Testimony of
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Before the
SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

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I. INTRODUCTION

Good morning, Chairman Boxer and members of the Committee, my name is Larry Schweiger and I serve as President and CEO of the National Wildlife Federation. I would like to thank you for the opportunity to testify today on behalf of our more than four million members and supporters.

I would like to begin by thanking you, Madam Chairman, as well as Senator Kerry and other key leaders, for the Clean Energy Jobs and American Power Act (S. 1733) and its comprehensive approach to protecting our fragile planet, the American economy, and American jobs in the face of climate change. I also would like to thank Senators Baucus and Whitehouse for the careful attention they have given to the natural resources adaptation provisions of this bill. The National Wildlife Federation and its conservation partners are pleased that S. 1733 provides long-term dedicated funding, using pollution allowances, for a strategic approach to natural resources adaptation. These investments will be a boon to the economy and will provide crucial public and private sector jobs, especially in rural areas of the country where local economies depend heavily on a healthy natural resources base. We look forward to helping you build bipartisan support for enacting a strong final product in the coming weeks.

The American people deserve nothing less. Our nation is blessed with an abundance of natural resources that are essential for our food, shelter and economic vitality. They provide for our physical and spiritual well being. Our unique habitats and landscapes define us as Americans. Born and raised as a hunter and an angler, I can say that our unique wildlife heritage has helped forge many of my family's traditions and values as well as those of many other American families from generation to generation.

Since the conservation leadership of President Theodore Roosevelt, millions of Americans have devoted themselves to protecting and restoring our country's natural resources. We have all benefited from their work in countless ways. Now, because of unchecked global warming, a century of conservation achievements is in jeopardy.

As you conduct your work on this most compelling challenge of our time – protecting our children's and grandchildren's inheritance from global warming - let us remember the words of President Roosevelt:

"Of all the questions which can come before this nation, short of the actual preservation of its existence in a great war, there is none which compares in importance with the great central task of leaving this land even a better land for our descendants than it is for us …,

Conservation is a great moral issue, for it involves the patriotic duty of insuring the safety and continuance of the nation. Let me add that the health and vitality of our people

are at least as well worth conserving as their forests, waters, lands, and minerals, and in this great work the national government must bear [a] most important part."

Today's hearing is essentially about whether Congress will step up to its moral duty to ensure our children and grandchildren are not left with a world fundamentally different than the one we have enjoyed. Are we ready to tell them that much of what we have enjoyed on earth will not be available to them?

I ask you, Madam Chairman, and Committee members: Are you ready to talk about a world that no longer has polar bears? Vast sagebrush steppe with free-roaming antelope? Ice fishing or deep snows in the winter? Sufficient river-flows in the summer for salmon and trout? Coastal wetlands teeming with waterfowl?

It is not an exaggeration to call what we are facing a climate crisis. In fact, a key problem with the debate so far has been *understatement.* For too many years, commentators framed climate changes such as melting of Arctic sea ice and rising of the seas as mere possible outcomes in the distant future. In fact, these and other profound ecosystem changes are well underway and are occurring far more rapidly than scientists once projected. With the current pace of climate change, it is hard to imagine what life will look like even ten years from now.

Far too many people remain unaware of the gravity of the climate crisis. It is a story we'd rather not hear or face up to. It is a story, however, that we can still alter, if we act swiftly. But the window is rapidly closing. This year I wrote a book entitled *Last Chance: Preserving Life on Earth* because I believe we are facing our last chance to protect life on earth as we have known it. The time for action is now.

National Wildlife Federation and our partners in conservation are extremely pleased that you chose the topic of adaptation for today's fourth panel. We must do all we can now to safeguard natural resources from a warming world. We are working with scientists, resource managers and a coalition of roughly 600 hunting, fishing and conservation organizations from every state in the nation, asking Congress to design climate and energy legislation that will conserve and protect fish, wildlife and natural areas -- including parks, marine sanctuaries, refuges and forests – from the impacts of global warming. (*See* Appendices A and B). We must not wait until the full impacts are upon us. We must prepare responsibly by conserving the resources we need right now, and developing new strategies that integrate climate science into conservation management plans.

If I had a magic wand – and believe me I wish I did – to end all carbon pollution tomorrow, the negative impacts on wildlife and natural resources would continue for decades. Congress must recognize that the climate crisis requires bold action on the effects as well as the causes.

As S. 1733 recognizes, we must invest *now* in safeguarding the natural world from the inevitable impacts of global warming. The fourth report from the Intergovernmental

Panel on Climate Change (IPCC) report warns that in the lifetime of a child born today, 20 to 30 percent of the world's plant and animal species will be on the brink of extinction if we don't take action now.[1] The legacy of fish, wildlife and plant species that we inherited from our parents -- and have benefitted tremendously from – will be denied to our children and grandchildren if we allow current carbon emissions to continue and if we fail to invest now in adaptation.

Of course, if we fail to cap and reduce the pollution that contributes to global warming, nothing we can do on the adaptation front will save our endangered wildlife or conserve the ecosystems that support our economy and protect our quality of life. The urgent need to cap pollution is frequently noted by commentators on the climate crisis. But many observers fail to recognize that if we reduce pollution but fail to make investments in protecting and restoring our natural resources, we will have accomplished only half the job.

