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Climate Change on Public Lands”
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Mister Chairman and members of the subcommittee, I am Noah Matson, Director of the Federal Lands Program at 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 testify before the subcommittee. Energy policy, climate change and public lands are inextricably linked. Current energy policy on America’s public lands is doubly damaging for wildlife: the rapid and haphazard expansion of oil and gas drilling has devastated wildlife habitat, while the ultimate burning of these fossil fuels contributes to global warming pollution, which is the single greatest threat facing people and wildlife today.

Fish and wildlife are a fundamental part of America’s history and character, and the conservation of fish and wildlife is a core value shared by all Americans. Wildlife conservation provides economic, social, educational, recreational, emotional and spiritual benefits. The economic value of hunting, fishing, and wildlife-associated recreation alone is estimated to contribute over \$100 billion to the U.S. economy, through job creation, tourism infrastructure, and recreational spending. In addition to these direct economic benefits, fish, wildlife, and plants provide important ecological services to our economy that are irreplaceable, including pollination of our crops, water and air purification, flood control, and an increasingly important service: carbon sequestration.

Our vast system of federal public lands is critical to the future of wildlife in America. Public lands protect endangered and threatened species, and help prevent species declining to the point where Endangered Species Act listings are necessary. Public lands provide comparatively intact tracts of land that serve as refuges from human development and other pressures, and provide important migration corridors for many species to respond to the changing climate. They help keep common species common, including game species valued for hunting and fishing activities. They provide refuge for species impacted by the effects of global climate change, and will play an important role in the adaptation of both people and wildlife to those impacts in the future.

To ensure that our cherished wildlife survive beyond the next century, we must reduce our greenhouse gas emissions, reform the way energy and other extractive uses are produced on our public lands, and develop programs to assist wildlife in the face of global warming.

IMPACTS OF GLOBAL WARMING ON WILDLIFE

The subcommittee's hearing could not have come at a more important time. Last month 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 and finite natural resources. In the United States, over 15,000 species are at risk of extinction and the country loses a staggering 6,000 acres of open space a day, stressing natural systems and diminishing recreational opportunities and quality of life. 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.

The first response to reduce the impacts of global warming on wildlife must be to reduce greenhouse gas emissions so wildlife can have a future. Second, immediate steps must be taken to reduce the non-climate related threats that wildlife is facing. Securing and restoring habitat, fighting invasive species, and reducing pollution all strengthen natural resilience in wildlife and wildlife habitat to cope with global warming. Finally, strategies must be developed to help wildlife adapt to changing ecological conditions.

Types of Global Warming Impacts

Global warming will impact – and is already impacting - wildlife in a variety of ways:

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 Arctic permafrost layer have generally increased since the 1980s (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%.

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. There are numerous other arctic species that are fairing no better than polar bears.

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.

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 than normal 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. Species' northern and elevational ranges have shifted, on average, almost four miles northward and 20 feet upward each decade. Clearly, if you're a species that already lives at high elevation, you may be out of luck as habitat choices simply run out.

The Environmental Protection Agency (EPA) estimates that many tree species may shift their ranges 200 miles to the north. Places like the Green Mountain and White Mountain National Forests 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 very rare bird 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 over ten feet. However, even a minor rise will have negative consequences for some wildlife. Coastal species like the endangered Florida Key deer depend entirely upon low-elevation 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 and 50 national park units in coastal areas. Many of these refuges, like Breton National Wildlife Refuge in Louisiana, 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 an additional 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 up to 20%, leading to drying up of springs and disappearance of plants. More than a third of the sheep populations that once lived in California's mountains have disappeared in the last century.

Non-arid regions are going to face dramatic changes as well. 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 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.

Increased wildfire.

Related to longer droughts is increased frequency and intensity of wildfires. Fire suppression and risk reduction programs already consume almost half of the U.S. Forest Service's budget. Increased fire directly inhibits our public lands from providing the suite of benefits we demand from them, including supporting wildlife, recreation, and timber production. In a study published in the journal *Science*, researchers found that compared to data from the 16 years prior, the period from 1987 to 2003 was 1.5 degrees higher in the West, had a 78-day longer fire season and four times as many large wildfires, which burned over six times more land than the previous study period. These dramatic changes were correlated with decreased winter rains, earlier snowmelt caused by warming temperatures, and have caused dramatic changes to national forests and other public lands.

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 increasing the acidity of the oceans. Reefs subsequently turn into rubble because of decreased concentrations of carbonate ions, a key building block for calcium carbonate required by the corals.

