Global Warming Wildlife Survival Act (S.2204)

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Team Members: Adelia Bahena-Cuevas, Siobhàn Burns, Nathalie Chalmers, Nathan Chan, Marci Fiedler, Myriame Gabay, Jennifer Haller, Elyse Hottel, Carolyn Langford, Erika Leung, Monica Miller, & Ariani Wartenberg

Advisors: Matthew Palmer & Tanya Heikkila

Columbia University School of International and Public Affairs
Master of Public Administration in Environmental Science and Policy

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Executive Summary

Climate change and its anticipated effects on humans, wildlife, and the greater environment pose some of the greatest threats to the world today. In particular, climate change has significant impacts on wildlife populations and their habitats, threatening many species with extinction. This is significant ethically because we often place an intrinsic value on the existence of wildlife and their habitats. More important, however, is the grossly underestimated economic value that biodiversity provides to humankind.

Within the United States, the Global Warming Wildlife Survival Act (S. 2204) is the first legislation that aims to address the threats to wildlife populations instigated by rapid climate change. The Act includes provisions for terrestrial, marine and Great Lakes ecosystems, to be immediately instituted on all federal lands within the country. The Act will establish a national framework, as well as coordinate, fund, and encourage research designed to mitigate and prevent the negative impacts of climate change on wildlife species.

The Act mandates the establishment of two Advisory Boards, responsible for terrestrial and aquatic issues, staffed by conservation and development experts to communicate with relevant state, local, and national agencies, in order to develop a national strategy to achieve the Act's goals.

A Global Warming Wildlife Survival Science Center is also mandated to coordinate research and development of new strategies on a national scale, as well as educate the public on relevant topics. Research and conservation findings from the Science Center will then be applied through regional satellite offices, allowing for local specificity. Given the nature of climate change, local specificity is important in order for solutions to be adapted to particular ecosystems. The Science Center will also oversee a Grants Program and a Special Imperiled Species Program. The Grants Program is designed to promote further research and innovations to improve current strategies. The Special Imperiled Species Program will also be established, which focuses its efforts on assisting species that are already deemed threatened by climate change.

In order to execute the mandated elements of the Act, our team adopted a decentralized organizational framework to allow for regional

Coral reefs are subject to a number of climate change threats, including elevated sea surface temperature and ocean acidification. Coral bleaching events have increased across the globe since the 1980s, occurring more often and in more areas. These bleaching events are a direct result of increased sea surface temperatures caused by anthropogenic climate change. Increasing acidification can also lead to decreased coral calcification. Under acidified conditions, the reef will either continue to reproduce with reduced skeletal density, making it more susceptible to breakage, or use more energy for calcification and less for reproduction. In either case, the result is a loss of productivity in the reef system. The losses of corals themselves also harm other species that use the reefs as a habitat or nurseries (Jokiel, 2004).

specialization and adaptive program management. Unlike a centralized framework, this strategy will allow for better implementation of the Act by accounting for regional issues. During the first fiscal year, the main priorities of the Act are focused on the establishment of the program's structural framework, and the integration of the newly mandated program elements into the existing federal administrative structure.

Over the course of this first year, an institutional framework and structure will be established in order to develop a budget and staffing plan that will ultimately facilitate the achievement of the long-term goals of the Act. Monitoring and feedback mechanisms will be developed as well, in order to ensure that these long-term goals are facilitating the ultimate goal of the national strategy, to protect and conserve wildlife in the face of climate change.

Introduction

The history of wildlife protection in the United State has been a long, complicated affair. When European settlers first colonized the United States, the land was teeming with wildlife, but with the influx of settlers came a new attitude towards nature. Because the wildlife populations seemed so abundant at the time, it was believed that their numbers could never be exhausted. However, we quickly learned that humans can cause the extinction of an entire species. Passenger pigeons (Figure 1), once the most common bird in North America, were driven to extinction by 1914 as a result of overhunting and habitat destruction. The American Bison almost suffered the same fate in the 1800s under a plan sanctioned by the United States government. Fortunately, man has come to realize the value of wildlife protection. In 1872 Yellowstone National Park was established for the protection not only of wild lands, but for the native plants and animals that inhabit the park area. As the environmental movement gained popularity in the 1960s and 1970s, the preservation of wildlife gained national attention.

The Endangered Species Act was passed in 1973 to aid wildlife threatened by extinction as a "consequence of economic growth and development untendered by adequate concern and conservation." Today, we face a new consequence of economic growth: **climate change**. Anthropogenic activity, primarily the combustion of fossil fuels, has increased the amount of greenhouse gases present in the atmosphere, effectively changing the Earth's climate (Intergovernmental Panel on Climate Change, Working Group II, 2007). Researchers project that 15-37% of species will be on the verge of extinction by 2050 due to climate change and global warming (Thomas, 2004). The consequences of losing these species would be significant. Not only would we lose animals important to the hunting and fishing industries, such as salmon, but we would also forego the ecosystem services provided by wildlife and their habitats, such as flood control and pollination.

Up to this point, species protection efforts in the United States have largely been geographic and case-specific. The cost of conservation programs, concerns over property rights, and the political atmosphere surrounding conservation efforts have all contributed to the lack of a national programmatic framework for the preservation of

The Sockeye Salmon of the Pacific Northwest, historically threatened by overfishing and habitat destruction, are currently facing an increased threat from global warming. Global warming is causing decreased snowpack, as well as an earlier and faster seasonal snowmelt. This leads to flooding events that can strip breeding streams of the small pebbles necessary to build salmon egg nests. Additionally, as glacial runoff is decreased, the river temperatures may rise to a point that salmon cannot survive the upstream migration, or that the freshly laid eggs will die due to inadequate oxygen levels (US Forest Service, 2008).

wildlife and their habitats. However, as the threat of climate change becomes a reality, the time has come for a comprehensive wildlife protection strategy.

This report is an analysis of the implementation plan for the Global Warming Wildlife Survival Act (Act) S.2204, introduced October 18, 2007 by Senators Sheldon Whitehouse (D-RI) and Barbara Boxer (D-CA), "to assist wildlife populations and wildlife habitats in adapting to and surviving the effects of global warming." The Act would establish a national strategy for assisting wildlife in adapting to climate change and a research framework for studying the effects of climate change on wildlife. In this report we have examined the scientific basis for the proposed legislation and potential management solutions to the problem, offering a detailed operational plan for the implementation and integration of the Act into the existing federal administrative structure.

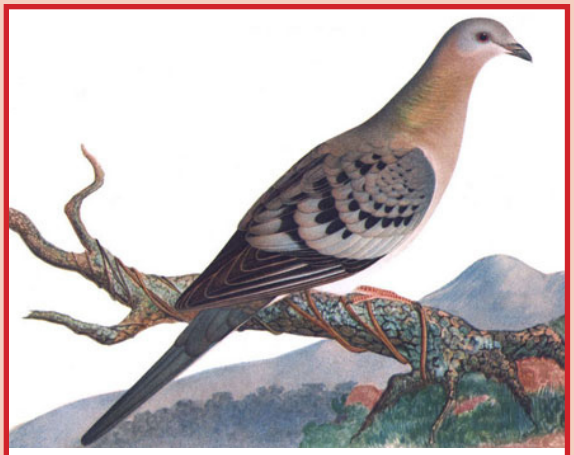

Figure 1. Passenger Pigeon
Driven to extinction in 1941

Environmental Problem

Climate Change

While habitat destruction and overhunting have historically been the main threats to wildlife populations, in the 21st century, they face an even greater danger: **climate change**. The predominant effect of climate change, global warming, refers to the change in average annual temperature and related climatic conditions across the planet. Human actions, such as the combustion of fossil fuels, affect climate by increasing the amount of greenhouse gases present in the atmosphere (IPCC, Working Group II, 2007). These gases, including carbon dioxide, trap heat and cause the atmosphere to warm (Figure 1). During the last century, Earth's temperature has risen by 1.5°C and scientists predict that global temperatures will continue to increase another 2-6°C by 2100 (Houghton, 1997).

In most areas of North America, the annual average warming is likely to exceed global average warming. The areas of greatest warming will likely be in Northern latitudes during the winter and in the Southwest during the summer. In the United States, precipitation is also likely to increase in the Northeast and decrease in the Southwest, and the length of snow season and the depth of snowpack are likely to decrease throughout the entire country (Christensen, 2007). Global warming, however, is only one symptom of the process of climate change that will have a negative effect on wildlife and their habitats. Changes in climate will also result in increased frequency and intensity of extreme weather events such as tornadoes, droughts, and floods.

Elevated concentrations of carbon dioxide are also causing the acidification of the oceans. Ocean acidification occurs when carbon dioxide reacts with calcium in the seawater, producing carbonic acid. As the concentration of carbon dioxide in the atmosphere increases, the amount of carbonic acid in the water also rises, increasing the acidity of the oceans (Caldeira, 2003).

Effects on Wildlife

Changes in climate patterns observed over the last century are already affecting wildlife

Wolverines are small carnivorous mammals of the weasel family that thrive in northern and alpine habitats in the northern United States and in the Rocky Mountains (The Wolverine Foundation, 2008). Due to their relatively large size and high position in the food chain, they require large prey populations and expansive habitat areas (Primm & Clark, 2002). Human activities have led to habitat conversion and fragmentation, which limit viable habitat area and threaten the wolverines' ability to survive. Global warming and climate change are likely to exacerbate these processes by further decreasing the wolverine's natural habitat (Tomasik & Cook, 2004). Currently, the species has been identified as endangered in Canada, but is not listed under the Endangered Species Act in the United States despite recurrent petitions for its inclusion (USFWS, 2008).

worldwide. Anthropogenic greenhouse gas emissions have altered the natural patterns of global warming and cooling, causing reduced capacity for ecosystems to adapt to changes (Harley, 1999; Houghton, 1997). Because the rate at which climate change will continue to occur is still uncertain, it is difficult to predict whether species will be able to adjust their ranges and behaviors fast enough to account for these changes (IPCC, Working Group II, 2007). In its latest report, the IPCC Working Group II stated that 20-30% of plant and animal species assessed are likely to be at risk of extinction if global average temperatures increase by more than 1.5-2.5°C (IPCC, Working Group II, 2007).

Some of the specific ways in which species are affected by climate change and thus at risk for extinction include the following:

- **Changes in species distribution and genetic traits**: Over the past century, scientists have observed changes in both the distribution and phenotypic variation, or changes in genetic traits, in a substantial proportion of species. Research has found that climate change is a likely contributor to the majority of these changes (Parmesan, 2006).
- **Shifts in species' range to higher latitudes and altitudes**: In North America, scientists expect terrestrial species' ranges to shift to higher latitudes and altitudes as temperatures continue to rise (IPCC, 2002). At the same time northern-range boundaries are likely to diminish, increasing species' risk of extinction (Parmesan, 2006). Polar species in the Arctic, such as caribou (Figure 2), and species occupying alpine habitats are especially at risk because they can migrate no further.
- **Habitat fragmentation and a lack of migration corridors**: Under warming climate conditions, species will need to move to more favorable habitats (IPCC, 2002). In Alaska, tundra will likely disappear from the mainland, leading to a loss of crucial habitat for migratory waterfowl and mammal breeding. Other unique ecosystems such as prairie wetlands, coastal salt marshes, and arid landscapes are especially vulnerable to climate change. Changes to these landscapes are likely to occur faster than species are capable of adapting (IPCC, 2002).

Figure 2. Caribou
Caribou and other arctic species are expected to be especially threatened by global warming.

- **Timing of seasonal events, such as migration, is expected to change**: The change in the timing of seasonal events can lead to mismatches, such as the arrival of migrating species after the availability of their food sources (IPCC, 2002). Early spring arrivals of many species of birds and insects have already been observed (Parmesan, 2006).

- **Warming of streams and freshwater bodies**: The Great Plains region is already experiencing summer water temperatures that approach lethal thresholds for freshwater fish species. In western North America, snowmelt-dominated watersheds will experience earlier than normal spring flows and reductions in overall flows, affecting freshwater aquatic species (IPCC, 2002).
- **Susceptibility to invasive species and diseases**: The northward and upward movement of pest species and diseases will also affect wildlife (Parmesan, 2006). As temperatures increase, invasive species and pests, such as the Red Imported Fire Ant (Figure 3), will expand their ranges, potentially exposing organisms to new threats and increasing competition for dwindling resources. Migration of tropical pests to new climates is more likely as the temperature ranges shift and warmer weather becomes more prevalent in northern regions (Parmesan, 2006).

Figure 3. Red Imported Fire Ants
The ranges of invasive species, like the red imported fire ant, are expanding with increased temperatures caused by global warming.

Marine habitats are uniquely affected by:

Figure 4. California Tide Pool
Coastal ecosystems, including tide pools, are experiencing rises in temperature that are proving to be lethal to many organisms inhabiting these unique habitats.

- **Rising ocean temperatures**: Waters off the coasts, including tide pools rich with biodiversity (Figure 4), have warmed several degrees over the last century (Parmesan, 2006).
- **Sea level rise**: In Louisiana, Florida, and on the Atlantic Coast of the United States, sea level rise and more frequent storm surges will lead to increased coastal erosion, coastal flooding and the intrusion of saltwater into freshwater ecosystems. Half of the coastal wetlands in North America are threatened with inundation (IPCC, 2002).
- **Ocean acidification**: Acidic ocean water is detrimental to shell-forming organisms and corals because calcium carbonate utilized for the formation of their shells and skeletons becomes less abundant under acidic conditions (NOAA, 2008).

Benefits of Wildlife Protection

Economic Value of Ecosystem Services

Wildlife is not only critical to the overall functioning of the planet, but is also a significant contributor to the economic value of the planet. Ecosystem services are undervalued because they are not included in traditional economic market systems, nor are they normally thought of in quantifiable economic terms (Costanza, 1997). In a seminal paper on the value of ecosystem services, Costanza, *et al.* identified many areas in which wildlife contributes to ecosystem services. For example:

- Insects, such as bees and butterflies, pollinate multi-million dollar crops.
- Wild fish and game contribute direct value to human food supplies.
- Wildlife species provide biological controls for other species. For example, top predators, such as wolves and mountain lions (Figure 6), are critical to maintaining white-tailed deer populations at levels that prevent overgrazing. Without theses top predators, deer populations increase dramatically and severely degrade the ecosystem (McShea 1997).

Figure 5 . Honey Bee Pollinating Cherry Blossoms
Insects, birds, and mammals provide an important ecosystem service through the pollination of orchards and crops.