To meet our fundamental ethical duty to pass on a healthy planet to our children and future generations, Congress must enact a two-part agenda in its climate and energy legislation. It must cap and reduce pollution at levels dictated by science to avoid dangerous climate change, and it must provide large-scale dedicated funding to implement new strategies that address the inevitable impacts of global warming on wildlife and natural resources. Any solution that puts a price on pollution must use some of the money paid by large polluters to repair the current and future damage they are causing.

Congress must enact legislation that offers Americans a better way to power our future and a better way to protect the planet. Restoring America's economic health is linked to restoring the health of our natural systems. We must address carbon pollution and the growing threats to our natural world. We cannot do one without the other, or we will fail to meet our moral obligations to the generations that will follow us.

II. CLIMATE CHANGE IS HARMING WILDLIFE AND DISRUPTING THE ECOSYSTEMS ON WHICH BOTH PEOPLE AND WILDLIFE RELY

Across the planet, carbon emissions from human activity are producing dramatic changes in the natural world, changes that have been accelerating at an astounding pace. Scientific findings since the publication of the 2007 IPCC scientific assessment suggest that the need for action is more urgent than ever. Earlier this year, scientists from around the world gathered in Copenhagen to discuss their most recent findings and concluded that the worst-case scenarios found in the 2007 assessment were being realized and even exceeded. New studies show that the melting of Arctic sea ice is vastly outpacing previous predictions, sea level rise projections must be revised dramatically upward, and

[1] IPCC, *Climate Change 2007. Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [M.L. Parry, et al. (eds.)] (IPCC, 2007a).

there is a rapid new release of methane from thawing permafrost and deep sea ice. Simply put, science mandates that we act as swiftly as possible to reduce greenhouse gas emissions as deeply as possible while safeguarding natural resources threatened by global warming.

In the United States, we are seeing a wide array of changes:

- Higher average air and water temperatures (both freshwater and marine);
- Increases in average annual precipitation in wetter regions (e.g., Northeast) and decreases in drier regions (e.g., Southwest), with an increasing proportion of precipitation falling in intense downpours;
- Lengthening of the frost-free season and earlier date of last-spring freeze;
- Declines in average Great Lakes ice cover and Arctic sea ice extent and thickness. Arctic summer sea ice is rapidly disappearing – it now covers less than 1/2 the area covered in the late 20th century and is melting even faster than scientists predicted;
- More extreme heat waves;
- More extensive drought, particularly in the West. Western droughts and increasing temperatures have led to a four-fold increase in major forest fires and six-fold increase in area burned in just two decades;
- Earlier spring snowmelt and a significant decline in average snowpack in the Rocky Mountains, Cascades, and Sierra Nevada ranges;
- Accelerating rate of sea-level rise and increased ocean acidity; and
- Increase in the intensity, duration, and destructiveness of hurricanes.[2]

These physical changes are already causing significant ecosystem disruptions. Increased water temperatures in coral reefs in Southern Florida, the Caribbean, and Pacific Islands have contributed to unprecedented bleaching and disease outbreaks.[3] Increased storm events, sea level rise, and salt-water intrusion have all led to a decline in coastal wetland habitats from the Atlantic Coast to the Gulf of Mexico. Already-beleaguered salmon and steelhead from Northern California to the Pacific Northwest are now challenged by global warming-induced alteration of habitat conditions throughout their complex life cycles.[4] Forest and grassland systems throughout the West have been stressed by drought, catastrophic wildfires, insect outbreaks, and the expansion of invasive species.[5] Across North America, plants are leafing out and blooming earlier;

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[2] This summary of impacts, as well as the adaptation principles and many of the case studies discussed below, including a full list of references, are drawn from Glick, P., et al., "A New Era of Conservation: Review of Climate Change Adaptation Literature" (National Wildlife Federation, 2009). (http://www.nwf.org/globalwarming/pdfs/NWFClimateChangeAdaptationLiteratureReview.pdf).

[3] Donner, S.D., Knutson, T.R., and Oppenheimer, M., "Model-based Assessment of the Role of Human-induced Climate Change in the 2005 Caribbean Coral Bleaching Event," *Proceedings of the National Academy of Sciences* 104 (2008).

[4] Janetos, A., et al., "Biodiversity," *The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States* (U.S. Climate Change Science Program and Subcommittee on Global Change Research, 2008).

[5] *Ibid.*

birds, butterflies, amphibians, and other wildlife are breeding or migrating earlier; and species are shifting ranges northward and to higher elevations.[6]

These and other changes are bellwethers for what scientists project will be even more dramatic impacts in the decades to come, even if we achieve significant reductions in our emissions of heat-trapping greenhouse gases. Some studies suggest that parts of North America will experience complete biome shifts, whereby the composition and function of a region's ecological systems change.[7] For example, boreal forest vegetation is projected to continue its spread into Arctic tundra regions at northern latitudes and higher elevations, with its current southern range possibly converting to grassland or temperate forest. The southwestern U.S. is expected to shift permanently to a more arid climate with even a modest amount of additional warming.[8]

Of particular concern is the disruption of entire ecosystems. As diverse species respond to global warming in different ways, important inter-specific connections – such as between pollinators and the flowers they fertilize, or breeding birds and the insects on which they feed – will be broken.[9] Decoupling of such relationships among species can have disastrous consequences. For example, research on the Edith's checkerspot butterfly (*Euphydryas editha*) in California revealed a climate-driven mismatch between caterpillar growth and the timing of its host plant drying up at the end of the season.[10] Observations of the species in the southernmost portions of its range have shown that during periods of extreme drought, or in low snowpack years, caterpillar food plants were already half dry by the time the eggs hatched. This reduction in forage quality led to high extirpation rates among those populations.

