



**TESTIMONY OF JAMIE RAPPAPORT CLARK
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**BEFORE THE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE
SUBCOMMITTEE ON PRIVATE SECTOR AND CONSUMER SOLUTIONS TO
GLOBAL WARMING AND WILDLIFE PROTECTION**

HEARING ON GLOBAL WARMING AND WILDLIFE PROTECTION

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Mister Chairman and members of the subcommittee, I am Jamie Rappaport Clark, Executive Vice President of Defenders of Wildlife. Founded in 1947, Defenders of Wildlife has over 500,000 supporters across the nation and is dedicated to the protection and restoration of wild animals and plants in their natural communities.

I want to thank you for the opportunity to submit this testimony for the record of this hearing, which focuses on one of the most important conservation issues we face today, the impact of global warming on wildlife. It is no exaggeration to say that all of the work that is being done to conserve wildlife and its habitat, in North America and around the globe, is put at risk by the potential consequences to wildlife of global warming. This is why Defenders of Wildlife is working to educate our supporters, the public, and policymakers on the threat to wildlife posed by global warming. We stand ready to work with this subcommittee and the rest of the Congress to develop solutions that will reduce greenhouse gas emissions and enable wildlife to survive the next century until the benefits of emissions reductions can be fully realized. In my testimony, I will highlight some of the impacts on wildlife from global warming and offer some ideas for addressing them.

Impacts of Global Warming on Wildlife

The subcommittee's hearing could not have come at a more important time. Last week the Intergovernmental Panel on Climate Change (IPCC) concluded that evidence of global warming is unequivocal, and that dramatic changes to the planet's climate are, with a 90 percent certainty, the result of human-generated emissions of greenhouse gases. Quite simply, there is no remaining scientific debate: we are causing global warming and it is past time that we do something about it.

We are already in the midst of what Harvard Professor Edward O. Wilson and others have referred to as the sixth great mass extinction crisis in the history of the planet. However, unlike previous extinction events, this one is due entirely to human activity, principally habitat destruction, pollution, and overexploitation of wildlife. Moreover, in each of the previous mass extinctions, it took more than 10 million years for new species to evolve to replenish the biodiversity that was lost.

Global warming only makes a bad situation worse. Under some climate change scenarios, the National Academy of Sciences predicts extinctions of 60% of all species on the planet. Extinctions alter not only biological diversity but also the essential evolutionary processes by which diversity is generated and maintained. Furthermore, we continue to destroy much of the habitat needed for species to survive and recover.

More than half (59%) of nearly 1,600 species examined in a study published in the journal *Nature*¹ showed measurable changes in distribution and/or timing of their life cycles concurrent with global warming. Buds leaf out and flowers bloom earlier, winter

¹ Parmesan, C., and G. Yohe. 2003. A globally coherent fingerprint of climate change impacts across natural systems. *Nature* 421: 37-42.

hibernation of wildlife is shorter in duration, and migrating and breeding occurs earlier in the spring. Such changes are consistently and systematically in the direction expected from regional changes in climate: upslope, inland, and towards the earth's poles. Thus, we consider climate change to be among the greatest conservation threats to our natural world.

Types of Global Warming Impacts

Among the observed impacts of global warming are the following:

Sea and land ice meltdowns. According to the IPCC, average Arctic temperatures increased at almost twice the global average rate in the past 100 years. Satellite data since 1978 show that annual average Arctic sea ice extent has shrunk by 2.7% per decade. Temperatures at the top of the permafrost layer have generally increased since the 1980s in the Arctic (by up to 3°C). The maximum area covered by seasonally frozen ground has decreased by about 7% in the Northern Hemisphere since 1900, with a decrease in spring of up to 15%.

Changes in the Arctic environment are eroding the integrity of unique terrestrial and marine ecosystems. Sea pack ice is literally melting, thinning, and moving further offshore from land, all of which tip the scales against wildlife that rely on this key habitat. Spectacled eiders, a sea duck already listed as threatened under the Endangered Species Act, use large open areas (termed polynyas) for foraging during the winter, and rest and sleep on adjacent ice edges strategically located over sea floor grounds rich in prey. Without their sea-ice roosting areas, Spectacled eiders won't be able to easily reach their food sources. Rapidly changing ice conditions have forced ringed seals to move and

give birth to their pups in different locations – even under ice – making finding and catching seals a bigger challenge for the polar bears that depend on them for survival.