Additional Value of Wildlife

A varied and diverse array of wildlife also contributes to the wealth of genetic resources available for research in developing new treatments and medications for the advancement of human health. Additionally, recreational

From the yellow-bellied marmots of the Colorado Rocky Mountains to the Hoary marmots of the Yukon's Ruby Range, this species is already feeling the effects of climate change. Hoary marmot populations are actually growing due to the unseasonably warm temperatures and related abundance of food ("Marmots in a Changing World", 2000), while the yellow-bellied marmot numbers are dwindling (Inouye, 2000). As marmots gauge when to come out of hibernation on air temperatures, researchers believe that a roughly 1.5 degree increase in average April temperatures over the last 30 years is triggering the marmots to come out of hibernation early – only to find snow still on the ground (T.H., 2000). It can often be weeks before that snow melts off, revealing the plants they need for sustenance. In the mean time, the marmots are using up their precious fat stores and in their weakened state are easy prey for predators (Gilman, 2007).

activities, including eco-tourism, hunting, and sport fishing, are often dependent on the presence of wildlife. In some cultures, wildlife even contributes to the spiritual health of the human population (Costanza, 1997).

When reflecting on the different ways we value wildlife, we must also consider the notion of intrinsic or inherent value. Loosely defined, this means that wildlife has value independent of its function or use by mankind. It simply has a right to exist on this planet, just as we do.

There is also the concept of extrinsic value which includes potential or option value, existence value and bequest value. Potential value suggests that something might have a future use to humans. An example of this would be a plant that may have yet unidentified medicinal properties. Existence value means that humans place value on knowing that something exists. For instance, many people never see a grizzly bear or a mountain lion but take pleasure in the fact that they can be found. Finally, bequest value is the idea that wildlife will continue to exist for future generations. This is the hope that our children and our children's children will continue to have the great breadth of biodiversity and the chance to see the amazing wildlife of the United States, without going to a zoo or reserve, in their time as we have now.

Failings of Current Legislation

Because the impacts of climate change are so widespread, many species of wildlife are not expected to be able to adapt to these changes without human intervention. Currently, there are no policies designed to mitigate the potentially negative impacts of climate change on wildlife and their habitats (Rohlf, 2005). Additionally, natural resource managers lack the basic information needed to make informed policy decisions about wildlife management. Without this information about specific habitats and ecosystems, all wildlife management decisions become reactionary, rather than preventative. Comprehensive monitoring systems and models to predict future changes are needed for effective management.

Figure 6. Mountain Lion
Top predators, such as mountain lions and wolves, act as keystone species, maintaining a healthy ecosystem by regulating herbivore populations.

New policies should build on the groundwork laid by past wildlife management legislation such as the Endangered Species Act of 1973 (ESA) (GAO, 2007). The ESA, however, protects species and their habitats only after their numbers have reached critically low levels. Even for species currently protected by the ESA, there is no explicit consideration for how they will be affected by climate change (Rohlf, 2005).

Global Warming Wildlife Survival Act

The purpose of the Global Warming Wildlife Survival Act (Act) is to aid wildlife in adapting to climate change. The Act requires the Secretary of the Interior to "establish a national strategy for assisting wildlife populations and habitats in adapting to the impact of global warming" (S. 2204, 2007).

The Act will provide funding for research and will establish institutional structures to create a unified national strategy that aims to assist wildlife in adapting to the changing climate by increasing resilience, defined as the ability of an organism to recover from the negative impacts of climate change. The Act, which defines wildlife as "any species of wild, free-ranging fauna including fish and other aquatic species and any fauna in a captive breeding program," is divided into three Titles to best address these issues.

Title I: Natural Resources and Wildlife Programs

Title I of the Act introduces the requirement that the Secretary of Interior establish a **National Strategy** for helping wildlife adapt to climate change. This strategy must be based on the best available science, provided to the Secretary of Interior by an **Advisory Board** (Terrestrial Advisory Board). The Terrestrial Advisory Board will be composed of ten to twenty members with expertise in a variety of disciplines, including wildlife biology, ecology, and climate change, and will also include the Director of the National Global Warming and Wildlife Science Center, as mandated by the Act.

The Secretary of Interior must consult with the Secretary of Agriculture, the Administrator of the Environmental Protection Agency, State and local agencies, as well as conservation organizations, while providing opportunities for public comment when devising the national strategy. The strategy should include goals and plans for implementation, taking into account relevant timeframes.

The national strategy will then be incorporated into all subsequent federal land management policies and plans. Since the federal government manages approximately 30% of U.S. land area (Figure 7), this provision will result in

The American pika is a small animal in the rabbit family found on talus hillsides where they hide amid the rocks for relief from heat and predators. Their densely furred bodies cannot withstand even 6 hours above 77° F temperatures without a reprieve from the heat (Grayson, 2005). Once found as low as 7,800 ft. in Yellowstone National Park, pikas cannot be found below 9,500 ft. there today, as this temperature sensitive creature has migrated upward, in response to climate change (Beever, 2003). Unfortunately, there is not much farther they can go (Brown, 1992). Since pikas do not hibernate, they must collect enough food stores in the short summer months to survive the long winters. Warm temperatures force them to retreat to their cool rock dens, limiting vegetation gathered (Martens, 2005). Because pikas have a limited half-mile radius range and such a specialized habitat, their ability to adapt to climate change is extremely limited.

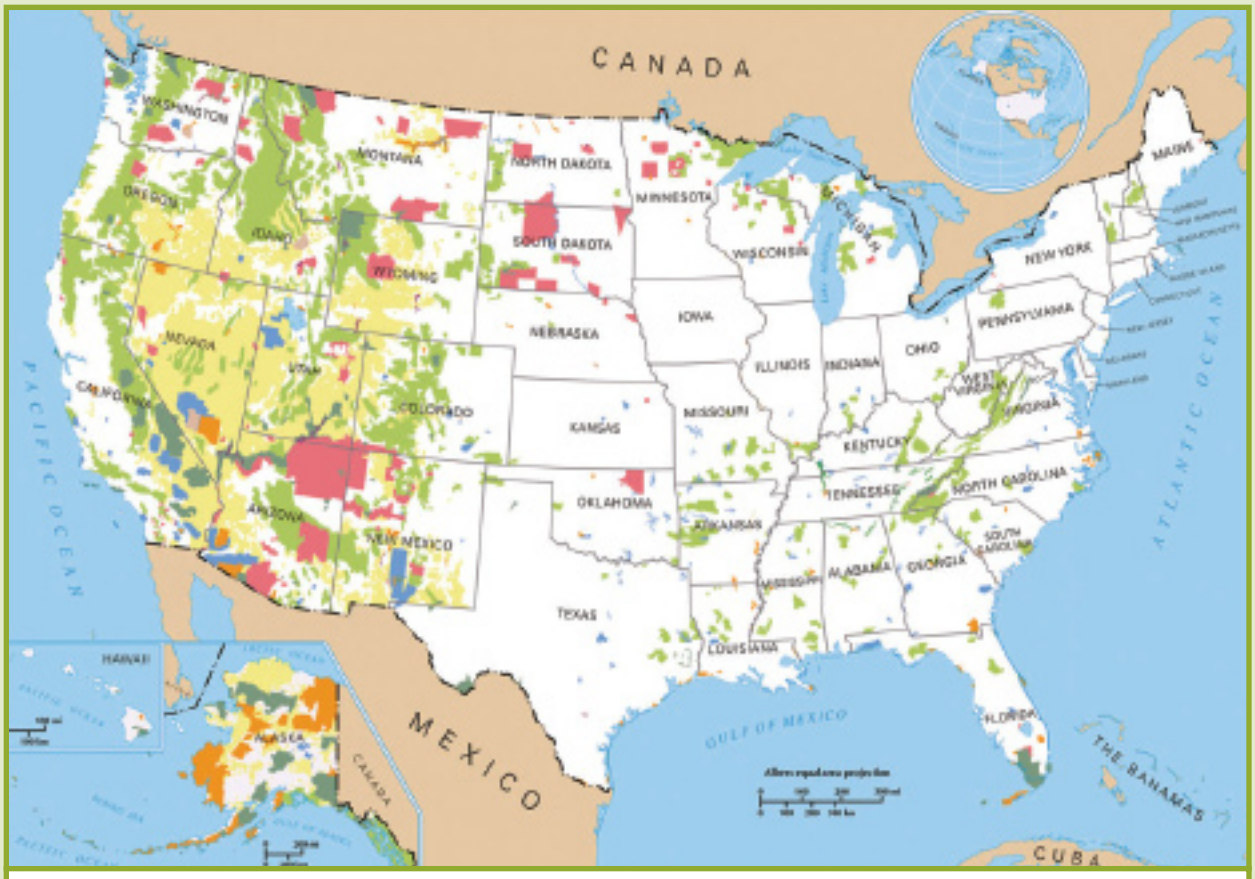

Figure 7. Map of Federally Managed Lands

substantial wildlife conservation and recovery programs (S. 2204, 2007). After five years, and every ten years thereafter, the national strategy should be revised to reflect the most relevant information.

The Secretary of Interior must also establish a **National Global Warming and Wildlife Science Center** (Science Center) under the United States Geologic Survey. The Science Center will serve to collect and distribute information concerning scientific research conducted on the impacts of global warming on wildlife and their habitats. Research will also focus on mechanisms for adaptation, mitigation and the prevention of impacts. Additionally, under Title I, the Act will establish a **Grants Program** for federal and state agencies, territories and Indian tribes (S. 2204, 2007).

Title II: Oceans and Great Lakes Ecosystems

Title II of the Act focuses on marine and Great Lakes ecosystems and issues related to sea level rise and ocean acidification. The Act recognizes that healthy ecosystems are more resilient than degraded ecosystems and that the natural resources found in coastal, ocean, and Great Lakes ecosystems will be jeopardized by the impacts of global warming. The Secretary of Commerce is required to:

- Establish a national strategy to "protect, maintain, and restore coastal and marine ecosystems" and to "avoid, alleviate, or mitigate" the impacts of global warming, including sea level rise and ocean acidification.
- Develop an Ocean Advisory Board of ten to twenty members with expertise in ocean, coastal, and Great Lakes biology, ecology, fisheries, climate change, ocean acidification, and other relevant disciplines, including economics.

other relevant disciplines, including economics.

Additionally, Title II includes provisions for the development of offshore alternative energy programs as well as carbon capture and sequestration activities (S. 2204, 2007). It also provides for federal aid in the form of financial grants, technical assistance, and/or general aid for the development and implementation of plans to reduce threats to coastal species due to climate change (S. 2204, 2007).

Title III: Special Imperiled Species Program

Title III of the Act provides for a **Special Imperiled Species Program** (Imperiled Species Program). Imperiled species are defined as species listed under the Endangered Species Act, species proposed for listing under the Endangered Species Act, candidate species under the Endangered Species Act, species listed as endangered under any state law, or species whose populations are declining at a significant rate.

Title III calls for regional ecological symposia on imperiled species followed by a report to the National Academy of the Sciences. Reports produced from these symposia should include an assessment of the impact of global warming on each imperiled species, recommendations for federal, state, local, and tribal agencies in assisting imperiled species in adapting to global warming, and other relevant ecological information (S. 2204, 2007).

Program Organization & Budget

Across the United States, there is enormous variation in habitats and wildlife. One challenge in creating a cohesive national strategy to protect wildlife across the nation lies in determining how to manage a variety of ecosystems. Taking this into consideration, we developed a program design (Figure 8) that utilizes three components to maximize the use of limited funding and expedite the program implementation:

- Independent Advisory Boards;
- The Global Warming Wildlife Science Center; and
- Regional Satellite Offices.

Independent Advisory Boards bring the scientific expertise that will be needed to develop the national strategy for wildlife management on all Federal lands. The Global Warming Wildlife Science Center will provide the central support structure for program management, grants and budgetary allocations, and administration of the national program. By creating regional offices that have more autonomy, we can craft a more adaptive program. This regional approach will allow for the implementation of policy at a local level by offering closer networking with state, tribal, and non-profit agencies.

The first year of the program will focus on establishing the administrative and programmatic framework. The amount of scientific research that will need to be compiled in order to devise an effective national strategy is enormous. Without establishing a strong foundation for program planning, the national strategy will be difficult to institute.

The national strategy will be developed through coordination between different programs mandated in the Act. Detailed below are the organization and budgeting assumptions of each program, assuming ratification of the Global Warming Wildlife Survival Act on January 1, 2009 with an estimated budget of $1.57 million for the fiscal year. The general distribution of the budget is displayed in Figure 9. Detailed budget tables for each of the above mentioned program goals are attachments to this document (See Appendix A).

Moose thrive in the northern states of the United States, Alaska, and large parts of Canada. Moose are herbivores that require extensive tracts of habitat to survive. They are threatened by human activities such as hunting, but also habitat conversion and fragmentation, which are likely to be exacerbated through climate change. As temperatures increase the current habitats of the moose become unsuitable due to longer frost periods and changes in vegetation growth patterns. Variations in moose population dynamics are also likely to influence those of their greatest predators, gray wolves. As of 2008, the moose is not listed as an endangered species, and therefore receives no protection, in the United States (USFWS, 2008).