The ecological impacts associated with climate change do not exist in isolation, but combine with and exacerbate other stresses on our natural systems. Leading threats to biodiversity include habitat destruction, alteration of key ecological processes such as fire, the spread of harmful invasive species, and the emergence of new pathogens and diseases.[11] The health and resilience of many of our natural systems are already seriously compromised by these "traditional" stressors and changes in climate will have the effect of increasing their impact, often in unpredictable ways. The loss and fragmentation of natural habitats due to the development of roads, buildings, and farms is especially worrisome because it hinders the ability of species to move across the landscape to track favorable climatic conditions.[12]

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[6] Parmesan, C., and Galbraith, H., Observed Impacts of Global Climate Change in the U.S. (Pew Center on Global Climate Change, 2004).
[7] IPCC, 2007a.
[8] Solomon, S., et al., "Irreversible Climate Change Due to Carbon Dioxide Emissions," *Proceedings of the National Academy of Sciences* 106 (2009): 1704-1709.
[9] Root, T., and Schneider, S., "Climate Change: Overview and Implications for Wildlife," *Wildlife Responses to Climate Change: North American Case Studies* [S. Schneider and T. Root (eds.)] (Island Press, 2002).
[10] Parmesan, "Climate and Species' Range," *Nature* 382 (1996): 765-766.
[11] Wilcove, D.S., et al., "Quantifying Threats to Imperiled Species in the United States," *BioScience* 48 (1998): 607-615
[12] Ibañez, I., et al., "Predicting Biodiversity Change: Outside the Climate Envelope, Beyond the Species-area Curve," *Ecology* 87 (2006): 1896-1906.

As noted above, the IPCC concluded in its most recent assessment of the science that as many as a million species of plants and animals around the world could be threatened with extinction between now and 2050 if we do not implement meaningful steps to address the problem. This unprecedented threat to our natural world recently led 612 leading experts in the biological sciences to write to Congress urging enactment of a large-scale dedicated funding mechanism to enable natural resources managers to safeguard natural resources from climate change impacts. *See* Appendix C.

III. WHEN NATURE THRIVES, AMERICA THRIVES

I would like to talk today about how Congress can face up to this dire situation and not only help wildlife and wildlife habitats survive global warming, but help them thrive.

As goes America's wildlife, so goes America. The health of wildlife and natural ecosystems is closely linked with the health of the economy, human health and safety and quality of life.

Can we weather the storm on the horizon if we do not pay careful attention to the warnings and alarms that are plain to see from the wildlife around us? Can we have safe communities and healthy families if we fail to protect the natural world we depend on for clean water, abundant food, flood protection and a strong economy? What will it be like for our kids and grandkids to grow up in America if we allow the majesty and vitality of America's great outdoors to be spoiled on our watch?

As naturalist Rachel Carson emphasized in her timeless book *Silent Spring*, wildlife provides the warning signal that enables us to take action on threats to our environment before it is too late. If we pay attention to what is happening to wildlife today from carbon emissions, we see early signs of "system failure" in many regions. For example, as the ocean warms and becomes more acidic and coral species begin to decline and disappear, we see signs of a potential breakdown in the very marine food web that people depend upon for their sustenance. As polar bears lose their hunting grounds and begin to experience reproductive failures, we see signs of a potential breakdown in an entire way of life that has evolved among the tribal people of the Arctic for many centuries. The dramatic changes we see in the tropical seas and the Arctic signal the potential for equally dramatic changes in the temperate zones if we fail to take immediate action.

In addition to serving as an important sentinel of change, wildlife serves as the foundation of rural economies throughout our nation. Fishing, hunting, hiking and other outdoor activities that rely on healthy wildlife and ecosystems contribute $730 billion to the U.S. economy. They also support nearly 6.5 million jobs and generate $88 billion in state and national tax revenue.[13] Continuation of this economic activity at or near current

[13] *The Active Outdoor Recreation Economy: a $730 Billion Contribution to the U.S. Economy* (Outdoor Foundation, 2006).

levels depends on a commitment by Congress to invest in safeguarding wildlife and ecosystems from climate change impacts.

These numbers barely scratch the surface of the vast array of ecosystem services that are vital to human existence.

Wetlands provide an important example of how the economy, human health and safety and quality of life depend on conservation. Wetlands provide essential flood control, water purification, ground and surface water supply, and wildlife habitat values. Using a very conservative estimate of $10,000 in value of benefits per acre,[14] the remaining 100 million acres of wetlands in the lower 48 states are worth roughly $1 trillion. Although the extent of overall damage to wetlands that will result from global warming is unknown - this will be determined in significant part by the actions of Congress – global warming is projected to dry up or degrade up to 90 percent of the wetlands in the nation's prairie pothole region alone.[15]

The economic benefits of forests provide another reason for urgent action to confront climate change. The U.S.'s 520 million acres of forests[16] are valued at more than $60 billion for the annual benefits they provide, such as water filtration and storage, flood protection, timber production and recreational opportunities.[17] As the climate has warmed, the area burned by fires in the western U.S. has increased six-fold and fire-fighting burdens have sky-rocketed; annual federal expenditures to prepare for and fight fires in 2007 were $3 billion, a three-fold increase from 1999.[18] The major increase in fires accelerates erosion, lowers water and air quality, and decreases timber yields, among other impacts.