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. For example, the timing of bird migration is finely tuned to available food resources, and many species are struggling to cope with changing seasonal patterns. 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 outbreak of bark beetles in southwestern forests including New Mexico and Arizona. In the 2002-2003 season, 3.5 million acres of piñon pine and 2 million acres of ponderosa pine were affected. Warming-induced drought stressed trees so they were unable to protect themselves with increased sap production. Warmer winters also reduced bark beetle mortality and expanded their breeding season.

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 delayed 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 reduce greenhouse gas emissions, wildlife will continue to feel the effects of global warming for at least the next 100 years, the period in which carbon dioxide already in the atmosphere will persist. In other words, there is at least 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 act now 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.

Energy Policy Reform and Building Resilience to Global Warming

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. Wildlife will have little chance of adapting to the impacts of global warming if already stressed by loss and fragmentation of habitat, competition with invasive species, and pollution. Thus, reducing other

stressors on wildlife is key to helping wildlife navigate the bottleneck of global warming impacts, and ensuring that wildlife and wildlife habitat are resilient to these changes should be a top priority. Unfortunately, our current energy policy does the exact opposite.

The Bush administration has treated wildlife as an impediment to the extraction of energy and other resources from America's public lands. On National Forests, the Bush administration eliminated the 20 year old requirement that national forests maintain viable wildlife populations. This requirement, adopted under the Reagan administration, helped ensure the persistence of wildlife while Forest Service pursued timber and energy production and other uses. Without this requirement, the Forest Service has been given the green light to offer our national forests to energy and timber companies with little assurance that, after these companies reap the benefits of public resources and leave, wildlife populations will be left for Americans to enjoy.

The Bureau of Land Management (BLM), unfortunately, has never had such a requirement. Still, the agency is supposed to sustain wildlife in managing the suite of multiple-uses BLM lands provide. Yet, the administration's energy policy has essentially converted the BLM into a dominant-use agency, an agency dedicated to energy development. Wildlife protections under the Bush administration have been specifically targeted as impediments to energy development, instead of viewing wildlife conservation as the cost of doing business on public lands.

The result: Nationwide, the number of oil and gas drilling permits approved by BLM more than quadrupled, from 1,803 to 7,736 for the years 1999 through 2005. Last year the BLM predicted they would receive over 10,000 drilling permit applications in 2007. There are over 60,000 producing wells on public lands and over 35 million acres are under active leases.

The impacts on wildlife are clear. In the Farmington, New Mexico field office, BLM approved plans to develop nearly 10,000 new wells. Yet the high level of drilling that has already occurred in the area has devastated wildlife. According to the New Mexico Department of Game and Fish, the elk population in the area plummeted 88% from 1999 to 2004. Even an industry funded study in Pinedale, Wyoming documented a 46% reduction in the mule deer population in an area of rapid energy development. Gas and oil drilling doesn't just impact elk or mule deer, of course, but these species are indicative of the dramatic adverse affects to the ecology of the entire region.

In addition to the direct impacts all this development has on wildlife through habitat loss and on-site pollution, the processing of thousands of drilling permits is consuming all BLM staff time in the field offices where energy development is greatest. According to the GAO, "dramatic increases in oil and gas permitting activity have lessened BLM's ability to ensure that environmental impacts are mitigated." Worse still for wildlife, according to a BLM internal review, up to 50% of staff and funding from BLM's fish, wildlife, and threatened and endangered species programs have been diverted to support the energy program, slashing the agency's ability to conduct habitat management and restoration, population monitoring and other wildlife management activities.

The synergistic effects of global warming and energy development and other non-climate related threats to wildlife and ecosystems are best illustrated by two examples: sage grouse and coastal wetlands.

Sage grouse, oil and gas development, and global warming

Two years ago, the Fish and Wildlife Service was petitioned to list the sage grouse under the Endangered Species Act. This caused wide-spread concern within the BLM and with the many users of BLM lands, particularly the oil and gas industry. And for good reason: There is broad overlap between known oil and gas reserves and sage grouse habitat in the Intermountain West. For example, in Wyoming, 26,000,000 acres (66.7%) of the state's remaining sage grouse habitat falls within areas of potential oil/gas development; 9,000,000 acres (28.1%) in Colorado; 3,000,000 acres (43.5%) in Utah; and 1,700,000 acres (16.2%) in Montana, according to an analysis conducted by Trout Unlimited.

Oil and gas development requires clearing of habitat for roads, well pads, and pipelines. In many areas, new power lines are erected to operate equipment, providing raptor perches where none previously existed, threatening sage grouse with increased predation. Noise from oil and gas operations interferes with the breeding behavior of sage grouse, which must hear distant calls to locate localized mating grounds. Finally, there is always the likelihood of spills, leaks and explosions of natural gas, oil, and other chemicals and contaminated water.