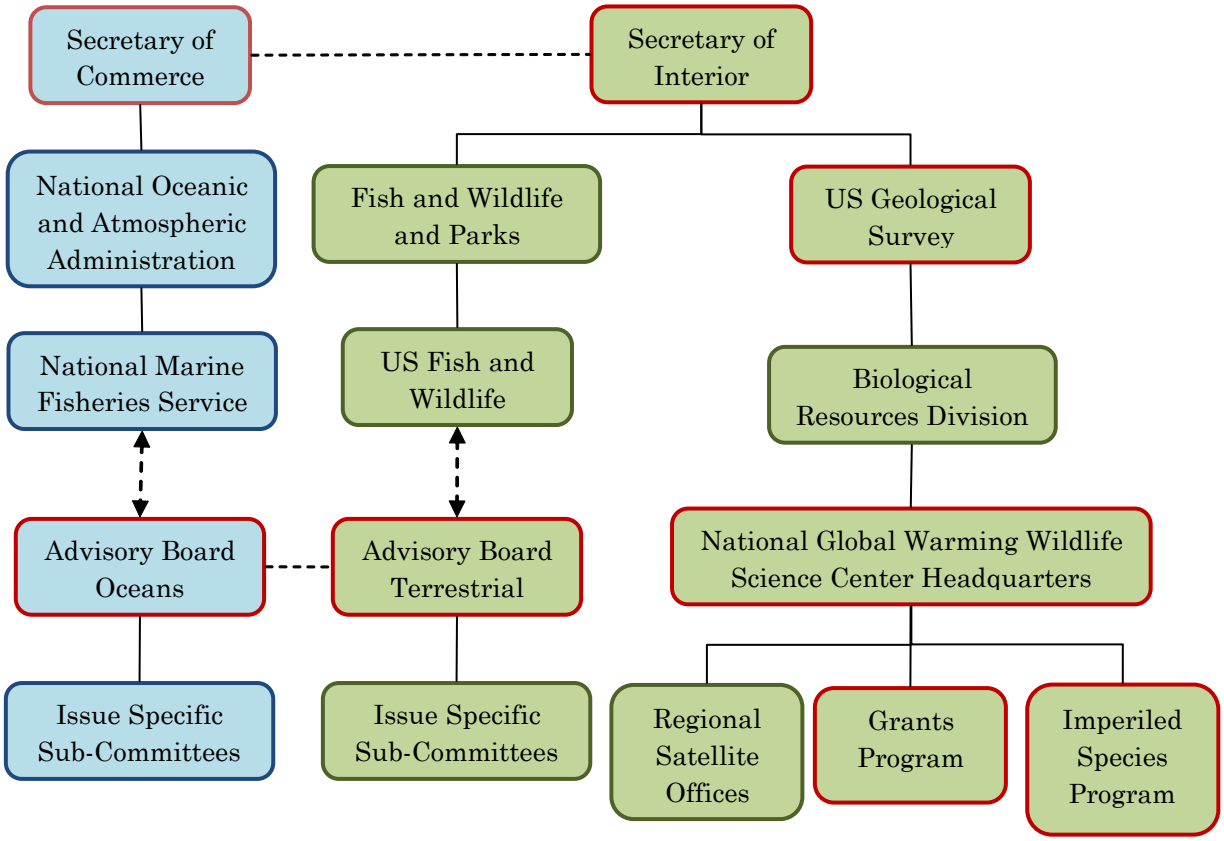

Figure 8. Program Organizational Structure
Components mandated in the legislation are outlined in red

Advisory Boards

Terrestrial and Oceanic Advisory Boards will be established under the Secretary of the Interior and Secretary of Commerce, respectively, to devise the national strategy. Additional issue-specific subcommittees under the Terrestrial and Oceanic Advisory Boards will also be created to address problems relating to topics such as economics, climatology, ecology, and property rights.

The Advisory Boards will meet quarterly to discuss research and develop a coordinated response plan for wildlife management in response to climate change. Each Board member will be a leading expert in their field and will present the latest research relating to their respective areas of expertise to the other members.

The Advisory Boards are responsible for providing scientific and technical advice and recommendations on issues regarding the impact of climate change on wildlife and their habitats. The Secretaries of the Interior and Commerce will utilize the advice of the Boards to implement the national strategy at a functional level. These recommendations will include propositions for specific policies or programs to assist wildlife, such as relocation, property acquisition, or the establishment of wildlife corridors.

The Secretaries of Interior and Commerce will select the Advisory Board members based on endorsements by the President of the National Academy of Sciences. All of the scientists will be hired on a contractual basis and will be required to attend the quarterly meetings. After the initial meeting, the Advisory Boards will form issue-specific subcommittees to deal with the most pressing issues. Additional scien-

tists may be added to the Advisory Boards based on the needs of these subcommittees. The Director of the Science Center will also serve on both Advisory Boards in order to maintain continuity of program planning and establish open lines of communication between the Science Center and the Boards.

Program Integration & Support

Personnel from the Department of Interior's U.S. Fish and Wildlife Service and the National Oceanic & Atmospheric Administration's (NOAA) National Marine Fisheries Service will support the Terrestrial and Oceans Advisory Boards, respectively. The staff from these agencies will provide administrative support to the Advisory Boards by coordinating meetings, including the distribution of quarterly reports and travel arrangements.

To further support the Advisory Boards' efforts in devising the national strategy, one full-time *Policy Analyst* and one full-time *Policy Liaison* will be hired for each Advisory Board. The Terrestrial Advisory Board analyst and liaison will be housed within the United States Fish and Wildlife Service. The other liaison and analyst will be housed within the National Marine Fisheries Service to assist the Oceans Advisory Board.

The Policy Liaisons will consult with federal, state, tribal, and local governments and agencies, as well as conservation groups, for input concerning the national strategy. The liaisons will also coordinate public meetings and comment periods, as well as synthesize recommendations from other agencies. The Policy Analysts will synthesize information from their respective Advisory Board and generate reports after each Advisory Board meeting.

First Year Goals

The Advisory Boards members will be selected during the first six months of implementation; therefore, the Boards will only meet for the 3rd and 4th quarter during the first year of enactment. Advisory Board conferences will be held for three consecutive days, but no venue rental expenses will be incurred by using existing facilities in other Federal agencies. The Terrestrial Advisory Board

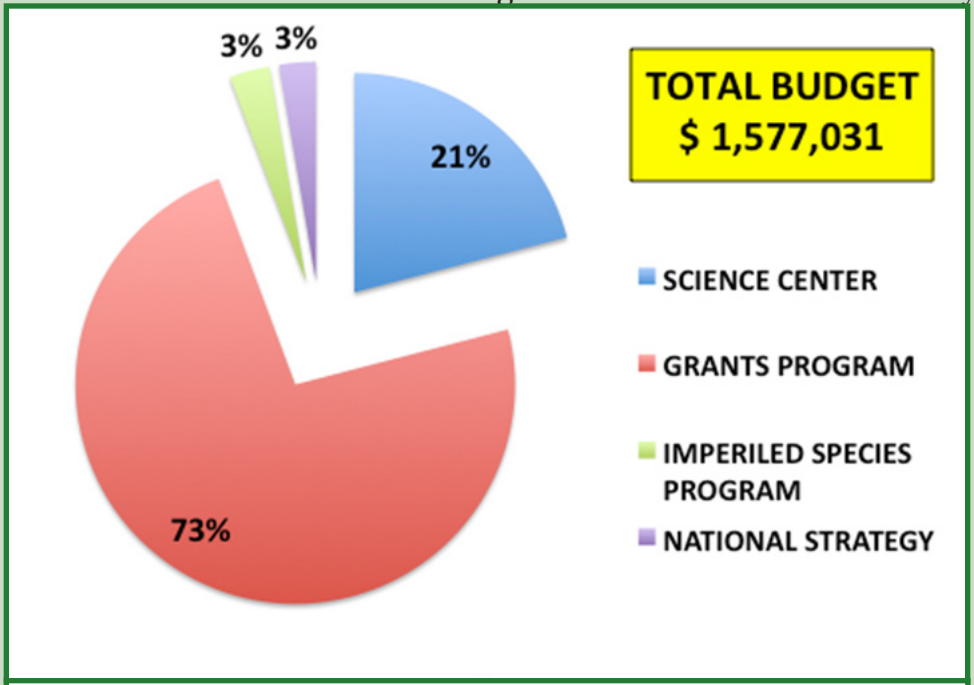

Figure 9. Budget

conferences will be held in the U.S. Fish and Wildlife offices, and the Oceans Advisory Board Conferences will be held in the National Marine Fisheries Service offices.

The Policy Liaisons and Analysts will be hired within one month of enactment, since they will assist in the formation of the Advisory Boards. Policy Liaisons and Policy Analysts working within the framework of existing agencies will help facilitate the formation of the national strategy.

Global Warming Wildlife Science Center

The Global Warming Wildlife Science Center will be established under the U.S. Geological Survey (USGS), as mandated by the Act. The Science Center headquarters will serve as a clearinghouse for all research related to wildlife and climate change. Regional satellite offices of the Global Warming Wildlife Science Center will be established to administer local wildlife programs and facilitate policy adoption at a regional level. Each of the regional offices will have a program officer for the Grants Program and the Imperiled Species Program. This will ensure appropriate distribution of grants based on region scientific needs. The requests for funding will be channeled through the central administrative offices at the Science Center.

Based on the decentralized program structure, the Science Center will have a central headquarters and eight regional offices in order to better address regional ecological needs. The regional offices will be based out of the pre-existing USGS offices around the country. Each of the satellite offices will administer the mandated Grants Program for state, local, and tribal organizations within their regions, and the mandated Special Imperiled Species Program. This structure provides a feedback mechanism to ensure that scientific information is incorporated into the national database of research managed by the Science Center, which will be used in developing the national strategy.

Program Integration & Support

The Science Center will house the national offices for the Grants and Imperiled Species Programs for central coordination and oversight of the regional satellite offices. Initially, the Science Center will be housed within the National Headquarters of the USGS Biological Resources Division (BRD) in Reston, Virginia. Using existing space within the Reston offices will expedite staffing and organization of the Science Center.

The Science Center Visitor's Center and Library will be located within the BRD offices during the initial phase of program implementation to allow for use of existing human resources and budgeting staff. A new, independent facility will be constructed at a later date for the Science Center. Partnering with BRD regional offices will facilitate the establishment of the Science Center regional satellite offices.

First Year Goals

During the first year the Director and Executive Assistant will be selected for the Science Center. The Science Center Director will be responsible for coordinating and managing all research activities as well as serving on the Terrestrial and Ocean Advisory Boards. The Director will have an Executive Assistant to aid in these functions.

The primary goals for the first six months will be staffing the temporary Science Center and initiating the construction of permanent Global Warming Wildlife Science Center Headquarters. Most of the

departments of the Science Center will be staffed during the first fiscal year. The staffing and goals of the departments of the Science Center are detailed below.

The Science Center and the general framework for the Grants and Imperiled Species Programs will be established within the first year. After these administrative functions are established, the Science Center will select sites and staff for the eight regional offices and compile an initial report on the Science Center's research activities.

Department of Science and Research

This department will be a repository for all research regarding wildlife adaptation issues mandated in the Act. A lead scientist from each of the chosen sub-disciplines will be located at the Science Center Headquarters. The lead scientists will serve as Deputy Directors of their respective disciplines, reporting directly to the Director of the Science Center. The duties of the Deputy Directors will also include:

- Coordination of research from the regional Science Centers related to their scientific disciplines regarding the effects of climate change on wildlife;
- Aid in staffing activities for their respective disciplines in the Regional Science Centers.

Deputy Directors will be appointed for the following disciplines:

- Mammalian Conservation Biology,
- Reptilian and Amphibian Conservation Biology,
- Ornithology,
- Ecology,
- Marine Biology, and
- Taxonomy.

The Executive Grants Coordinator and the Program Executive for the Imperiled Species Program will also be located in this department. The Grants Program will award money to state, local, and tribal agencies. Requests will be sent to the regional offices, and satisfactory applications will be sent to the central office for final approval and funding. This will allow for the regional offices to better respond to local issues by approving grant research focused on the needs of individual ecosystems.

The Executive Grants Coordinator will oversee the regional offices and serve as the primary auditor of grant monies. Although no grants will be administered within the first fiscal year, the Grants Coordinator should test and become familiar with the grant-tracking software to ensure it meets the Grants Program needs. With the help of the Web Developer, the Grants Coordinator will then link the grant-tracking software to the Science Center website so that grant applications can be filed online and grant recipients can update the progress of their projects through the website. The same organizational structure will be established for the Imperiled Species Program, where the Program Executive will be stationed at the main Science Center with regional specialists focusing on imperiled species within their respective regions.

The Imperiled Species Program will convene multiple regional scientific symposia to identify and examine the ecological impacts of climate change on imperiled species in specific ecosystems of the United States. The bill requires that the symposia take place no later than eighteen months after the ratification of the Act. For the first fiscal year, an Imperiled Species Program Coordinator will be hired to begin planning for the symposia; however, the symposia will take place after the first fiscal year.

Department of Information Technology

The Science Center's main focus is to centralize all wildlife research currently

being conducted. Tracking, consolidation and indexing of research findings will be extremely important. The Director of the Information Technology (IT) Department will be responsible for establishing research databases, electronic reporting systems, and purchasing software and licenses. A web designer and an IT assistant will also be hired to design a website for the Science Center. The website should be operative by the end of the first year. The website will create an open interface to allow other scientists and the public access to the research performed at the Science Center and to publicize information about the effects of climate change on wildlife.

Visitor's Center

The Science Center will house a Visitor's Center to educate the public on issues related to wildlife and climate change. During the first year, a Visitor's Center Director will be appointed to coordinate these efforts. There will also be a Head Librarian to collect and archive research being conducted concerning the impact of climate change on wildlife. The Director of Volunteer Services will also be housed within this department. In order to cut down on costs, volunteers, primarily students, will staff the Visitor's Center. These students will also be involved in the research conducted at the Science Center, providing them with functional experience to further their professional pursuits.

A Director of Communication and Outreach will be appointed as a press officer. He will establish and maintain communication with the public, draft press releases with updates regarding the activities of the Science Center, as well as advertise opportunities for community involvement at the Science Center.

Performance Management

The goals of performance management are mainly focused on ensuring that appointed parties reach their respective goals and work together to form a system that will provide cohesive and efficient conservation efforts over the long-term. The overarching aim is to create an adequate framework to develop the national strategy.

First year progress will measure efficiency of the established framework and staff performance. Program inputs are the resources used for activities and to meet goals, including staffing and funding. The program outputs for year one involve the specific tasks and functions expected by the Advisory Boards, the Science Center, and their support staff as they work toward achieving the goal of establishing a national strategy. The performance management system will create a reporting function to monitor and track the accomplishment of major tasks. The parties responsible for each task will compile status reports on a regular basis.

It is important to distinguish between the short- and long-term goals. Long-term outcomes, such as establishing a comprehensive plan for protecting wildlife from the effects of climate change, are not expected to be achieved within the first year. However, this performance management system will establish preliminary indicators for long-term outcomes, notably through the work of the six Deputy Directors. It will be the role of the Advisory Boards, in the first year, to recommend a long-term performance tracking system for the agencies involved in implementing the national strategy. Short-term outcomes, such as increased inter-agency communication and awareness of the issues will hopefully be enhanced by this system and will facilitate the long-term outcomes. Activities are divided into the two sections: the National Strategy and the Global Warming Wildlife Science Center.

"First year progress will measure efficiency of the established framework and staff performance."