Large-scale investments in forest conservation, both through strategic acquisitions and through enhanced management and restoration measures, would pay enormous dividends. For example, water utilities that rely upon surface water depend heavily on investments in forest conservation to avoid the much higher expenses associated with water treatment facilities. One study showed that for every 10 percent increase in forest cover in the source area, utilities saved *20 percent* of their water treatment and chemical costs.[19]

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[14] Costanza, R. et al. 1997. "The Value of the World's Ecosystem Services and Natural Capital." Nature 387: 253-260.

[15] Anderson, M.G., and Sorenson, L.G., "Global Climate Change and Waterfowl: Adaptation in the Face of Uncertainty," *Transaction of the 66th North American Wildlife and Natural Resources Conference* (Wildlife Management Institute, 2001): 300-319.

[16] Pimentel, D., et al., "Economic and Environmental Benefits of Biodiversity," *BioScience* 47 (1997): 747-757.

[17] Krieger, D.J., *The Economic Value of Forest Ecosystem Services: A Review* (The Wilderness Society, 2001).

[18] Government Accountability Office (GAO), 2008. Wildland Fire Management: Federal Agencies Lack Key Long- and Short-Term Management Strategies for Using Program Funds Effectively. Statement of Robin M. Nazzaro Before the Subcommittee on Interior, Environment, and Related Agencies, Committee on Appropriations, House of Representatives, February 12, 2008. GAO-08-433T.

[19] Ernst, C., et al., *Protecting the Source: Conserving Forest to Protect Water* (American Water Works Association, 2004). This statistic applies only to source areas with less than 65 percent forest cover.

Similarly, large-scale investments in restoring coastal and floodplain habitats to buffer against sea level rise and intensified storms would have substantial economic and human safety benefits. During the 1980s, there were just three weather-related natural disasters with losses of $1 billion or more. The number rapidly increased to 26 during the 1990s, and another 26 between 2000 and 2006 alone.[20] Investments in buffer zones and continuous vegetative corridors along rivers and streams, on barrier islands and along coastlines not only protect and strengthen critical ecosystems, but also reduce the amount of property at risk from catastrophic damages due to storms and sea-level rise. Such investments also promote land uses, such as recreation and agriculture, which are more compatible with storms and natural hazards. Moreover, they often promote greater groundwater infiltration, which helps moderate the impacts of intensified droughts and low flow periods that are expected to accompany climate change.

Increases in weather-related disasters associated with global warming carry more than an economic cost. The perils of weather-related disasters are exemplified by Hurricane Katrina, which caused one million evacuees to flee and more than 1,800 deaths.[21] Investing in restoring coastal wetlands and other buffers against sea level rise and intensified storms will be essential to protecting these and other communities.

Safeguarding our natural resources is also essential for achieving our nation's greenhouse gas reduction goals. A key part of these goals will be met through sequestering carbon in forests and grasslands – but only if those natural systems are sufficiently resilient to withstand the intensified floods, droughts, pests, disease and other stresses that accompany climate change.

Clearly, we must act now to safeguard our natural resources not just for aesthetic and moral reasons, but also because they serve as the foundation of our very lives and of much of our economy. What we do today will determine the well-being of our children and grandchildren, and the economic security of our country.

IV. LEGISLATION CAPPING GLOBAL WARMING POLLUTION MUST BE "CLEAN, GREEN, AND FAIR."

As the broad agreement among scientists continues to tell us, to avoid the worst effects of global warming we must limit additional warming to no more than 2 degrees

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Incomplete data prevented any conclusions regarding the benefits of adding additional forest cover to areas that already have 65 percent or greater forest cover.

[20] U.S. Climate Change Science Program (CCSP), 2008. *Weather and Climate Extremes in a Changing Climate. Regions of Focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands*. T.R. Karl, et al. (eds.). Department of Commerce, NOAA's National Climatic Data Center, Washington, D.C., USA, 164 pp.

[21] Brown, A., "Hurricane Katrina Pummels Three States," *CNN Transcripts* (http://transcripts.cnn.com/TRANSCRIPTS/0508/29/asb.01.html, aired August 29, 2005) and Grier, P, "The Great Katrina Migration," *Christian Science Monitor* 12 (2005).

Celsius over pre-industrial levels.[22] According to the IPCC, we have a reasonable chance of meeting this objective if developed countries, such as the United States, as a whole cut their emissions by 25-40 percent below 1990 levels by 2020 and by 80-95 percent below 1990 levels by 2050.[23]

It should come as no surprise, therefore, that NWF's top priority is enactment of legislation that places mandatory caps on global warming pollution from major emitters and invests in transforming America to a new, clean energy economy. This legislation must reduce domestic global warming pollution as swiftly as possible by 2020 and by over 80 percent by mid-century in order to protect wildlife and future generations from the most destructive impacts of climate change. If designed and implemented correctly, such legislation can also provide the financial resources needed to invest in new clean energy solutions, create millions of new jobs, protect the public from rising energy prices, *and* safeguard America's natural resources from the impacts of global warming.

The best means to accomplishing these goals is by implementing an economy-wide cap and invest system that is "clean, green, and fair." Through such a system, the nation's biggest polluters should be required to promptly and steadily reduce their pollution levels. Revenue generated from polluters paying for emission allowances can be directed to meet our moral obligation to solve global warming, facilitate a clean energy transition that is economically fair to families in all regions of the nation, protect our natural resources from the impacts of a warming climate, and take care of communities and those who are least able to respond to the changes that are coming. While the cap sets out a path to reduce global warming pollution, the choices of how we invest the financial resources generated from such a system will also determine whether we solve the climate crisis and create a low-cost, productive, and sustainable transition to a clean energy economy.