Indeed, polar bears depend entirely on sea ice as platforms for hunting the marine mammals that provide their nutritional needs. Because the necessary ice bridges linking land and sea have disappeared, adult and young polar bears have starved and drowned. Some polar bears have even resorted to cannibalism, leading scientists to remark that they are witnessing stressors unprecedented in decades of observation. Consequently, the U.S. Fish and Wildlife Service has proposed listing the polar bear as threatened under the Endangered Species Act, a proposal which Defenders of Wildlife strongly supports.

On land, prospects are no better. Disappearance of permafrost has led to draining of Arctic wetlands, aquatic habitats used extensively by the breeding waterfowl that winter in the lower 48 states and support a multi-billion dollar sport hunting economy. Declining winter snow packs threaten species such as the wolverine, a large relative of the weasel that relies upon snow for denning.

One place where all of these changes are occurring is the Arctic National Wildlife Refuge in Alaska. The Arctic Refuge is the most important on-shore denning habitat for polar bears in the United States. As offshore sea-ice denning areas melt away, the Arctic Refuge becomes one of the last places for these polar bears to winter with their newborn cubs. The refuge's famed Porcupine caribou herd is also being affected by global warming. Caribou are departing their wintering grounds a month earlier and are still having trouble making it to the coastal plain of the Arctic Refuge in time for the earlier arrival of spring, when the most nutritious forage is available for their calves. Thus, the importance of the Arctic Refuge to wildlife is made even greater by global warming,

making proposals to open the refuge to oil and gas development even more misguided.

Habitat shifts. As the planet warms, the habitat occupied by particular species shifts as well, typically northward in the northern hemisphere, upslope, and inland. Northern and elevational boundaries have moved, on average, 6.1 km northward and 6.1 meters upward each decade.

For some species, already on the edge, these shifts could spell extinction. For instance, the Peaks of Otter salamander is endemic to central Virginia near the Blue Ridge Parkway. With one of the most restricted ranges of any salamander in the United States, all of this amphibian's habitat lies within a handful of mountains in two counties. If global warming pushes it further up the mountains in search of a cooler environment, it will have no place left to go. In the polar regions, with expectations that the Arctic Ocean will be largely devoid of summer sea pack ice later in this century, species such as polar bears, ivory gulls, walruses, and the ice-dwelling seals will find their habitat literally melted away.

In our recent report, *Refuges at Risk—The Threat of Global Warming: America's 10 Most Endangered National Wildlife Refuges 2006*, Defenders of Wildlife highlights the impact of global warming on the National Wildlife Refuge System. We point out that the Environmental Protection Agency (EPA) estimates that many tree species may shift their ranges 200 miles to the north. Places like the Silvio O. Conte National Wildlife Refuge in New England are expected to lose tree species wholesale, including the regionally important sugar maple whose range may shift entirely out of the United States. Changing forest composition will directly affect wildlife that depends on the current tree species of New England's forests, like Bicknell's Thrush, a bird species dependent on

New England's high elevation balsam fir trees, which may decline 96% by century's end due to global warming, according to the EPA.

Rising sea levels. Estimates of sea level rise from global warming range from 7 to 22 inches over the next century, according to the latest IPCC report. Catastrophic melting of Antarctica or Greenland could raise sea levels by several meters. However, any rise will have negative consequences for some wildlife. Islands used by the endangered Hawaiian monk seal could be completely underwater by century's end, overcrowding the remaining islands used for breeding and rearing of young and increasing the predation of seals by sharks. Other coastal species like the endangered Florida Key deer depend entirely upon low-level barrier islands, and are especially vulnerable to sea level rise.

Federal properties and resources are at serious risk. There are approximately 160 national wildlife refuges in coastal areas. Many of these refuges, like Virginia's Chincoteague National Wildlife Refuge, protect coastal marshes that are only a foot or two above the current sea level. Even the lowest estimated rise in sea level over the next century will have profound effects on coastal wetlands, which are one of the most biologically productive ecosystems on earth. Coastal marshes also happen to be tremendous carbon sinks, and their loss will reduce their ability to absorb carbon and potentially even release more carbon dioxide into the atmosphere as inundated marsh plants decompose.

Longer droughts. Drought resulting from global warming poses a further threat to species that rely on already scarce water in arid environments such as the American southwest. For example, even in the best of times, survival can be precarious for desert

bighorn sheep. Inhabiting steep, rocky terrain in the driest areas of the American southwest, they live in small groups isolated by miles of blazingly hot terrain. In southeastern California, rainfall has declined by as much as 20%, leading to drying up of springs and disappearance of plants². More than a third of the populations of sheep that once lived in California's mountains have disappeared in the last century.