National Strategy

The performance management system will

Green sea turtles make their nests on beaches along the coastal United States. Sea level rise and extreme weather events such as hurricanes, brought on by rising global temperatures, threaten the turtles' beach nesting grounds and habitat through inundation and erosion. Because the sex of sea turtle hatchlings is determined by the surrounding temperature, global warming also has implications for the sex ratios of sea turtle populations. If temperatures continue to increase, more female than male sea turtles will be born, resulting in a biased population and severely threatening the species. Increased heavy rainfall due to global warming would likewise disrupt the development of turtle eggs by cooling surrounding temperatures. Global warming also threatens to alter global ocean currents, which would affect the growth of seagrass, an important food source for green sea turtles (Griffin, 2007).

focus on the quarterly meetings of the Advisory Board as illustrated in Figure 10. Numbers represent the order of the flow of information in the reporting structure. Science Center staff, including the regional offices under the purview of the Deputy Directors, will send reports of their progress and salient new research to the Director of the Science Center (1). A report from the Director will then be given to the Administrator of the Advisory Board staff two weeks before the quarterly meetings (2). The Advisory Board staff's performance will be measured by the successful organization of Advisory Board meetings. They will inform the Advisory Board members of the date, time, and place of meetings one month beforehand. They are also in charge of compiling preparatory reports for the meetings, including the findings from the Science Center report and of the Policy Liaison. These reports are to be sent to the Advisory Board members one week before the meetings (3). If all members attend the meetings and have received a complete report, the staff has achieved its goals.

The Advisory Boards' performance will be measured through a report compiled by the Policy Analyst following every meeting (4). The report will be sent back to the Director of the Science Center as well as to the NOAA Administrator and the Fish and Wildlife Service's Deputy Director. This creates a feedback loop upwards to the Secretaries of Commerce and Interior and back downwards to the Science Center (5).

The Policy Analysts' main goal for the first year will be to gain firm knowledge of all internal proceedings, enabling them to develop the national strategy based on the recommendations of the Advisory

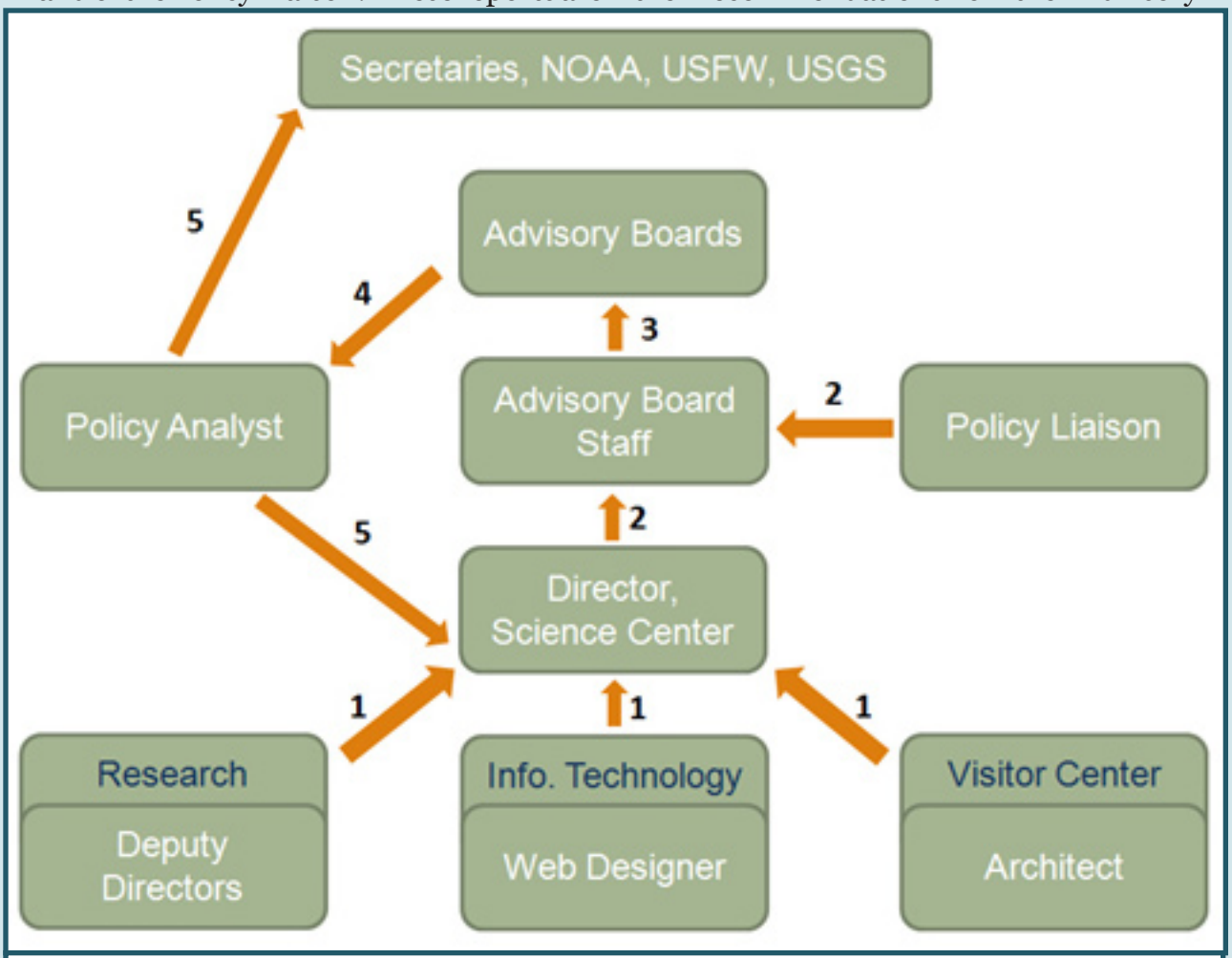

Figure 10. Performance Management Process Flow

Performance Tracking Template: Web Designer				
Task	**Due Date**	**Date Completed**	**Resources**	**Output Summary**
Website Design	25-Jul-09		2 IT staff	User Interface Design

Figure 11. Performance Tracking
Example of Performance Tracking Template

Boards. On the other hand, the Policy Liaison will ensure that relevant external agency information is brought to the Advisory Board Meetings. The Liaison will coordinate with the Advisory Board staff and compile all recommendations and information from outside entities into the preparatory reports. These will be discussed at the quarterly meetings and relevant outcomes will be integrated into post-meeting reports.

This process will ensure monitoring of the Advisory Boards' performance in terms of identifying long-term goals and creating long-term performance management systems. It will inform the Secretaries of the Advisory Boards' progress and identify any problems. If problems are identified, the Advisory Board staff and the Director of the Science Center will find ways to address these issues, such as through additional data collection or hiring of field specialists as consultants, and acquiring additional funding for program-specific needs.

Global Warming Wildlife Science Center

The Director of the Science Center will be the focal point of the performance management system. Since the Science Center Director serves on the two Advisory Boards, he will act as the liaison between the Advisory Boards and the Science Center. He will also be in charge of collecting all the reports received from the different departments of the Science Center. These reports will be submitted one month prior to each quarterly Advisory Board meeting. Two weeks after receiving the reports from the departments, a compiled report will be sent by the Science Center Director to the Advisory Board staff to be included in the preparatory reports.

A performance-tracking template will be designed to ensure performance feedback within the Science Center. This simple template will clearly show whether goals have been reached and what resources were used. It will allow for prompt identification of problems and define the sources of these problems. An example of the template is displayed in Figure 11.

Every person identified in each department of the Science Center will fill out the template and submit the report to the Science Center Director one month prior to the quarterly meetings. The activities and progress made at the Science Center will be reported back to the Advisory Boards. Feedback from the Advisory Boards will be incorporated into the Policy Analyst's final report to the Science Center.

The Science Center Director will also monitor activities that will be outsourced from the Science Center. The main first year activities are architectural design and site plans for the construction of the Science Center building. The Science Center Director will integrate progress on these activities into the Center's performance report, which will be communicated at the Advisory Board meetings.

Long Term Perspective

One of the Advisory Boards' first year goals is to recommend a long-term performance system for monitoring the success of the national strategy. Key goals identified in

the Act, which must be included in the performance management system, include the protection of species from the effects of climate change and raising awareness about the issue of climate change to the general public and across agencies.

Indicators have been identified to monitor the progress towards these primary goals:

- Species Protection:
  - Identify keystone species and their habitats. Make a catalogue of all such species and establish scientific indicators for species' ability to survive and reproduce;
  - Regularly check indicators of ecosystem dynamics, such as food webs in all habitats;
  - Identify and catalogue current migration sites for sensitive species;
  - Keep count of relocated populations, especially in climate refuges; and
  - Introduce regular surveillance of corridor use and buffer zones.
- Awareness:
  - Design a questionnaire for visitors to the Science Center;
  - Design a questionnaire for members of various state and local agencies.

The above activities will have to be monitored, similar to the first year goals. In the long run, a system of electronic reporting is recommended between all parties before the quarterly Advisory Board meetings. As there will eventually be eight regional offices, a performance management system of video teleconferences is proposed for progress review, as displayed displayed in Figure 12. This would allow for direct interaction between the Center and the offices, while eliminating travel costs. Each regional office will hold quarterly teleconferences with the Director of the Science Center, who will then report back to the Advisory Board. The Director will also report critical messages from the Advisory Board and send summary reports to all regional directors. This will create an efficient feedback loop between the Science Center

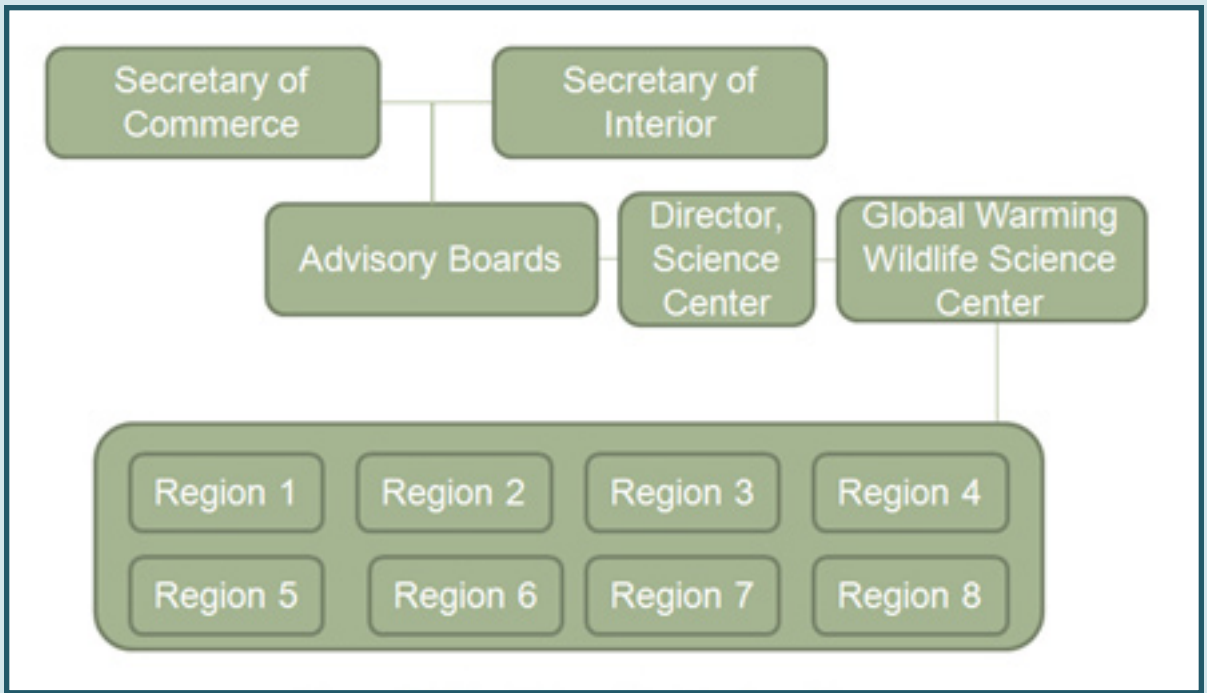

Figure 12. Monitoring Over the Long Term

system and the Advisory Board system.

This performance management system will ensure regular and efficient reporting of deliverables across the organization as a whole. Planning and centralizing all the reporting around the Advisory Board meetings is the best way to manage performance. This allows for centralized feedback and avoids miscommunication. Clear feedback also assures that problems are identified and resolved promptly, facilitating the development of the program.

Conclusion

Global climate trends and observations indicate that humanity has reached a tipping point in history in which human activity dictates the survival and vitality of other species on Earth. In order to prevent and mitigate these harmful climate effects, it is necessary to implement adaptive management programs through conservation and resource management. The Global Warming Wildlife Survival Act is the first proposed bill in the U.S. that provides legislative power for the creation of a highly organized national strategy to address the effects of climate change on wildlife.

These issues have yet to be addressed by our national government. Hence, the Global Warming Wildlife Survival Act is important because it seeks to prevent the catastrophic loss of biodiversity through assisting wildlife in adapting to climate change. The national strategy will be written and designed through collaboration between leading scientists and organizations with region specific knowledge of wildlife and their habitats. When this strategy is implemented, first on federal lands, and then throughout the United States, it will become our most powerful tool for wildlife conservation. The Global Warming Wildlife Science Center, as a clearinghouse for research, will ensure that these programs are informed by the most up-to-date information available.

The Global Warming Wildlife Survival Act represents an essential change in political attitudes towards environmental valuation and protection. When the Act passes, it will set a new tone for conservation in the United States. This legislation represents an important step in ecological activism that is necessary for the continued prosperity of wildlife and biodiversity in this country.

The Florida Panther is a highly endangered species that lives in the lowlands of Florida. Individual panthers are very territorial, and they require a large range for breeding. As such, habitat loss poses a major threat to the species and its ability to successfully reproduce. The species has already been negatively impacted by climate change. Sea level rise has led to fragmentation of the panther's habitat. This has resulted in isolation and inbreeding, leading to reproductive problems and decreased viability of offspring (Harris & Cropper, 1992). As climate continues to change, the Florida Panther population will likely experience further fragmentation from sea level rise, leading to even lower survival rates.

Frequently Asked Questions

Q: Who sponsored the bill?
Senators Sheldon Whitehouse (D-RI) and Barbara Boxer (D-CA), Chair of the Senate Environment and Public Works Committee, introduced the bill in the Senate on October 18, 2007.

Q: Has the Act been passed?
Not as of December 2008. The Act was read twice and referred to the Committee on Environment and Public Works.

Q: Has similar legislation been introduced before the Wildlife Survival Act?
The Global Warming Wildlife Survival Act was first introduced in May 2007 as part of H.R. 2338. The Act was then incorporated into H.R. 3221, also known as the New Direction for Energy Independence, National Security, and Consumer Protection Act. It was struck from H.R. 3221 during negotiations between the House and Senate, which was ultimately passed without wildlife protection provisions.