National Wildlife Federation believes that the Chairman's mark of the Clean Energy Jobs and American Power Act provides a clean, green and fair framework.

A. Investing in a Clean Energy Future

We must remember that the challenge of combating global warming also brings enormous opportunity. The shift to a clean energy economy will put millions of Americans, including those most in need, back to work in the face of our deepest economic crisis since the Great Depression. Resources generated by a cap and invest system can ensure that this opportunity is realized.

To meet the challenge of global warming, we must first transform the ways America and the rest of the world produce and use energy, achieving dramatic improvements in

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[22] This temperature increase is equivalent to 3.6 degrees Fahrenheit over pre-industrial levels or about 2 degrees Fahrenheit over the amount of warming that has already occurred.

[23] IPCC, *Climate Change 2007. Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Houghton, J., et al. (eds.)] (IPCC, 2007b).

the efficiency with which we use energy in our homes, businesses, and vehicles and moving to clean, renewable energy, like wind and solar power. A significant share of revenue generated by new global warming legislation must be directed toward overcoming technological or market obstacles, and toward creating new and stable jobs in key sectors, including green buildings and other efficiency improvements. These investments also must focus on building an updated smart electric grid; generating wind, solar, and geothermal electricity; designing carbon capture and storage; and transforming the transportation sector (with low carbon fuels, electric automobiles, and reduced vehicle miles traveled). And new incentives must be made available to encourage American farmers and land owners to assist in combating global warming by enhancing the sequestration of carbon on their private lands with healthy forests, sustainable agriculture, and other actions.

B. Investing in our Green Conservation Legacy

Of an equal imperative is the need to protect America's great, green legacy of conservation. As I elaborate further in the next section of this testimony, we need to ensure that our critical natural resources are protected from the growing impacts of global warming. Any solution that puts a price on global warming pollution must also use some of the resources it generates to repair the current and future damage caused by such pollution. Financial commitments are needed, and will continue to be needed, to protect and restore the land and water that people and wildlife depend on, including freshwater ecosystems, forest lands, and coastal ecosystems, so that they are more resilient. Federal climate legislation must include sufficient funding to empower natural resource managers at the national, state, local and tribal levels to identify, prioritize and protect ecosystems at risk from global warming. The investment must be dedicated, not appropriated, so that resource managers have a guaranteed source of funding for these critically important projects. This absence of fully dedicated funding was a key weakness of the American Clean Energy and Security Act passed by the House, and so the National Wildlife Federation strongly supports the provisions in the Clean Energy Jobs and American Power Act that remedy this problem.

C. Investing in Fair Solutions

We know that creating a program to reduce global warming pollution will, over time, drive major, positive changes in our homes, communities and workplaces. During this transition we need not only to protect individuals and communities from potential short-term financial hardship that could result from these changes, but also to promote the technology, training, and other investments needed to ensure that the transition brings new jobs and opportunities to every community. Long-term investments need to provide communities with new employment and educational opportunities, including urban and rural worker training programs. These will create the work force needed to build the new clean energy infrastructure.

Funding from a cap and invest program also should ensure that the economic impacts of the legislation are fair for families and consumers from all regions of the nation, and

we applaud the provisions in the Clean Energy Jobs and American Power Act that do precisely that. Because low- and moderate-income households spend a larger share of their budgets on energy and other basic costs of living than others, we must make sure that any energy-related price increases are cushioned by direct consumer rebates that effectively and efficiently reach households and workers in need. Investment in energy efficiency also is crucial – it is one of the most effective means of protecting all consumers from rising energy prices because it keeps money circulating in American households and communities rather than allowing it to flow overseas to import more polluting fuels.

Our responsibility to solve global warming in a fair and equitable manner does not stop at our borders. In addition to acting at the domestic level, the U.S. must also become an international leader and forge a new climate treaty in the Copenhagen climate negotiations. Successfully resolving the global warming crisis at the international level is dependent, in part, on substantial funding for adaptation in developing countries, which are the most vulnerable to climate change impacts. The United Nations Development Program (UNDP) recently estimated that through 2016 developing countries will require approximately $86 billion per year in new adaptation funding to cope with the impacts of climate change.[24] The U.S. should lead the way toward a global solution to climate change by providing developing countries with measurable, reportable, and verifiable financing for clean energy technologies, forest conservation, and adaptation efforts that address unavoidable climate impacts. The National Wildlife Federation strongly supports the Clean Energy Jobs and American Power Act's policy measures to address these challenges and we hope to work with Congress to strengthen its commitment of funding to support these policies.

V. SAFEGUARDING NATURAL RESOURCES IN THE FACE OF CLIMATE CHANGE WILL PAY LARGE DIVIDENDS FOR PEOPLE AND WILDLIFE

A. Aggressive Action is Needed to Protect People and Wildlife from Climate Change Impacts

Conservation strategies of the past century have been carried out under the assumption that climate, weather patterns, species and habitat ranges, and other environmental factors will (or should) remain consistent with historical trends. Today, much of the environmental progress that has been achieved using these strategies is at grave risk. Continuing to operate under a "business as usual" approach will likely lead to a wave of extinctions and severe degradation of the ecosystems on which both people and wildlife depend. Given current trends of global warming and human development, a new conservation paradigm must be launched. This paradigm, referred to here as natural resources adaptation, is far more ambitious than the previous approach to conservation.