Non-arid regions are going to face dramatic changes as well. As we highlight in *Refuges at Risk*, the prairie pothole region of the country is the nation's duck factory; its thousands of small lakes and ponds providing ideal habitat for breeding waterfowl. Over 50 national wildlife refuges, such as Medicine Lake refuge in eastern Montana, and Devils Lake Wetland Management District in North Dakota, have been established in this region to protect breeding bird habitat. Climate scientists predict that warmer climates in the northern prairie wetlands region will increase the frequency and severity of droughts – so much so that the number of breeding ducks in this region could be cut in half.

Excess carbon dioxide. Often described as the rainforests of the ocean, coral reefs support a dazzling array of creatures. But die-offs of corals, as much as 98% in some locations during the last 25 years, landed two coral species on the endangered species list. Staghorn and elkhorn coral form massive thickets, provide cover for numerous reef fish, and are essential for the health of entire reef ecosystems. However, warming ocean temperatures are stripping corals of the algae they need to survive, while carbon dioxide emissions are also turning the naturally alkaline oceans more acidic. Reefs subsequently turn into rubble because of lowering concentrations of carbonate ions, a key building block for calcium carbonate required by the corals.

² Epps, C. W., D. R. McCullough, J. D. Wehausen, V. C. Bleich, and J. L. Rechel. 2004. Effects of climate change on population persistence of desert-dwelling mountain sheep in California. *Conservation Biology* 18: 102-113.

The threat from global warming to coral reefs affects many national wildlife refuges, including the Northwest Hawaiian Islands refuge, Guam National Wildlife Refuge, and the Palmyra Atoll, Midway Atoll, and Kingman Reef refuges in the south Pacific.

Other impacts. Global warming will affect wildlife in other ways as well. For example, changes in migration patterns will alter some species' ability to find suitable habitat and food. Changes in average precipitation (far more or far less annual rain and snow than falls currently) will place strain on species adapted to current precipitation patterns.

Another result of global warming is that certain weather events will become more extreme, causing a greater probability of freshwater flooding inland and more intense and violent storms and other weather events, such as hurricanes, along the coasts. Rapidly changing environments will also heighten the risk of invasive native and invasive non-native species, both of which can pose threats to the species they displace. For example, global warming has been implicated in the recent severe outbreaks of spruce bark beetles on Alaska's Kenai National Wildlife Refuge, which have decimated half of the forests on the Kenai peninsula.

Helping wildlife navigate the global warming bottleneck

According to last week's IPCC report, global warming and associated sea level rise will continue for centuries due to the timescales associated with climate processes and feedbacks, even if greenhouse gas concentrations are stabilized now or in the very near future. Thus, even if we act now, as we must, to cap and reduce greenhouse gas

emissions, wildlife will continue to feel the effects of global warming for at least the next 100 years. In other words, there is a century-long bottleneck that we must help wildlife navigate, so that it can survive to reap the benefits from reductions in greenhouse gas emissions undertaken now. Consequently, our national strategy for combating global warming must consist of two parts. First, we must take immediate steps to reduce greenhouse gas emissions, to address the root cause of climate change. Second, we must also craft responses and mechanisms now to help wildlife navigate the looming bottleneck of complex threats caused by global warming. Some ways to do this are suggested in the following pages of my testimony.

A Coordinated, Interagency Response is Essential

Federal agencies must use their existing authorities and be given additional direction to consider the impacts of global warming on wildlife in program planning, land management, and environmental analysis pursuant to the National Environmental Policy Act, the Endangered Species Act, and other relevant laws. Though the brunt of some global warming impacts may not be fully felt for a number of years, planning to address and ameliorate those impacts on wildlife and wildlife habitat must begin now.

Equally important, new governmental processes and structures need to be explored that will themselves be resilient and adaptive to the threats from global warming. While it is important for each federal agency to develop measures for protecting wildlife from the effects of global warming, it is insufficient for individual agencies, or even individual federal land units, to contemplate and plan strategies purely on their own. The problem is simply too complex.

One option is to establish an interagency planning and coordinating mechanism, a National Council on Global Warming and Wildlife. Modeled after the National Interagency Fire Center and the National Invasive Species Council, the National Council on Global Warming and Wildlife would develop a national strategy for addressing the impact of global warming on wildlife, with the express purpose of helping wildlife navigate the bottleneck of global warming impacts over the next century. This strategy should examine management issues common to geographic areas and threat type (e.g. sea level rise, increased hurricane frequency and intensity). Individual agencies and land management units could then coordinate their management activities with these national and regional goals and strategies. State strategies, particularly those set forth in state wildlife action plans, should address global warming impacts on wildlife and also be coordinated with the national strategy.