Q: Are there opponents to the Act?
Most stakeholders have come to the consensus that climate change is real and it will significantly affect all life on the planet. Opponents to S.2204 may be unconvinced that assisting wildlife adaptation to climate change should be a priority. The Act provides for further research on the effects of climate change on wildlife and how we can help wildlife adapt to a rapidly changing environment.

Q: Why would someone oppose the bill?
Opponents to the bill likely do not believe that climate change is a problem. In addition, opponents may disagree on how much money and other resources will be required to prevent further damage.

Q: Is wildlife adaptation to climate change a priority in the House of Representatives?
The legislative history of S. 2204 is sparse, leaving the impression that S. 2204 is a low-priority bill in the House of Representatives.

From Baja California all the way up to British Columbia, the Edith's Checkerspot Butterfly has been disappearing from American landscapes as global warming continues to threaten this already imperiled species. This orange, white, and black-colored butterfly is severely affected by climate change because warmer temperatures are drying up larval plants that they are dependent on for sustenance (Raloff, 1997). Because they are forced to search elsewhere for food, Edith's Checkerspot Butterfly is an indicator species for global warming as they have shifted their range northward to higher, cooler altitudes (Raloff, 1997). Already threatened with extinction from habitat-loss and competition with invasive species, global warming will reduce Edith's Checkerspot Butterfly populations to dangerously low levels (Canadian Wildlife Federation, 2008).

Q: What is the purpose of the Global Warming Wildlife Survival Act?

The Act will establish a national strategy for assisting wildlife populations and their habitats in adapting to the impacts of global warming. Additionally, it will create a Science Center as a clearinghouse for research related to climate change. The Center will also provide for program coordination of the national strategy.

Q: What is mandated in the Global Warming Wildlife Survival Act?

Titles I and II of the Act mandate the creation of two Advisory Boards. The Act establishes two separate Advisory Boards in order to represent the specialized needs of terrestrial ecosystems and ocean, coastal and Great Lakes ecosystems. The Secretary of the Interior is directed to lead the terrestrial component of the Act, while the Secretary of Commerce is directed to lead specific issues pertaining to oceanic programs and research. The Act requires the Advisory Boards to analyze scientific information and create a national strategy to be presented to the Secretaries of the Interior and Commerce. Each Advisory Board is required to have 10-20 members, with scientists recommended by the president of the National Academy of Sciences including wildlife biologists, ecologists, climatologists and economists. The Board must also include the Director of the National Global Warming Wildlife Science Center.

Q: Why does the Act only refer to research? Why doesn't it suggest actual adaptation strategies, like wildlife corridors?

There is still uncertainty concerning how climate change will affect wildlife, and this is why the Act calls for more intensive research. It would be difficult for the Act to explain specific remediation activities because there is too much variation between regions and problems that affect wildlife. For example, remediation in Florida to improve the habitat for the Florida panther would be very different than the remediation plans in Colorado to improve the habitat for an alpine pika. It is therefore beyond the scope of the Act to list specifics, and is much more efficient to provide funds through grants to support scientific research on assisting wildlife. In this way, habitat restoration can meet regional wildlife needs.

Q: This policy creates a framework for future research. Why don't they use existing research?

Some research on global warming's effects on animals has already been done, but this research has primarily focused on a single species. This policy will provide a framework for macro-level or large-scale research to assess both individual needs for each species, and the needs of ecosystems as a whole, to be used in the creation of a cohesive national strategy. Additionally, this policy will create a framework for research and use expert scientific advice to assist wildlife in adapting to climate change.

Q: It seems like there is nothing in this bill that addresses the actual problem of climate change. Wouldn't stopping climate change be more useful in helping wildlife?

The goal of the Act is not to address climate change directly. Even if we completely stop emitting greenhouse gases tomorrow, we will still experience the negative effects of previous pollution. The Act is designed to address the effects of global warming on wildlife and reduce the stress on wildlife from a changing environment.

Q: How will the Secretaries of the Interior and Commerce cooperate with State fish and wildlife agencies and Indian tribes?

The policy liaison will communicate with State and Indian governments regarding the details of the national strategy. Also, on a regional level the offices will also liaise with external institutions through the Grants Program.

Q: Why does this bill establish an overarching national strategy as opposed to proposing specific steps to help threatened wildlife?

The United States covers a diverse range of territory, with very different regions in terms of landscape, climate and ecosystems. It is more efficient to establish a national framework through which to work, while allowing the regional offices to adopt the specific strategies they deem necessary.

Q: Why is there a need for a separate "imperiled species" program? Isn't the Endangered Species Act sufficient?

The Endangered Species Act does not directly address the issues of climate change. The need for the Imperiled Species Program is to help currently endangered species as well as threatened species, or other wildlife that will be affected by climate change, deal with the increasing stresses of a changing environment.

Q: What are the possible effects on wildlife due to climate change?

Climate change is predicted to cause changes in migratory and reproductive behavior, habitat loss and fragmentation, and declines in species population to name a few.

Q: Why is "survival" alone an insufficient indicator of success?

A species could be considered as "surviving" even when only the weakest members of the species are left alive. To say that a species is surviving does not mean that it is surviving healthfully. The goal of the Global Warming Wildlife Survival Act is to ensure that species will survive into the future under the new climatic conditions.

Q: What are some monitoring techniques that can be employed to measure the success of the Global Warming Wildlife Survival Act?

The most common monitoring technique is capture-mark-recapture. One form of this technique includes taking DNA samples from the animals to study mitochondrial DNA to determine its distribution. Another option is to monitor indicator species as a measure of the health of the ecosystem in which they exist.

Q: Why are time scales important when determining how to measure the success of the Global Warming Wildlife Survival Act?

Time scales are important because species change very slowly. Some animals take many years to reach reproductive age, for example, and as such their populations will not exhibit changes for many decades.

Q: Why wouldn't you allocate the regional grants out of a single fund? How would you keep track of which region received funding?

Grants are administered regionally, meaning the application will be processed and selected by a staff person in the regional office, but the money will come out of a central fund of grant monies managed by the Science Center Headquarters.

Q: Why is the Science Center Headquarters located in Reston, Virginia?

The Science Center Headquarters will initially be in the same building as the Biological Resource Division of the US Geological Survey in Reston. This way the Headquarters will be able to use existing infrastructure and staff, while also being located near Washington, D.C. This is intended to encourage visitation at the proposed Visitor's Center at the Headquarters.

Q: Why are the first year outputs so general?

The main goal of the Act is to create a framework for a national strategy. Very few details are given regarding program outcomes. The first year is essentially about establishing the organizational framework, hiring staff, and evaluating the budget and program allocations.

Q: How did you set your priorities for the first year?

During the first year, most of the goals are focused on establishing the administrative structure and hiring staff for the various divisions. During the second half of the year, hopefully the primary staff will be hired, including the Advisory Board members. The goal is to have the 3rd and 4th quarter meeting of the Advisory Boards so that the policy analyst can start drafting the national strategy.

Q: Why are the Advisory Boards located under the National Marine Fisheries Service and the US Fish & Wildlife?

The Advisory Boards are actually independent entities. The Boards will utilize staff and meeting space within these agencies. Also, these agencies are experienced with program implementation related to the Endangered Species Act. Therefore, the staff and expertise that manage the ESA programs will be useful to the Boards.

Q: If current protected areas in the United States are inadequate, why have there not been more efforts to correct this?

The Environmental Protection Agency (EPA) focuses on the conservation of species that have already been identified as endangered, focusing on redrawing reserve and park boundaries where these species exist. However, there has been no overarching effort as of yet to take preemptive action to mitigate habitat loss for species potentially affected by climate change.

Q: You state that buffer zones are areas with little or no human activity within them, and that they need to be expanded. Won't this affect local communities and businesses? Is there any part of the Act that accounts for this?

Yes. In our designed program framework we have decided to establish a particular sub-committee of the Advisory Boards that will be responsible for taking care of the legal aspects of protective action, including dealing with property ownership rights.

Q: What do you mean by dispersal limitations?

Shifting weather patterns can alter local and regional habitats. Sometimes this is beneficial, but oftentimes it is not for a given species. If the change is not favorable, species may migrate away from a specific habitat area, therefore disrupting the ecosystem.

Q: Why is the timing of migration patterns so important?

Many species migrate seasonally to avoid harsh winters or to locate particular foods during the spring and

summer. Timing of migration can be disturbed due to changes in weather patterns or temperature cues. An early migration may mean that the ponds or lakes have not melted for migrating birds to land. This may mean that there is a lack of suitable food for nutrition due to a mistiming of the winter thaw, plant flowering and fish spawning. In some cases, predators may still be present at times when migratory species arrive, making the migrating animals easy prey.

Q: How will sea level rise affect wildlife?

Sea level rise will cause shoreline inundation into freshwater or brackish areas, such as estuaries and wetlands, which are often used by fish as 'nurseries' for fry. Saltwater intrusion can also contaminate groundwater aquifers used for human consumption and replenishment of local creeks and streams.

Q: What is causing sea level rise?

The release of greenhouse gases from humans has caused the global temperatures to increase, which has led to the melting of glaciers and polar ice caps. As these massive stores of water in the form of ice are melting, the water runs to the sea, which is causing the ocean to slowly rise as the ice reserves melt.

Q: How can we stop sea level rise?

Even if all carbon emissions were stopped today, humans have already started a feedback cycle, wherein the greenhouse gases are feeding into natural temperature cycles, and this is currently causing an intensification of global temperatures. We cannot stop sea level rise now. We can only try to alleviate the impact of global warming by reducing greenhouse gas emissions.

Some proposed solutions to preventing major damages from sea level rise include building structures to create tidal barriers, such as sea walls, or restoring barrier islands that will protect the inner shore from high wave action during storms or hurricanes. Some have also proposed re-zoning and/or abandoning high-risk properties to prevent unnecessary property damage or placing humans in danger.

Q: What is ocean acidification?

Ocean acidification is caused by the excess absorption of carbon dioxide gas (CO_2) into the oceans. The oceans have the capacity to absorb the gas, but once too much is absorbed the pH or water chemistry is disturbed. Calcium carbonate is a naturally occurring mineral in the oceans that is relevant to the oceans buffering capacity. This mineral is used up as CO_2 is absorbed.

Q: Why is ocean acidification a problem for marine life?

Ocean acidification affects calcification of shells. Calcium carbonate is used to make these shells, but as the mineral is used up to help absorb the excess CO_2 in the air, less is available for the marine organisms to use for their shells.

Photosynthetic organisms form the foundation of the marine food web, such as diatoms. These animals are food for zooplankton, like the copepod or krill, which are food for larger fish and baleen whales. A significant decrease in phytoplankton productivity could lead to a complete collapse of the food web, leading to declining fisheries catches and the starvation of whales.

Q: Title II: Oceans Programs suggests carbon sequestration may be used to reduce the effects of climate change. What does that have to do with wildlife?

The goal of the Act is to help animals adapt to climate change, which includes reducing the impacts of global

warming. The Act does not mandate carbon sequestration, but uses it as an example of a way we may be able to reduce greenhouse gasses and potentially slow global warming.

Q: What is carbon sequestration?

Carbon sequestration is a proposed method to capture carbon dioxide emissions from large industries, such as coal plants, to be concentrated under high pressure to form a liquid. This liquid would then be injected into rock formations under the ocean floor, where the gas would react with the rock and remain 'trapped' underground. This solution is still being researched and the process is very expensive. Until further research is performed, the solution is not a feasible solution for reducing carbon emissions in the environment.

Q: What is ocean fertilization?

Ocean fertilization is when humans introduce a limited nutrient, such as iron or phosphorus, to try and create an algae or plankton bloom. The idea is that when the phytoplankton blooms, they remove carbon dioxide from the atmosphere. When they die, they sink to the bottom of the ocean, thus removing the carbon dioxide from air and moving it to the bottom of the ocean.

This is still a highly controversial method, as some scientists believe that it may affect the local environment, causing eutrophication, a local reduction of oxygen in the water. There are no long-term studies to prove that the dead plankton actually reach the bottom of the ocean, or if they merely get moved around in the ocean currents.

Q: I'm unclear on the importance of the government lands depicted on the map on page 12. What is the significance?

In addition to creating a national strategy for mitigating effects of climate change on wildlife, this bill calls for that strategy to be put into action on federal lands. This means that mitigating efforts, as identified by the research and Advisory Board decision-making unit, will be enacted in national parks, forest service and wilderness areas, bureau of land management lands, etc. Since the land represented on the map, is roughly 1/3 of the area of the United States, this is a significant impact, as well as effort.