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24 UNDP, "Fighting Climate Change: Human Solidarity in a Divided World," *Human Development Report 2007/2008* (UNDP, 2008) (http://hdr.undp.org/en/media/HDR_20072008_EN_Complete.pdf).

In essence, it calls for anticipating the harmful combined impacts to ecosystems of inevitable global warming and human development and using conservation measures to protect wildlife and people from those impacts.

Although the discipline of natural resources adaptation is a new one, a consensus is rapidly emerging among scientists and natural resource managers on the key steps that must be taken. In selecting conservation objectives and developing management strategies, natural resources adaptation experts recommend adhering to the following five principles:

1. **Reduce other, non-climate stressors.** Addressing other conservation challenges—such as habitat destruction and fragmentation, pollution, and invasive species—will be critical for improving the ability of natural systems to withstand or adapt to climate change. Reducing these stressors will increase the resilience of the systems, enabling them to recover from climate-related disturbances and return to a functional state.

2. **Manage for ecological function and protection of biological diversity.** Healthy, biologically diverse ecosystems are better able to withstand the impacts of climate change than depleted ecosystems. Ecosystem resilience can be enhanced by protecting biodiversity among different functional groups, among species within function groups, and variations within species and populations, in addition to species richness itself.

3. **Establish habitat buffer zones and wildlife corridors.** Improving habitat "connectivity" to facilitate species migration and range shifts in response to changing climate condition is an important adaptation strategy.

4. **Implement "proactive" management and restoration strategies.** Efforts that actively facilitate the ability of species, habitats and ecosystems to accommodate climate change—for example, beach renourishment, enhancing marsh accretion, planting climate-resistant species, and translocating species—may be necessary to protect highly valued species or ecosystems when other options are insufficient.

5. **Increase monitoring and facilitate management under uncertainty.** Because there will always be some uncertainty about future climate change impacts and the effectiveness of proposed management strategies, careful monitoring of ecosystem health coupled with management approaches that accommodate uncertainty will be required.

Conservation practitioners are already putting these principles into action. For example, we know that we must rebuild the coastal wetland complex in Louisiana if we are going to protect the people and wildlife of that region from the combined effects of sea level rise and intensified storms. Coastal Louisiana loses the equivalent of 32

football fields of land every day. If this rapid loss is allowed to continue, nearly 2 million people in Louisiana's coastal zone will be subjected to more frequent and severe flooding. Entire communities may have to be abandoned. Seafood and other natural resources critical to families across the country will be lost.

To address this threat, the National Wildlife Federation is working with state and federal agencies and other NGOs to restore this vast wetland complex. One very promising near-term opportunity is a project to restore the Bayou Bienvenue cypress swamp -- a 31,000 acre area in St. Bernard Parish and eastern New Orleans. This cypress forest once protected the community and its natural resources from storms, and with the support of Congress, it can do so again. Imagine the progress that could be made in protecting communities from storms and floods, and generating economic activity, if Congress were to use dedicated funding generated by cap-and-invest legislation to stimulate these kinds of habitat restoration projects across the country.

There are similar adaptation projects in early stages of planning and implementation in every region of country. These projects, and many others, await a substantial funding commitment from Congress to produce the conservation outcomes that the American people value and expect. For example:

- In New York, the Department of Environmental Conservation (DEC) is working with state Department of Transportation (DOT) on redesigning the standards for culverts under roadways across the state to take into account intensified rainfall events and to improve the connectivity of aquatic and riparian habitats. Both agencies have integrated climate change forecasts into their planning. The DEC benefits from the expanded culverts because they help reduce soil erosion, allow for sediment buildup and improve aquatic habitat; the DOT benefits because roadways are less likely to be washed away by storms.[25]

- In Massachusetts, the state is integrating principles of climate change adaptation in its ongoing watershed activities. In its Town Brook Restoration Project, agency and non-governmental organization (NGO) partners are restoring habitat and connectivity for both resident and anadromous cold water fish in Plymouth. The project entails a combination of selected dam removal, restoration of areas of natural stream bank, altering a culvert, and rebuilding a fish ladder. Anticipating the more intense rainfall events and warmer stream temperatures that accompany climate change, the state will be providing fish with more natural flow regimes as well as cold-water refugia.[26]

- Also in Massachusetts, the state is undertaking a comprehensive assessment of the climate change vulnerability of its priority wildlife habitats to understand which wildlife species and habitats will be at increased risk, and where future conservation actions will be most important. Building on the state's federally-approved wildlife action plan, this

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[25] Federal Highway Administration, *Integrating Climate Change into the Transportation Planning Process* (ICF International, 2008).
[26] Massachusetts Department of Fish and Game, "Adapting to Climate Change" (http://www.mass.gov/dfwele/climatechange.htm).

vulnerability assessment is being used by state agencies and private conservation partners to alter priorities for conservation land acquisitions.[27]

- In California's San Francisco Bay, efforts to restore salt marsh habitat on abandoned salt evaporation ponds have been revised to take projected sea level rise into account. The U.S. Fish and Wildlife Service (FWS) is restoring these wetlands with the aim of not only providing habitat for migratory birds and endangered species but also protecting low-lying communities from flooding.[28]