Scientific Capacity Should be Enhanced

Building more robust scientific, inventory and monitoring programs is essential to managing wildlife and federal lands in a world changed by global warming. The scientific capacity of federal agencies, however, is woefully inadequate. No federal land system has a comprehensive biological inventory of their lands. The National Park Service has completed inventories on individual units, but other federal land systems, including the National Wildlife Refuge System, do not have comprehensive biological inventories. How are agencies to know how ecological systems are changing as a result of global warming, and subsequently what adaptive responses may be necessary, if they do not even know what is there? Building applied research, inventory and monitoring

capacity across the agencies is essential.

One particularly important need is the development of simulation maps of expected vegetation changes in response to global warming. These will have to be refined as our understanding grows of how habitats are responding to changing climatic conditions. This tool is extremely important for helping managers plan land and conservation programs.

A coordinated science arm of a national strategy for addressing the impacts of global warming on wildlife will also be essential in developing and determining the efficacy of specific measures to address those impacts. A number of different types of responses have already been proposed by the scientific community including the protection and restoration of habitat corridors to assist species in shifting their ranges and the protection of climate “refugia” – areas that are not as vulnerable to the whims of a changing climate and are better able to preserve biodiversity through the climate bottleneck. These and other strategies will need to be further developed and tested.

Building Resilience to Climate Change

Many species and ecological systems have the ability to tolerate and adapt to some degree of ecological and climate changes. If global warming was the only stress on wildlife, more species might be able to weather it. Unfortunately though, most ecosystems throughout the globe have been impacted in some measure by human-caused stressors, inhibiting the ability of species and ecosystems to adapt to global warming. All of the threats to natural systems that have been the center of attention for decades, including habitat loss, pollution, invasive species, and overexploitation, are heightened in

the face of global warming. Thus, reducing other stressors on wildlife is key to helping wildlife navigate the bottleneck of global warming impacts.

For example, at the Silvio O. Conte National Wildlife Refuge, warmer temperatures will reduce the snow pack of New England's mountains and cause earlier spring melting. This will reduce the late summer flows of the Connecticut River. Low flows and warmer temperatures reduce the dissolved oxygen in the water, starving fish, including the endangered shortnose sturgeon, of oxygen. Anticipating this, strategies to reduce other causes of lowered dissolved oxygen levels, including strategies to reduce the runoff of fertilizers and other nutrients into the river, should be accelerated. This will build resilience in the system to assist species in navigating the global warming bottleneck.

Another example is the tremendous loss of coastal wetlands in Louisiana. Louisiana loses up to 40 square miles of coastal marshes per year, driven by many factors including the diversion and channelization of the Mississippi River, which has starved these wetlands of essential marsh-building sediment, and saltwater intrusion caused by canals carved into coastal marshes, which kills off erosion-controlling wetland vegetation. These were threats to Louisiana and a large proportion of the nation's migratory birds and commercial fisheries before we recognized the problem of global warming – now they are crippling these marshes' resilience to rising sea levels. Restoring these wetlands to their natural functioning will help them adapt to global warming and maintain migratory bird and fisheries habitat, and equally important, will buffer the coast from future devastating hurricane storm surges.

Providing Funding to Address Global Warming's Impacts on Wildlife

Development and implementation of a national strategy to address global warming's impacts on wildlife, providing the necessary science to underpin that strategy, and taking action to reduce other stressors on wildlife will require substantially more money than is currently provided to conservation. As Congress develops legislation to cap greenhouse gas emissions, it is likely to create a system of emissions credits that can be traded. In the process, there is an opportunity to auction some of these credits, producing substantial revenue for the federal Treasury. A portion of that revenue should be dedicated to programs to offset the impacts of global warming on wildlife with special emphasis on providing funding to address federal responsibilities for wildlife and land conservation in the face of global warming. Defenders of Wildlife looks forward to working with this subcommittee and others in Congress to develop a program that will result in effective measures to help wildlife navigate the global warming bottleneck so that our children and grandchildren will be able to enjoy the wealth of wildlife and its habitat that we have enjoyed.

Conclusion

Global warming is the conservation challenge of our time. It casts a long shadow over all of our other efforts to conserve and recover wildlife. We must act promptly to reduce greenhouse gas emissions to halt and eventually reverse the changes we are causing to our planet from global warming. At the same time, we must take steps to enable wildlife to survive the next century of inevitable impacts from global warming, to

navigate this bottleneck, so that wildlife and, ultimately, humans, will benefit from the actions we take now to stop global warming. On behalf of Defenders of Wildlife, thank you for the opportunity to share our perspective on this critical issue. We look forward to working with you in the days ahead to meet the challenge of global warming's impact on wildlife and wildlife habitat.