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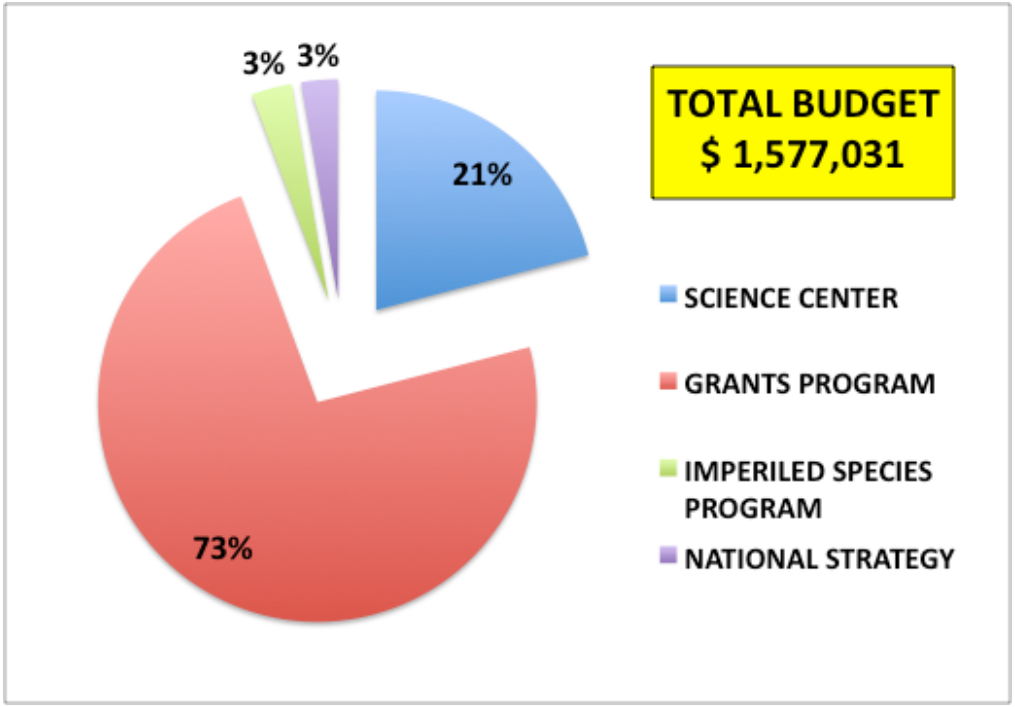
Appendix A: Budget

TOTAL BUDGET

TOTAL BUDGET:	$1,577,031.50							
	PROGRAM	GOALS						
	NATIONAL STRATEGY	SCIENCE CENTER					GRANTS PROGRAM	IMPERILED SPECIES PROGRAM
		SCIENCE & RESEARCH	ADMINISTRATION	COMMUNICATIONS & OUTREACH	INFORMATION TECHNOLOGY	BUILDING CONSTRUCTION		
		$490,890.75	$356,759.50	$172,659.50	$109,261.25	$20,740.25		
PROGRAM BUDGET SUMS:	$345,486.75	$1,150,311.25					$42,612.75	$38,620.75



I. PROGRAM GOAL: NATIONAL STRATEGY

PROGRAM BUDGET SUMS:	$345,486.75

	NATIONAL STRATEGY
ADVISORY BOARD TERRESTRIAL	
* Travel Expenses	$31,200.00
* Contracting Fees	$28,800.00
* Per Diem	$1,536.00
* Published materials	$2,000.00
* Supplies	$520.00
* Concessions	$1,000.00

ADVISORY BOARD TERRESTRIAL SUPPORT STAFF	
*** Policy Analyst (0.50 yr)**	$24,054.00
* Fringe Benefits	$6,013.50
* Travel Expenses for Policy Analyst	$2,600.00
* Per Diem	$384.00
*** Policy Liaison (0.75 yr)**	$36,081.00
* Fringe Benefits	$9,020.25
* Travel Expenses for Policy Liason	$2,600.00
* Per Diem	$384.00
* Office Equipment	$2,000.00
* Office Supplies	$2,000.00

ADVISORY BOARD OCEANS & GREAT LAKES	
* Travel Expenses	$31,200.00

* Contracting Fees	$28,800.00
* Per Diem	$1,536.00
* Published materials	$2,000.00
* Supplies	$520.00
* Concessions	$1,000.00

ADVISORY BOARD OCEANS SUPPORT STAFF	
*** Policy Analyst (1 yr)**	$48,108.00
* Fringe Benefits	$12,027.00
* Travel Expenses for Policy Analyst	$2,600.00
* Per Diem	$384.00
*** Policy Liaison (1 yr)**	$48,108.00
* Fringe Benefits	$12,027.00
* Travel Expenses for Policy Liason	$2,600.00
* Per Diem	$384.00
* Office Equipment	$2,000.00
* Office Supplies	$2,000.00

II. PROGRAM GOAL: SCIENCE CENTER

A. SCIENCE & RESEARCH

PROGRAM BUDGET SUMS:	**$1,150,311.25**
SUB-PROGRAM BUDGET SUM:	**$490,890.75**

	SCIENCE CENTER SCIENCE & RESEARCH
a. Science & Research	
*** Deputy Director for Ecology (0.50 yr)**	$57,658.50

* Fringe Benefits	$14,414.63
* Travel Expenses	$1,300.00
* Convention Fees	$750.00
* Per deim	$192.00
* Lab Supplies	$2,500.00
* Lab Equipment	$5,000.00
*** Deputy Director for Mammalian Conservation Biology (0.50 yr)**	$57,658.50
* Fringe Benefits	$14,414.63
* Travel Expenses	$1,300.00
* Convention Fees	$750.00
* Per deim	$192.00
* Lab Supplies	$2,500.00
* Lab Equipment	$5,000.00
*** Deputy Director for Marine Biology (0.50 yr)**	$57,658.50
* Fringe Benefits	$14,414.63
* Travel Expenses	$1,300.00
* Convention Fees	$750.00
* Per deim	$192.00
* Lab Supplies	$2,500.00
* Lab Equipment	$5,000.00
*** Deputy Director for Ornithology (0.50 yr)**	$57,658.50
* Fringe Benefits	$14,414.63
* Travel Expenses	$1,300.00
* Convention Fees	$750.00
* Per deim	$192.00

* Lab Supplies	$2,500.00
* Lab Equipment	$5,000.00
*** Deputy Director for Reptilian & Amphibian Conservation Biology (0.50 yr)**	$57,658.50
* Fringe Benefits	$14,414.63
* Travel Expenses	$1,300.00
* Convention Fees	$750.00
* Per deim	$192.00
* Lab Supplies	$2,500.00
* Lab Equipment	$5,000.00
*** Deputy Director for Taxonomics (0.50 yr)**	$57,658.50
* Fringe Benefits	$14,414.63
* Travel Expenses	$1,300.00
* Convention Fees	$750.00
* Per deim	$192.00
* Lab Supplies	$2,500.00
* Lab Equipment	$5,000.00

B. ADMINISTRATION

PROGRAM BUDGET SUMS:	**$1,150,311.25**
SUB-PROGRAM BUDGET SUM:	**$356,759.50**

	SCIENCE CENTER ADMINISTRATION
b. Administration	

*** Director of Science Center (1 yr)**	$120,000.00
* Fringe Benefits	$30,000.00
* Travel Expenses for Director	$5,200.00
* Per deim	$1,152.00
*** Executive Assistant (1 yr)**	$58,206.00
* Fringe Benefits	$14,551.50
* Science Center Office Supplies	$7,150.00
* Science Center Office Equipment	$115,500.00
* Science Center Journal Subscriptions	$5,000.00

C. COMMUNICATIONS & OUTREACH

PROGRAM BUDGET SUMS:	**$1,150,311.25**
SUB-PROGRAM BUDGET SUM:	**$172,659.50**
	SCIENCE CENTER COMMUNICATIONS & OUTREACH
c. Communications & Outreach	
*** Director of Communications & Outreach (0.50 yr)**	$57,234.00
* Fringe Benefits	$14,308.50
* Publication Expenses	$2,250.00
*** Director of Visitor's Center (0.80 yr)**	$55,811.20
* Fringe Benefits	$13,952.80
*** Library Director (0.40 yr)**	$23,282.40
* Fringe Benefits	$5,820.60

D. INFORMATION TECHNOLOGY

PROGRAM BUDGET SUMS:	**$1,150,311.25**

SUB-PROGRAM BUDGET SUM:	**$109,261.25**
	SCIENCE CENTER
	INFORMATION TECHNOLOGY
d. Information Technology	
*** Director for Information Technology (0.50 yr)**	$37,208.00
* Fringe Benefits	$9,302.00
* Software License Fees	$20,670.00
* Management Information System Development	$7,500.00
*** Web designer (0.50 yr)**	$19,665.00
* Fringe Benefits	$4,916.25
* Web Development	$10,000.00

E. BUILDING CONSTRUCTION

PROGRAM BUDGET SUMS:	**$1,150,311.25**
SUB-PROGRAM BUDGET SUM:	**$20,740.25**
	SCIENCE CENTER
	BUILDING CONSTRUCTION
e. Building Construction	
* Architect (Contractor)	$20,740.25

III. PROGRAM GOAL: GRANTS DISTRIBUTION

PROGRAM BUDGET SUMS:	**$42,612.75**
	GRANTS PROGRAM
Grants Distribution	
*** Grant Coordinator (0.50 yr)**	$29,103.00

* Fringe Benefits	$7,275.75
* Travel Expenses	$2,600.00
* Convention Fees	$750.00
* Per Diem	$384.00
* Grant Tracking Software	$2,500.00

IV. PROGRAM GOAL: IMPERILED SPECIES PROGRAM

PROGRAM BUDGET SUMS:	**$38,620.75**
	IMPERILED SPECIES PROGRAM
Imperiled Species Program	
*** Imperiled Species Program Coordinator (0.50 yr)**	$29,103.00
* Fringe Benefits	$7,275.75
* Travel Expenses	$1,300.00
* Convention Fees	$750.00
* Per Diem	$192.00

Appendix B: Global Warming Wildlife Survival Act

110TH CONGRESS
1ST SESSION

S. 2204

To assist wildlife populations and wildlife habitats in adapting to and surviving the effects of global warming, and for other purposes.

IN THE SENATE OF THE UNITED STATES

OCTOBER 18, 2007

Mr. WHITEHOUSE (for himself and Mrs. BOXER) introduced the following bill; which was read twice and referred to the Committee on Environment and Public Works

---

A BILL

To assist wildlife populations and wildlife habitats in adapting to and surviving the effects of global warming, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the ''Global Warming Wildlife Survival Act''.

(b) TABLE OF CONTENTS.—The table of contents of this Act is as follows:

SEC. 2. DEFINITIONS.

In this Act:

(1) ECOLOGICAL PROCESSES.—

(A) IN GENERAL.—The term ''ecological processes'' means the biological, chemical, and physical interactions between the biotic and abiotic components of an ecosystem.

(B) INCLUSIONS.—The term ''ecological processes'' includes—

(i) nutrient cycling;

(ii) pollination;

(iii) predator-prey relationships;

(iv) soil formation;

(v) gene flow;

(vi) hydrologic cycling;

(vii) decomposition; and

(viii) disturbance regimes, such as fire and flooding.

(2) HABITAT.—

(A) IN GENERAL.—The term ''habitat'' means the physical, chemical, and biological properties that are used by wildlife for growth, reproduction, and survival.

(B) INCLUSIONS.—The term ''habitat'' includes aquatic and terrestrial plant communities, food, water, cover, and space on a tract of land, in a body of water, or in an area or region.

(3) INDIAN TRIBE.—The term ''Indian tribe'' has the meaning given the term in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450b).

(4) WILDLIFE.—The term ''wildlife'' means—

(A) any species of wild, free-ranging fauna, including fish and other aquatic species; and

(B) any fauna in a captive breeding program the object of which is to reintroduce individuals of a depleted indigenous species into previously occupied range.

TITLE I—NATURAL RESOURCES AND WILDLIFE PROGRAMS

SEC. 101. DEFINITIONS.

In this title:

(1) ADVISORY BOARD.—The term ''Advisory Board'' means the Advisory Board established under section 113(a).

(2) HABITAT LINKAGE.—The term ''habitat linkage'' means an area that—

(A) connects wildlife habitat or potential wildlife habitat; and

(B) facilitates the ability of wildlife to move within a landscape in response to the effects of global warming.

(3) NATIONAL STRATEGY.—The term ''national strategy'' means the national strategy established under section 112.

(4) SECRETARY.—The term ''Secretary'' means the Secretary of the Interior.

Subtitle A—National Policy and Strategy for Wildlife

SEC. 111. NATIONAL POLICY ON WILDLIFE AND GLOBAL WARMING.

It is the policy of the Federal Government, in cooperation with State, tribal, and affected local governments, other concerned public and private organizations, landowners, and citizens to use all practicable means and measures—

(1) to assist wildlife populations and wildlife habitats in adapting to and surviving the effects of global warming; and

(2) to ensure the persistence and resilience of the wildlife of the United States, together with wildlife habitat, as an essential part of the culture, landscape, and natural resources of the United States.

SEC. 112. NATIONAL STRATEGY.

(a) REQUIREMENT.—

(1) IN GENERAL.—Not later than 2 years after the date of enactment of this Act, the Secretary shall implement the national policy under section 111 by establishing a national strategy for assisting

wildlife populations and wildlife habitats in adapting to the impact of global warming.

(2) ADMINISTRATION.—In establishing the national strategy, the Secretary shall—

(A) base the national strategy on the best available science, as provided by the Advisory Board;

(B) develop the national strategy in cooperation with State fish and wildlife agencies and Indian tribes;

(C) consult with—

(i) the Secretary of Agriculture;

(ii) the Secretary of Commerce;

(iii) the Administrator of the Environmental Protection Agency;

(iv) local governments;

(v) conservation organizations;

(vi) scientists; and

(vii) other interested stakeholders; and

(D) provide public notice and opportunity for comment.

(b) CONTENTS.—

(1) IN GENERAL.—The Secretary shall include in the national strategy prioritized goals and meas-

ures and a plan for implementation (including a timeframe)—

(A) to identify and monitor wildlife populations, including game species, that are likely to be adversely affected by global warming, with particular emphasis on wildlife populations with the greatest need for conservation;

(B) to identify and monitor coastal, marine, terrestrial, and fresh water habitats that are at the greatest risk of being damaged by global warming;

(C) assist species in adapting to the impact of global warming;

(D) protect, acquire, and restore wildlife habitat to build resilience to global warming;

(E) provide habitat linkages and corridors to facilitate wildlife movements in response to global warming;

(F) restore and protect ecological processes that sustain wildlife populations that are vulnerable to global warming; and

(G) incorporate consideration of climate change in, and integrate climate change adaptation strategies for wildlife and wildlife habitat into, the planning and management of Federal

land administered by the Department of the Interior and land administered by the Forest Service.

(2) COORDINATION WITH OTHER PLANS.—In developing the national strategy, the Secretary shall, to the maximum extent practicable—

(A) take into consideration research and information contained in—

(i) State comprehensive wildlife conservation plans;

(ii) the North American Waterfowl Management Plan;

(iii) the National Fish Habitat Action Plan; and

(iv) other relevant plans; and

(B) coordinate and integrate, to the extent consistent with the policy established under section 111, the goals and measures identified in the national strategy with goals and measures identified in those plans.

(c) REVISIONS.—Not later than 5 years after the date of the initial establishment of the national strategy and every 10 years thereafter, the Secretary shall revise the national strategy to reflect—

(1) new information on the impact of global warming on wildlife and wildlife habitat; and

(2) advances in the development of strategies for adapting to or mitigating the impact.

(d) IMPLEMENTATION.—

(1) IMPLEMENTATION ON FEDERAL LAND SYSTEMS.—To achieve the goals of the national strategy and to implement measures for the conservation of wildlife and wildlife habitat identified in the national strategy—

(A) the Secretary of the Interior shall exercise the authority of the Secretary under this title and other laws within the jurisdiction of the Secretary pertaining to the administration of land; and

(B) the Secretary of Agriculture shall exercise the authority of the Secretary of Agriculture under this title and other laws within the jurisdiction of the Secretary pertaining to the administration of land.

(2) WILDLIFE CONSERVATION PROGRAMS.—To the maximum extent practicable, the Secretary, the Secretary of Agriculture, and the Secretary of Commerce shall use the authorities of the respective Sec-

retary under other laws to achieve the goals of the national strategy.

(e) LIMITATION ON EFFECT.—Nothing in this section creates new authority or expands any existing authority for the Secretary to regulate the use of private property.