- The Western Governor's Association (WGA) has recognized that healthy ecosystems and abundant wildlife are important economic drivers and that in the face of climate change the survival of many of the West's most cherished wildlife species will depend on protecting crucial habitats and ensuring connectivity among these habitats. To that end, it has carried out a multi-state planning effort to identify important wildlife corridors, and has established a Western Wildlife Habitat Council to coordinate and manage implementation of the wildlife corridors initiative.[29]

- On the southern tip of Florida, bleaching events in the coral reef have been increasing in number and severity due in part to warming of ocean waters. The recovery plan outline for the threatened elkhorn and staghorn coral calls for new measures to prevent land-based pollution will make corals far less susceptible to such bleaching.[30]

- In North Carolina, agencies and NGOs such as the Nature Conservancy are responding to and anticipating a significant loss of lowland wetlands due to a combination of land subsidence and sea-level rise in the Albemarle-Pamlico region. They are installing water control structures to manage water levels, to enhance marsh accretion and planting flood- and salt-tolerant plant species such as native bald cypress. In addition, they are constructing native oyster reefs along the shorelines to reduce wave energy and create new shallow-water habitats.

- In Maryland, the state has established a "Living Shorelines" program that uses sand-loving plants to anchor Chesapeake Bay coastal habitats in the face of sea level rise. Maryland changed its laws last year to encourage more communities to build this kind of project instead of hardened bulkheads, and awards $1.5 million a year in no-interest loans for such projects.[31] This is a departure from the costly and ecologically destructive "armoring" approach to sea level rise, which relies on man-made sea walls or rock piles that has made the Chesapeake look like a "high-sided swimming pool" in some places.[32]

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[27] Ibid.
[28] FWS, "Many Partnerships Involved in South Bay Restoration," *Tideline: San Francisco Bay National Wildlife Refuge Complex* 23 (2003).
[29] WGA, Wildlife Corridors Initiative (Western Governors' Association, 2008).
[30] Grimsditch, G.D., and Salm, R.V., Coral Reef Resilience and Resistance to Bleaching (The World Conservation Union, 2005).
[31] Maryland Department of Natural Resources, "Living Shorelines" (http://shorelines.dnc.state.md.us/living.asp).
[32] Fahrenthold, D.A., "Eco-bills Come Due at Bay's Beaches," *The Washington Post*, March 19, 2009, p. A01.

- In Washington, university scientists and state agencies are working with Washington State's Watershed Planning Program to help locally-based watershed managers anticipate projected shifts in annual streamflow patterns and thereby reduce flood damage and improve stream health.

- In Oregon, the Forest Service and others modeling future climate conditions and vegetative change to project potential impacts of climate change on natural systems in the Rogue River Basin of Oregon. They project that reduced snowpack, rising temperatures, and the occurrence of drought will dry out soils and make forests more susceptible to wildfires, leading to decline in the production of forest product. As a result, managers are considering adjusting forestry management practices and post-fire logging activities, as well as adopting policies that integrate fuel reduction efforts with small scale biomass energy production.

- In Virginia and at least fourteen other states, state wildlife agencies have brought together stakeholders at workshops to update their State Wildlife Action Plans to ensure that they account for inevitable climate change.

As the above examples make clear, natural resources conservation leaders across the country are helping to launch a new paradigm for conservation, one that helps America safeguard its natural assets from the unprecedented threat of human-caused climate change. However, the financial resources available for this work have been quite limited, especially when compared to investments made in the physical sciences and in investigating the causes and mitigation of climate change.

The recently released report on adaptation by the U.S. General Accountability Office highlights how the absence of any clear national strategy, and the lack of any funding mechanism to carry out such a strategy, has hindered progress in safeguarding wildlife and people from climate change impacts. GAO's survey of federal, state and local officials revealed that, despite a broad recognition of the gravity of the climate change threat, non-adaptation projects generally receive higher priority attention than adaptation efforts from agencies due to the long-term nature of the problem and the absence of any mandate to take action. In addition, agencies are constrained in their ability to take action due to the shortage of local climate projections and other site-specific data. Another key challenge is the general absence of any delineation of roles and responsibilities.[33]

To address these substantial gaps in capacity and policy direction and to put in place a new paradigm of natural resources adaptation , Congress must make large-scale investments in the design and implementation of a national adaptation strategy as well as region-specific natural resources adaptation plans.

B. Natural Resources Adaptation Requires Strong Investments, but the Benefits Greatly Exceed the Costs

[33] *Climate Change Adaptation: Strategic Federal Planning Could Help Government Officials Make More Informed Decisions* (US GAO October 2009).

In May 2008, the Senate considered S. 3036, the Climate Security Act (CSA), which earlier had been approved by the Environment and Public Works Committee. Among other features benefiting wildlife and natural resources, the CSA provided an average of roughly $7 billion annually over its first two decades for natural resources adaptation in the U.S. In contrast, H.R. 2454, the American Clean Energy and Security Act passed by the House this past June, provides an average of roughly $1.7 billion over the same time period. We have not yet had the opportunity to estimate the dollar value of the investments contemplated in S. 1733, but we anticipate that it will be slightly lower than in the House bill. Of these three amounts, NWF and its conservation partners firmly believe that last year's Senate bill provided an appropriate level of investment for protection of U.S. natural resources threatened by climate change, given the numerous other pressing demands for those proceeds.