Oil and gas development also facilitates the spread of invasive species like cheatgrass. Cheatgrass, a fire-adapted species, alters the fire regime of sagebrush ecosystems causing larger-scale, hotter fires than would normally burn in this system. Oil and gas development also increases the risk accidental human-caused wildfire ignition. Sagebrush typically recovers very slowly after a fire, and may take 30 years or more to reestablish at the same level of coverage as pre-fire conditions. In the period of time before regrowth has occurred, sage grouse lack cover and are more vulnerable to predators, and there are fewer succulent plants and insects available for them to eat.

Cheatgrass is well adapted to global warming, and is an example how global warming can disrupt ecosystems. Because cheatgrass is fire adapted, it can withstand the increased fire risk of the drier conditions caused by higher evaporation rates with global warming. Cheatgrass and other exotic grasses have also been shown to out-compete native plants with increased atmospheric concentrations of carbon dioxide, the main contributor to global warming. In other words, global warming is expected to significantly alter sagebrush ecosystems that sage grouse and other species depend on.

This emphasizes the importance of conservation measures now to increase sagebrush and other vulnerable ecosystems' resilience to the impacts of global warming. Unfortunately, most of the core sage grouse strongholds have been leased for oil and gas development. On top of this, stipulations to development designed to limit disturbance to sage grouse during the sensitive breeding period are regularly waived by the BLM. Add to this the diversion of staff and funding from BLM's wildlife program to process drilling permits and the gutting of the Forest Service's wildlife viability requirement, and the picture looks grim for the future of sage grouse, even if global warming were not a threat to its survival.

Restoring the Forest Service's requirement to maintain viable populations of wildlife and instituting a similar requirement for BLM would go a long way towards restoring the balance of uses on our public lands and help wildlife survive now and in the future in the face of global warming.

Coastal wetlands, oil and gas development, and global warming

Coastal wetlands are extremely productive ecosystems, important to both migratory waterfowl and commercial fisheries. Louisiana is home to 40 percent of remaining wetlands in the contiguous U.S. Louisiana's coastal marshes provide vital wintering areas for millions of ducks and other birds, and important resting areas for birds crossing the Gulf of Mexico. These wetlands also produce 20 percent of the country's commercial fish harvest, according to the USGS National Wetlands Research Center. These wetlands serve as vital buffers against storm surges. For every mile of coastal wetlands, storm surges are reduced by one foot in height.

These important wetlands are disappearing at the rate of 40 square miles of marsh a year – a full 80 percent of the wetland losses in the country. This devastating loss is caused by a variety of factors, including the loss of marsh-building sediment from the historic flooding of the Mississippi River, subsidence, sea level rise, and oil and gas development.

Louisiana is the portal for most of the offshore oil and gas production in the Gulf of Mexico. The oil and gas industry has dredged thousands of miles of canals through Louisiana's coastal wetlands, including through federal lands like Delta National Wildlife Refuge at the mouth of the Mississippi River. Canals allow saltwater to intrude into freshwater marshes, killing sediment-trapping vegetation, speeding the pace of erosion.

Global warming-induced sea level rise will further accelerate this problem. Not only will the loss of these wetlands have dire consequences for fish and wildlife, it will harm the oil and gas industry itself. Over 20,000 miles of oil pipelines crisscross these marshes from offshore – pipelines that will be directly exposed to whims of nature as wetlands recede around them.

Again, this example emphasizes the critical importance of timely conservation measures to buffer against the effects of global warming. Though we cannot stop the seas from rising, we can fill in canals and restore a portion of the historic sediment flows from the Mississippi River to these wetlands to prevent catastrophic loss of coastal marshes.

A Coordinated, Interagency Response is Essential

In addition to building ecological resilience to global warming by reducing the current threats to wildlife and habitat, 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.

We believe it is imperative that a national strategy be developed 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 should 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 altered 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.

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.

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.

In addition, as the subcommittee explores methods to capture the true costs of energy development on public lands, including requiring mitigation fees and increased royalties, a portion of these funds should be dedicated to restoring wildlife and wildlife habitat to build natural resilience to the impacts of global warming.

This was the promise of the Land and Water Conservation Fund (LWCF). The

LWCF, funded largely by a portion of federal offshore oil and gas royalties, was designed to provide a permanent conservation benefit to the American public in exchange for the liquidation of federal natural resources. The promise of the LWCF, however, has never been fulfilled. In fact, the Bush administration's FY 2008 budget request includes the second lowest request in the history of the 40 year program. The need for land protection through the LWCF and programs like it has never been greater. In designing revenue streams for conservation, the subcommittee should ensure that funds are dedicated to conservation and mitigation purposes.

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 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.