SEC. 113. ADVISORY BOARD; NATIONAL GLOBAL WARMING AND WILDLIFE SCIENCE CENTER.

(a) ADVISORY BOARD.—

(1) IN GENERAL.—The Secretary shall establish and appoint the members of an Advisory Board that is composed of—

(A) not less than 10, and not more than 20, members recommended by the President of the National Academy of Sciences with expertise in wildlife biology, ecology, climate change, and other relevant disciplines; and

(B) the Director of the National Global Warming and Wildlife Science Center established under subsection (b), who shall be an ex officio member of the Advisory Board.

(2) FUNCTIONS.—The Advisory Board shall—

(A) provide scientific and technical advice and recommendations to the Secretary on—

(i) the impact of global warming on wildlife and wildlife habitat;

(ii) areas of habitat of particular importance for the conservation of wildlife populations affected by global warming; and

(iii) strategies and mechanisms to assist wildlife populations and wildlife habitats in adapting to the impact of global warming on the management of Federal land and in other Federal programs for wildlife conservation;

(B) advise the National Global Warming and Wildlife Science Center established under subsection (b) and review the research programs of the Center; and

(C) advise the Secretary regarding the best science available for purposes of developing and revising the national strategy established under section 112.

(3) PUBLIC AVAILABILITY.—The advice and recommendations of the Advisory Board shall be available to the public.

(b) NATIONAL GLOBAL WARMING AND WILDLIFE SCIENCE CENTER.—

(1) IN GENERAL.—The Secretary shall establish a National Global Warming and Wildlife Science Center within the United States Geological Survey.

(2) DIRECTOR.—The Center shall be headed by a Director, appointed by the Secretary.

(3) FUNCTIONS.—The Center shall—

(A) conduct scientific research on national issues relating to the impact of global warming on wildlife and wildlife habitat and mechanisms for adaptation to, mitigation of, or prevention of the impact;

(B) consult with and advise Federal land management agencies and Federal wildlife agencies on—

(i) the impact of global warming on wildlife and wildlife habitat and mechanisms for adaptation to or mitigation of the impact; and

(ii) the incorporation of information regarding the impact and the adoption of mechanisms for adaptation or mitigation of the impact in the management and planning for Federal land and in the administration of Federal wildlife programs; and

(C) consult and, to the maximum extent practicable, collaborate with State and local agencies, institutions of higher education, and other public and private entities regarding research, monitoring, and other efforts to address the impact of global warming on wildlife and wildlife habitat.

(4) INTEGRATION WITH OTHER FEDERAL ACTIVITIES.—The Secretary, the Secretary of Agriculture, and the Secretary of Commerce shall ensure that research and other activities carried out under this section are integrated with climate change program research and activities carried out under other Federal law.

(c) DETECTION OF CHANGES.—The Secretary, the Secretary of Agriculture, and the Secretary of Commerce shall use existing authorities to each carry out programs to detect changes in wildlife abundance, distribution, and behavior related to global warming, including—

(1) conducting species inventories on Federal land and in marine areas within the exclusive economic zone of the United States; and

(2) establishing and implementing robust, coordinated monitoring programs.

SEC. 114. AUTHORIZATION OF APPROPRIATIONS.

(a) IN GENERAL.—There are authorized to be appropriated such sums as are necessary to carry out this subtitle.

(b) IMPLEMENTATION OF NATIONAL STRATEGY.—Of the amount that is made available to carry out this subtitle for each fiscal year—

(1) 45 percent of the amount shall be made available to Federal agencies to develop and implement the national strategy established under section 112 in the administration of Federal land systems, of which not less than—

(A) 35 percent shall be allocated to the Department of the Interior—

(i) to operate the National Global Warming and Wildlife Science Center established under section 113(b); and

(ii) to carry out the policy established under section 111, and implement the national strategy, in the administration of—

(I) the National Park System;

(II) the National Wildlife Refuge System; and

(III) public land of the Bureau of Land Management; and

(B) 10 percent shall be allocated to the Department of Agriculture to carry out the policy established under section 111, and implement the national strategy, in the administration of the National Forest System;

(2) 25 percent of the amount shall be made available to Federal agencies to carry out the policy established under section 111, and to implement the national strategy, in the administration of fish and wildlife programs (other than for the operation and maintenance of Federal land), of which—

(A) 10 percent shall be allocated to the Department of the Interior to carry out endangered species, migratory bird, and other fish and wildlife programs administered by the United States Fish and Wildlife Service, other than operations and maintenance of the National Wildlife Refuges; and

(B) 15 percent shall be allocated to the Department of the Interior to implement or fund activities that assist wildlife and wildlife habitat in adapting to the impact of global warming under applicable cooperative grant programs, including—

(i) grants from the cooperative endangered species conservation fund established under section 6(i) of the Endangered Species Act of 1973 (16 U.S.C. 1535(i));

(ii) Private Stewardship Grants;

(iii) grants from the North American Wetlands Conservation Act (16 U.S.C. 4401 et seq.);

(iv) grants from the multinational species conservation fund established under the heading ''MULTINATIONAL SPECIES CONSERVATION FUND'' of title I of the Department of the Interior and Related Agencies Appropriations Act, 1999 (16 U.S.C. 4246);

(v) grants from the Neotropical Migratory Bird Conservation Fund established by section 9(a) of the Neotropical Migratory Bird Conservation Act (16 U.S.C. 6108(a)); and

(vi) grants under the National Fish Habitat Action Plan; and

(3) 30 percent of the amount shall be made available for grants to States and Indian tribes

through the State and tribal wildlife grants program authorized under section 121—

(A) to carry out activities that assist wildlife and wildlife habitat in adapting to the impact of global warming in accordance with State comprehensive wildlife conservation plans developed and approved under the program; and

(B) to revise or supplement existing State comprehensive wildlife conservation plans as necessary to include specific strategies for assisting wildlife and wildlife habitat in adapting to the impact of global warming.

(c) AVAILABILITY TO STATES AND INDIAN TRIBES.—

(1) IN GENERAL.—Subject to paragraphs (2) and (3), funding under this section may be made available to States and Indian tribes in accordance with this section.

(2) INITIAL 5-YEAR PERIOD.—During the 5-year period beginning on the date of enactment of this Act, a State shall not be eligible to receive funds under this section unless the head of the wildlife agency of the State has—

(A) approved, and provided to the Secretary, an express strategy to assist wildlife

populations in adapting to the impact of global warming in the State; and

(B) incorporated the strategy as a supplement to the comprehensive wildlife conservation plan of the State.

(3) SUBSEQUENT PERIOD.—After the 5-year period described in paragraph (2), a State shall not be eligible to receive funds under this section unless the State has submitted to the Secretary, and the Secretary has approved, a revision to the comprehensive wildlife conservation plan of the State that—

(A) describes the impact of global warming on the diversity and health of the wildlife populations and habitat of the State;

(B) describes and prioritizes proposed conservation actions to assist wildlife populations in adapting to the impact;

(C) establishes programs for monitoring the impact of global warming on wildlife populations and wildlife habitat; and

(D) establishes methods for—

(i) assessing the effectiveness of conservation actions taken to assist wildlife populations in adapting to the impact; and

(ii) adapting the actions to respond appropriately to new information or changing conditions.

(d) MAINTENANCE OF EFFORT.—It is the intent of Congress that funding provided under this subtitle supplements (and not supplants) existing sources of funding for wildlife conservation.

Subtitle B—State and Tribal Wildlife Grants Program

SEC. 121. STATE AND TRIBAL WILDLIFE GRANTS PROGRAM.

(a) AUTHORIZATION OF PROGRAM.—The Secretary shall establish a State and tribal wildlife grants program under which the Secretary shall provide wildlife conservation grants to States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, the United States Virgin Islands, and Indian tribes for the planning, development, and implementation of programs for the benefit of wildlife and wildlife habitat, including species that are not hunted or fished.

(b) ALLOCATION OF FUNDS.—

(1) IN GENERAL.—Subject to paragraph (2), of the amount that is made available to carry out this section for each fiscal year—

(A) 10 percent shall be used to conduct a competitive grant program for Indian tribes that are not subject to any other provision of this section;

(B) of the amount remaining after the application of subparagraph (A) and after the deduction of the administrative expenses incurred by the Secretary to carry out this section—

(i) not more than ½ of 1 percent shall be allocated to provide grants to each of—

(I) the District of Columbia; and

(II) the Commonwealth of Puerto Rico; and

(ii) not more than ¼ of 1 percent shall be allocated to each of—

(I) Guam;

(II) American Samoa;

(III) the Commonwealth of the Northern Mariana Islands; and

(IV) the United States Virgin Islands; and

(C) of the amount remaining after the application of subparagraphs (A) and (B), the Secretary shall apportion among the States—

(i) ⅓ based on the ratio that the land area of each State bears to the total land area of all States; and

(ii) ⅔ based on the ratio that the population of each State bears to the total population of all States.

(2) ADJUSTMENTS.—The amount apportioned under paragraph (1)(C) for a fiscal year shall be adjusted equitably so that no State is apportioned under that subparagraph an amount that is—

(A) less than 1 percent of the amount available for apportionment under that subparagraph for the fiscal year; or

(B) more than 5 percent of the amount.

(c) COST SHARING.—

(1) PLAN DEVELOPMENT GRANTS.—The Federal share of the costs of developing or revising a comprehensive wildlife conservation plan shall not exceed 75 percent of the total costs of developing or revising the plan.

(2) PLAN IMPLEMENTATION GRANTS.—The Federal share of the costs of carrying out an activity under an approved comprehensive wildlife conservation plan carried out with a grant under this section

shall not exceed 50 percent of the total costs of carrying out the activity.

(3) PROHIBITION ON USE OF FEDERAL FUNDS.—The non-Federal share of costs of an activity carried out under this section shall not be paid with amounts derived from any Federal grant program.

(d) REQUIREMENT FOR PLAN.—

(1) IN GENERAL.—No State, territory, possession, or other jurisdiction (referred to in this subsection as an ''eligible jurisdiction'') shall be eligible for a grant under this section unless the eligible jurisdiction submits to the Secretary a comprehensive wildlife conservation plan that—

(A) complies with paragraph (2); and

(B) considers the broad range of wildlife and associated habitats of the eligible jurisdiction, with appropriate priority placed on species with the greatest conservation need and taking into consideration the relative level of funding available for the conservation of those species.

(2) CONTENTS.—The comprehensive wildlife conservation plan of an eligible jurisdiction shall contain—

(A) information on the distribution and abundance of species of wildlife (including low and declining populations as the fish and wildlife agency of the eligible jurisdiction considers appropriate) that are indicative of the diversity and health of the wildlife of the eligible jurisdiction;

(B) information on the location and relative condition of key habitats and community types essential to the conservation of species identified under subparagraph (A);

(C) a description of—

(i) problems that may adversely affect species identified under subparagraph (A) or the habitats of the species; and

(ii) priority research and survey efforts that are needed to identify factors that may assist in the restoration and improved conservation of those species and habitats;

(D) a description of conservation actions proposed to conserve the identified species and habitats and priorities for implementing the actions;

(E) a proposed plan for monitoring species identified under subparagraph (A) and the habitats of the species, for—

(i) monitoring the effectiveness of the conservation actions proposed under subparagraph (D); and

(ii) adapting the conservation actions to respond appropriately to new information or changing conditions;

(F) a description of procedures to review the comprehensive wildlife conservation plan at intervals of not to exceed 10 years;

(G) a plan for coordinating the development, implementation, review, and revision of the comprehensive wildlife conservation plan with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the jurisdiction or administer programs that significantly affect the conservation of identified species and habitats; and

(H) provisions that provide an opportunity for broad public participation as an essential element of the development, revision, and implementation of the comprehensive wildlife conservation plan.

(e) EXISTING STRATEGIES AND ACTIVITIES.—

(1) STRATEGIES.—A State comprehensive wildlife strategy that was approved by the Secretary pursuant to a provision of law in effect on the day before the date of enactment of this Act shall remain in effect until the authority for the strategy expires or is revised in accordance with the terms of the strategy.

(2) ACTIVITIES.—Except as specified in section 114(c), funds made available under this section may be used to carry out conservation and education activities conducted or proposed to be conducted pursuant to a strategy described in paragraph (1).

(f) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated such sums as are necessary to carry out this section.

TITLE II—OCEAN PROGRAMS

SEC. 201. SHORT TITLE.

This title may be cited as the ''Global Warming and Acidification Coastal and Ocean Resiliency Act''.

SEC. 202. FINDINGS.

Congress finds that—

(1) healthy, diverse, and productive coastal, ocean, and Great Lakes ecosystems, communities,

and habitats are critical to securing the full range of natural resource benefits for the United States;

(2) healthy ecosystems are more resilient than degraded ecosystems;

(3) resilient ecosystems can better adapt to changing environmental conditions, including global warming and ocean acidification;

(4) the effects of global warming, including relative sea level rise and ocean acidification pose significant threats to healthy ocean, coastal, and Great Lakes ecosystems; and

(5) policies and programs designed to ensure the recovery, resilience, and health of coastal, ocean, and Great Lakes ecosystems and the resources of the ecosystems in the face of environmental change are an urgent national priority.

Subtitle A—National Policy for Ocean, Coastal, and Great Lakes Ecosystem Health and Resiliency

SEC. 211. NATIONAL POLICY ON OCEAN, COASTAL, AND GREAT LAKES ECOSYSTEM HEALTH AND RESILIENCY.

It is the policy of the Federal Government, in cooperation with State, tribal, and affected local govern-

ments, other concerned public and private organizations, coastal and ocean resource users, and citizens to take effective measures—

(1) to ensure the recovery, resiliency, and health of ocean, coastal, and Great Lakes ecosystems;

(2) to predict, plan for, and mitigate the impact on coastal, ocean, and Great Lakes ecosystems from global warming, including relative sea level rise, and from ocean acidification;

(3) to plan for and mitigate the impact of the development of offshore alternative energy resources and appropriate carbon capture and sequestration activities; and

(4) to cooperate and collaborate to support improved and enhanced ocean and coastal management in the United States.

SEC. 212. NATIONAL OCEAN, COASTAL, AND GREAT LAKES RESILIENCY STRATEGY.

(a) REQUIREMENT.—

(1) IN GENERAL.—Not later than 2 years after the date of enactment of this Act, the Secretary of Commerce (referred to in this title as the ''Secretary'') shall implement the national policy under section 211 by establishing a national strategy to

protect, maintain, and restore coastal and marine ecosystems so that the ecosystems are more resilient and better able to withstand the additional stresses associated with global warming, including relative sea level rise, and with ocean acidification.