Although no study has yet tabulated the full cost of conserving species and ecosystems in the face of climate change, it is clear that the cost will be far greater than $7 billion annually. For example, a series of studies on the costs of restoring the Everglades, Chesapeake Bay and Great Lakes suggests that the cost over five years ranges from at least $10 billion to $20 billion each.[34] Another study found that $350 billion would be needed over 30 years to make up a viable habitat conservation network across the lower 48 states (using conservation easements to acquire interests in land).[35]

Although most of the conservation actions considered in these studies would build ecosystem resiliency in the face of climate change, it should be emphasized that these studies did not specifically take into account the impacts of climate change in arriving at their cost estimates.[36] Considering that climate change adds a large stressor on top of existing stressors, Congress should assume that these cost estimates significantly understate the overall costs of conserving ecosystems in the face of climate change.

Despite this large price tag, Congress must recognize that, as discussed above, the economic benefits of conservation reach into the hundreds of billions annually and therefore far exceed the costs. In essence, healthy, well-functioning ecosystems provide the foundation for a healthy economy.

Some will argue that Congress should postpone to another day the funding of natural resources adaptation. This would be a foolish approach. As each day passes where conservation action is delayed, the costs of inaction continue to mount. More and more

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[34] CRS Report for Congress: Ecosystem Restoration in the Great Lakes: The Great Lakes Regional Collaboration Strategy (January 30, 2008).

[35] Casey, F., et al., *The Cost of a Comprehensive National Wildlife Habitat Conservation System* (Defenders of Wildlife, 2008). The study drew from a sample of maps prepared by state and fish wildlife agencies in developing State Wildlife Action Plans, which are largely oriented toward terrestrial habitats.

[36] Presumably, most adaptation measures will use existing conservation tools and approaches, but climate change information will necessitate changes in the timing, location and scale in which they are employed. Natural resources adaptation also will inevitably require the development of novel tools and approaches. Unfortunately, little federal research and development funding to date has gone into adaptation planning and implementation. Substantial public investments are needed to spur innovation in this area.

species spiral toward extinction and ecosystems become further degraded. Over time, the options for restoring them will become increasingly reduced and more costly.

C. A Dedicated Funding Mechanism in Climate Legislation is Essential to Meeting the Challenge of Safeguarding Wildlife and Natural Resources from the Impacts of Climate Change

As noted above, National Wildlife Federation and its conservation partners are extremely pleased that S. 1733 provides a permanent source of dedicated funding, using pollution allowances, for natural resources adaptation. We are also pleased that this dedicated funding is broadly distributed among federal, state and tribal natural resources agencies.[37] These agencies already have the program delivery infrastructure in place to quickly put natural resources adaptation projects on the ground. In addition, with their well-established cooperative grant programs, they are well-positioned to distribute funds to private landowners and companies that have historically played leadership roles in natural resources protection and restoration. These private sector enterprises will provide crucial environmental jobs, especially in rural areas of the country where local economies depend heavily on a healthy natural resources base.

In contrast, H.R. 2454, passed by the House in June, provides a dedicated source of funding only to the states. Under the House bill, federal agencies must rely upon the annual appropriations process to meet their obligations to safeguard wildlife and natural resources from the impacts of global warming. Adopting this approach in the Senate would be a mistake. First, the amounts that would potentially be available through the appropriations process would not come close to meeting the scope of the challenge. Second, natural resource adaptation projects are necessarily multi-year endeavors, requiring long-term planning and predictable investments. Finally, this nation has long adhered to the principle of "polluter pays." Thus, in determining how to address the harmful impacts of global warming, it is entirely appropriate to use dedicated funding generated by those who emit global warming pollution into the atmosphere. In allocating proceeds of the sale of global warming pollution allowances, Congress should highlight how these proceeds are addressing both the causes and effects of this pollution.

Finally, we are pleased that S. 1733 provides funding to general adaptation programs such as water utility adaptation, wildfire reduction and coastal infrastructure protection. We also are pleased that the bill recognizes the importance of using natural systems to provide buffers against storms and floods and to provide filtration services for drinking water utilities. However, Congress should resist any temptation to create a single dedicated fund for these types of adaptation as well as natural resource adaptation. Natural resources adaptation requires a distinct approach and a distinct funding source.

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[37] As sovereign nations and managers of 95 million acres of land, Indian tribes will play a crucial role in helping wildlife and natural resources survive climate change.

D. The Broad Array of Groups that Have Mobilized in Support of the Safeguarding Natural Resources Agenda Shows its Urgency and Importance

As noted above, NWF participates in a diverse coalition of roughly 600 conservation and sporting organizations that have joined in an effort to secure large-scale dedicated funding for wildlife and natural resources in federal climate change legislation. Recently, conservation and sporting organizations from every state in the nation sent two letters to the Senate urging enactment of comprehensive climate and energy legislation that reduces greenhouse gas emissions and provides dedicated funding for natural resources adaptation. *See* Appendices A and B. As these letters make clear, our coalition recognizes the crucial importance of ensuring that spending of natural resource adaptation funds is done strategically. We recommend that all spending be guided by national and state-level adaptation strategies, and that such strategies be integrated with large-landscape conservation plans such as State Wildlife Action Plans. In addition, such strategies must be based on sound science and developed with broad public participation and input.

In summary, NWF urges Congress to cap and reduce pollution at levels dictated by science to avoid dangerous climate change, and to provide large-scale dedicated funding to safeguard wildlife and natural resources from climate change impacts. Thank you again for the opportunity to testify today.