change is essential in order to provide natural resource decision-makers with the information they need to plan for potentially significant changes. To that end, the Service is working with the USGS to develop modeling and other research for assessing potential impacts from climate change. For example, the USGS is currently conducting research into water use and availability

trends in order to examine the implications for managing the National Wildlife Refuge System. Part of this analysis will include projections on climate related changes in water availability.

In its Future Challenges partnership with USGS, the Service has also identified climate change as one of four overarching challenges facing natural resource management. The Future Challenges report is currently being finalized and will include recommendations for addressing climate change.

The Department of Interior is a member of the U.S. Climate Change Science Program, an interagency coordination body that sets research priorities for federal climate change science. Through the CCSP, Interior is partnering with other Federal agencies to author a chapter on adaptation strategies for the National Wildlife Refuge System. This chapter is part of the Synthesis and Assessment Product effort of the CCSP and will coincide with chapters on National Parks and National Forests. As part of this effort, the Service has obtained sea-level rise predictions for four National Wildlife Refuges in Florida, and we are working on ways to make modeling available for additional refuges so they can determinate the potential impacts on trust species and better plan future management strategies and land acquisitions for coastal refuges.

Finally, the Service is cooperating with USGS to implement a framework for conservation that we call "Strategic Habitat Conservation." This is an adaptive management framework that begins with explicit trust resource population objectives. The objectives are met by applying models and conservation biology principles into landscape habitat goals. Simply put, it's a new conservation paradigm that looks at conservation in terms of "how much" and "where" to accomplish our highest conservation priorities, rather than "x" number of acres all over the place. It's happening in the Lower Mississippi Valley and is being replicated across the country. We believe this science-driven framework will be a key ingredient in adapting our management strategies in response to changing climate.

Conclusion

Critical to our success in addressing these challenges will be our ability to build the capacity to understand the changing climate and to predict and adapt to its forcing effects on the natural environment. Admittedly, there is still a lot of work to be done, but the Service is making significant strides in developing adaptive and mitigation responses and expanding our knowledge of climate change trends and effects. Despite the enormity of the many challenges associated with this issue, the Service is committed to addressing climate change and its potential impacts on our Nation's fish, wildlife, and habitat.