(2) MEASURES.—In establishing the national strategy, the Secretary shall provide for research and design of practical measures—

(A) to avoid, alleviate, or mitigate the impact of global warming, including relative sea level rise, and of ocean acidification on ocean, coastal, and Great Lakes ecosystems and resources in the United States; and

(B) to ensure the recovery, resiliency, and health of ocean, coastal, and Great Lakes ecosystems.

(3) ADMINISTRATION.—Before and during the development of the national strategy, the Secretary shall—

(A) base the national strategy on the best available science;

(B) consult with—

(i) the Secretary of the Interior;

(ii) the Administrator of the Environmental Protection Agency;

(iii) Regional Fishery Management Councils;

(iv) State coastal management and fish and wildlife agencies;

(v) Indian tribes;

(vi) local governments;

(vii) conservation organizations;

(viii) scientists; and

(ix) other interested stakeholders; and

(C) provide public notice and opportunity for comment.

(b) CONTENTS.—

(1) IN GENERAL.—The Secretary shall include in the national strategy prioritized goals and measures and a plan for implementation (including a timeframe)—

(A) to incorporate climate change adaptation strategies into the planning and management of ocean and coastal programs and resources administered by the Department of Commerce;

(B) to incorporate the strategies into the planning and management of ocean and coastal resources administered by Federal and non-

Federal governmental entities other than the Department of Commerce;

(C) to support predictions of relative sea level rise;

(D) to protect, maintain, and restore coastal and marine ecosystems so that the ecosystems are more resilient and better able to withstand the additional stresses associated with global warming, including relative sea level rise, and with ocean acidification;

(E) to protect ocean and coastal species from the impact of global warming and ocean acidification;

(F) to incorporate adaptation strategies for relative sea level rise into coastal zone planning;

(G) to protect and restore ocean and coastal habitats to build healthy and resilient ecosystems, including the purchase of coastal and island land; and

(H) to promote the development of plans to mitigate at the community level the economic consequences of global warming, including relative sea level rise and ocean acidification.

(2) COORDINATION WITH OTHER PLANS.—In developing the national strategy, the Secretary shall, to the maximum extent practicable—

(A) take into consideration research and information contained in—

(i) Federal, regional, and State management and restoration plans;

(ii) the reports of the Pew Oceans Commission and the United States Commission on Ocean Policy; and

(iii) any other relevant reports and information; and

(B) encourage and take into account regional plans for protecting and restoring the health and resilience of ocean and coastal ecosystems, including the Great Lakes.

(c) REVISIONS.—Not later than 5 years after the date of the initial establishment of the national strategy and each 10 years thereafter, the Secretary shall revise the national strategy to reflect—

(1) new information on the impact of global warming, including relative sea level rise, and of acidification on ocean, coastal and Great Lakes ecosystems and the resources of the ecosystems; and

(2) advances in the development of strategies for adapting to or mitigating for the impact.

(d) IMPLEMENTATION.—To achieve the goals of the national strategy, each Federal agency shall (directly and in cooperation with other agencies) implement measures for the conservation of ocean, coastal, and Great Lakes ecosystems under the jurisdiction of the Federal agency that promote the national strategy established under this section.

SEC. 213. ADVISORY BOARD.

(a) IN GENERAL.—The Secretary shall establish and appoint the members of an Advisory Board that is composed of not less than 10, and not more than 20, members recommended by the President of the National Academy of Sciences with expertise in ocean, coastal, and Great Lakes biology, ecology, fisheries, climate change, ocean acidification, and other relevant disciplines, including economics at the community level.

(b) FUNCTION.—The Advisory Board shall—

(1) provide scientific and technical advice and recommendations to the Secretary on—

(A) the impact of global warming, including relative sea level rise, and of acidification on ocean and coastal ecosystems, resources, eco-

logical and coastal communities, and habitats; and

(B) strategies and mechanisms to mitigate the impact of global warming, including relative sea level rise, and of acidification on ocean and coastal ecosystems;

(2) advise the Secretary on priorities for research or information collection; and

(3) advise the Secretary on priority needs for achieving systematic improvements in ocean and coastal resiliency for the purposes of section 212.

SEC. 214. IMPLEMENTATION OF NATIONAL STRATEGY.

(a) IN GENERAL.—Of the amount that is made available to carry out this subtitle for each fiscal year—

(1) 40 percent shall be made available for the carrying out of Federal responsibilities to develop and implement the national strategy established under section 212; and

(2) 60 percent shall be used to make grants under subsection (b).

(b) GRANTS.—

(1) IN GENERAL.—The Secretary shall make grants to eligible entities to pay the Federal share (as determined by the Secretary) to carry out activities that contribute to or result in protecting, main-

taining, or restoring the resilience and health of coastal, ocean, and Great Lakes ecosystems and resources, including planning and scientific research to support such purposes.

(2) ELIGIBLE ENTITIES.—To be eligible to receive a grant under this subsection, an entity shall be—

(A) a Federal agency;

(B) an agency of a State or political subdivision;

(C) a regional partnership;

(D) an Indian tribe;

(E) an institution of higher education; or

(F) a nongovernmental organization.

(3) ELIGIBLE USES.—A grant provided under this subsection may only be used to carry out an activity described in paragraph (1) that is approved by the Secretary.

(4) PRIORITIZATION.—In approving applications under this subsection, the Secretary shall give priority to proposals that—

(A) implement measures to enhance the health or resilience of coastal, ocean, or Great Lakes areas of national significance, including biological, historical, and cultural measures;

(B) result in systematic improvements to the resilience and health of coastal and ocean ecosystems and resources;

(C) are sufficiently cooperative and broad in geographic scope to address the problem or need; and

(D) demonstrate cost-effectiveness based on ecosystems services provided per dollar of Federal expenditure, including consideration of the potential for a funding match.

(5) GUIDANCE.—The Secretary shall issue guidance regarding a process for—

(A) the approval or disapproval of applications for grants under this subsection, including opportunities for public comment; and

(B) the establishment of annual and multiyear national funding priorities.

(6) EVALUATION.—

(A) IN GENERAL.—The Secretary shall establish a system to provide for an annual external evaluation of each grant that measures the progress of implementation of the grant against the goals and objectives of the grant project.

(B) PUBLIC AVAILABILITY.—The Secretary shall make the results of the evaluations publicly available.

SEC. 215. REPORTS.

(a) NATIONAL ACADEMY OF SCIENCES.—The Secretary shall enter into an arrangement with the National Academy of Sciences under which the Academy shall report to Congress, not later than 2 years after the date of enactment of this Act, on the current and projected impact of global warming, including relative sea level rise, of ocean acidification, and on effective mitigation strategies for the ocean, coastal, and Great Lakes ecosystems and resources of the United States.

(b) REPORT TO CONGRESS.—The Secretary shall make available to Congress a copy of the strategy and implementation plan established under this subtitle (including any updates to the strategy and plan).

SEC. 216. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated such sums as are necessary to carry out this subtitle.

Subtitle B—Planning for Climate Change in Coastal Zone

SEC. 221. PLANNING FOR CLIMATE CHANGE IN COASTAL ZONE.

(a) IN GENERAL.—The Coastal Zone Management Act of 1972 (16 U.S.C. 1451 et seq.) is amended by adding at the end the following:

"SEC. 320. CLIMATE CHANGE RESILIENCY PLANNING.

"(a) DEFINITIONS.—In this section, the terms 'ecological processes', 'habitat', and 'wildlife' have the meanings given those terms in section 2 of the Global Warming Wildlife Survival Act.

"(b) PROGRAM.—The Secretary shall establish, consistent with the national policies established under section 303, a coastal climate change resiliency planning and response program to—

"(1) provide assistance to coastal states to develop and implement coastal climate change resiliency plans pursuant to approved management programs approved under section 306, to prepare for and reduce, in an environmentally sensitive manner, the negative consequences to the coastal zone that may result from global warming and ocean acidification; and

"(2) provide financial and technical assistance and training to enable coastal states to implement plans developed pursuant to this section through enforceable policies of the coastal states.

"(c) GUIDELINES.—Not later than 180 days after the date of enactment of this section, the Secretary, in consultation with the coastal states, shall issue guidelines for the implementation of the grant program established under subsection (d).

"(d) CLIMATE CHANGE RESILIENCY PLANNING GRANTS.—

"(1) IN GENERAL.—Subject to the availability of appropriations, the Secretary may make a grant to any coastal state for the purpose of developing and implementing climate change resiliency plans pursuant to guidelines issued by the Secretary under subsection (c).

"(2) PLAN CONTENT.—

"(A) IN GENERAL.—A plan developed with a grant under this section shall include adaptation strategies for fish and wildlife, fish and wildlife habitat, and associated ecological process as are necessary to assist fish and wildlife, fish and wildlife habitat, and associated ecological processes to adapt to, become resilient to,

and mitigate the impact of, global warming and ocean acidification.

"(B) INCLUSIONS.—The plans shall specifically include—

"(i) adaptive management strategies for land and water use to respond or adapt to changing environmental conditions, including strategies to protect biodiversity and establish habitat buffer zones, migration corridors, and climate refugia; and

"(ii) requirements—

"(I) to initiate and maintain long-term monitoring of environmental change to assess coastal zone resiliency; and

"(II) if necessary, to adjust adaptive management strategies and new planning guidelines to attain the policies under section 303.

"(3) ALLOCATION.—Grants under this section shall be—

"(A) available only to coastal states with management programs approved by the Secretary under section 306; and

"(B) allocated among the coastal states in a manner consistent with regulations promulgated pursuant to section 306(c).

"(4) PRIORITY.—In the awarding grants under this subsection, the Secretary may give priority to any coastal state that has received grant funding to develop program changes pursuant to paragraphs (1), (2), (3), (5), (6), (7), and (8) of section 309(a).

"(5) TECHNICAL ASSISTANCE.—The Secretary may provide technical assistance to a coastal state (consistent with section 310) to ensure the timely development of plans supported by grants awarded under this subsection.

"(6) FEDERAL APPROVAL.—In order to be eligible for a grant under subsection (e), a coastal state shall have the plan of the coastal state developed under this section approved by the Secretary.

"(e) COASTAL RESILIENCY PROJECT GRANTS.—

"(1) IN GENERAL.—Subject to the availability of appropriations, the Secretary may make grants to any coastal state that has a climate change resiliency plan approved under subsection (d)(6) for implementation of the plan.

"(2) PROGRAM REQUIREMENTS.—

"(A) IN GENERAL.—Not later than 90 days after the date of approval of the first plan approved under subsection (d)(6), the Secretary shall publish in the Federal Register requirements regarding applications, allocations, eligible activities, and all terms and conditions for grants awarded under this subsection.

"(B) MERIT-BASED AWARDS.—No less than 30 percent of the funds made available for any fiscal year for grants under this subsection shall be awarded through a merit-based competitive process.".

(b) AUTHORIZATION OF APPROPRIATIONS.—Section 318(a) of the Coastal Zone Management Act of 1972 (16 U.S.C. 1464(a)) is amended—

(1) in paragraph (1), by striking "and" at the end;

(2) in paragraph (2), by striking the period at the end and inserting "; and"; and

(3) by adding by adding at the end the following:

"(3) for grants under subsections (d) and (e) of section 320, such sums as are necessary for each fiscal year.".

TITLE III—SPECIAL IMPERILED SPECIES PROGRAMS

SEC. 301. DEFINITIONS.

In this title:

(1) DIRECTOR.—The term ''Director'' means the Director of the United States Geological Survey.

(2) ECOSYSTEM.—The term ''ecosystem'' means any complex of a plant, animal, fungal, and microorganism community and the associated non-living environment of the community that interacts as an ecological unit, including the species and the viability of species within the community.

(3) IMPERILED SPECIES.—The term ''imperiled species'' means—

(A) a species listed as an endangered species or threatened species under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.);

(B) a species proposed for listing under that Act;

(C) a candidate species under that Act.;

(D) a species listed as an endangered species under any State law; and

(E) a species, the population of which is declining at a significant rate.

SEC. 302. REGIONAL ECOLOGICAL SYMPOSIA.

(a) IN GENERAL.—Not later than 18 months after the date of enactment of this Act, the Director, in coordination with the Director of the United States Fish and Wildlife Service and the Director of the National Marine Fisheries Service, shall convene multiple regional scientific symposia to examine the ecological impact of global warming on each imperiled species in each ecosystem of the United States.

(b) COMPOSITION.—A symposium convened in a region shall include—

(1) scientific representatives from Federal agencies with species- or ecosystem-related activities in the region;

(2) if appropriate, scientists or technical experts representing State, local, and tribal governments; and

(3) scientific experts from institutions of higher education and scientific societies, and any other independent scientists with sufficient qualifications and credentials, particularly with respect to site-specific ecological conditions and the status of species and ecological communities of concern in the region.

(c) DUTIES.—A symposium convened in a region shall—

(1) identify and assess fish, wildlife, and plant species, the habitats of the species, and the natural processes, ecosystems, and landscapes that support the habitats, that are most imperiled by global warming; and

(2) focus on imperiled species that are located on public land, declining migratory birds species, and other species that are protected by treaty or international agreement.

SEC. 303. NATIONAL ACADEMY OF SCIENCES REPORT.

(a) IN GENERAL.—As soon as practicable after the date of enactment of this Act, the Secretary of the Interior shall enter into an arrangement with the National Academy of Sciences under which the Academy shall convene a panel—

(1) to examine and analyze the reports, data, documents, and other information created by the multiple regional scientific symposia convened in accordance with section 302(a); and

(2) to prepare a report that takes into consideration each report, data, document, and other item of information described in paragraph (1).

(b) CONTENTS OF REPORT.—The report required under subsection (a)(2) shall include—

(1) an identification and assessment of—

(A) the impact of global warming on each imperiled species and ecosystem in the United States (including the territories of the United States); and

(B) different ecological scenarios that may result from different intensities, rates, and other critical manifestations of global warming;

(2) recommendations for specific roles to be played by Federal, State, local, and tribal agencies and private parties in assisting imperiled species in adapting to, and surviving the impacts of, climate change, including a recommended list of prioritized remediation actions by those agencies and parties; and

(3) other relevant ecological information.

(c) PUBLIC AVAILABILITY.—The recommendations and report required under this section shall be made available to the public as soon as practicable after the recommendations and report are complete.

(d) USE OF REPORT BY CERTAIN HEADS OF FEDERAL AGENCIES.—The Secretary of Agriculture, the Secretary of Commerce, and the Secretary of the Interior, in carrying out each national policy described in sections 111

1 and 211, shall take into account the recommendations and
2 report required under this section.

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