

“PLANNING FOR A CHANGING CLIMATE AND ITS IMPACTS ON WILDLIFE AND OCEANS: STATE AND FEDERAL EFFORTS AND NEEDS”; AND H.R. 4455, WILDLIFE WITHOUT BORDERS AUTHORIZATION ACT.

**OVERSIGHT AND
LEGISLATIVE HEARING**

BEFORE THE
SUBCOMMITTEE ON FISHERIES, WILDLIFE
AND OCEANS

OF THE
COMMITTEE ON NATURAL RESOURCES
U.S. HOUSE OF REPRESENTATIVES

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OVERSIGHT HEARING ON “PLANNING FOR A CHANGING CLIMATE AND ITS IMPACTS ON WILDLIFE AND OCEANS: STATE AND FEDERAL EFFORTS AND NEEDS”; AND LEGISLATIVE HEARING ON H.R. 4455, WILDLIFE WITHOUT BORDERS AUTHORIZATION ACT.

**Tuesday, June 24, 2008
U.S. House of Representatives
Subcommittee on Fisheries, Wildlife and Oceans
Committee on Natural Resources
Washington, D.C.**

The Subcommittee met, pursuant to call, at 10:14 a.m. in Room 1324, Longworth House Office Building, Hon. Madeleine Z. Bordallo [Chairwoman of the Subcommittee] presiding.

Present: Representatives Bordallo and Wittman.

**STATEMENT OF THE HONORABLE MADELEINE Z. BORDALLO,
A DELEGATE IN CONGRESS FROM GUAM**

Ms. BORDALLO. Good morning. The Subcommittee on Fisheries, Wildlife and Oceans will now come to order.

The Subcommittee is meeting today to hear testimony on two topics. The first is efforts that are underway and that are needed in the future for states and the Federal agencies to plan for and mitigate the impacts that climate change is expected to have on our oceans, our coasts and our wildlife. The second is H.R. 4455, the Wildlife Without Borders Authorization Act, introduced by the Ranking Member of the Committee on Natural Resources from Alaska, Mr. Young.

The Subcommittee meets today to hear testimony on two important issues, as I noted earlier. The first is regarding efforts by states and the Federal agencies to plan for and mitigate climate change impacts on our oceans, our coasts and our wildlife. As we heard at our hearing last year and as numerous scientific commissions have concluded, our land and water resources are extremely vulnerable to a wide range of effects from climate change. And some of these effects are already occurring. And even if we were to end all emissions tomorrow, they are still going to continue and grow in magnitude in the future.

The effects will be broad, ranging from drought, floods, ocean warming and acidification, and sea level rise to the increase in

disease and insect infestations, coral bleaching and changes in the distribution of numerous fish and wildlife species across their habitat ranges. Many of these habitat ranges themselves will change dramatically. Despite this urgency, a GAO report published in August of last year found that Federal resources agencies, including NOAA, Fish and Wildlife Service, and the Park Service, had not made climate change a priority and the agencies' strategic plans did not specifically address climate change.

In addition, resources managers within these agencies have limited guidance about whether or how to address climate change and were uncertain about what, if any, actions should be taken. Nor did they have the site-specific information necessary to plan for and manage the effects of climate change on the Federal resources that they manage.

I am hopeful that we will hear from both the Fish and Wildlife Service and NOAA that this situation has dramatically improved in our resource management agencies over the nine months since that report was issued. At the same time, I look forward to hearing from the States of California and Virginia, who both appear to have met the challenge of climate change head on and are proactively planning for the impacts on their oceans, coasts, wildlife and infrastructure. Yet, as both of these states will point out, they cannot do it alone, and a comprehensive and strategic effort by Federal agencies, as well as additional resources will be needed to complement state efforts.

Finally, the Committee will also hear testimony on H.R. 4455, introduced by our colleague from Alaska, Mr. Young, to authorize the Wildlife Without Borders program within the Fish and Wildlife Service. Now, the intent of this program is to move beyond the existing species-specific international wildlife funds previously authorized by Congress and to instead formally authorize a program to direct the Federal Government to address international wildlife conservation needs on a broader landscape basis.

So I look forward this morning to hearing from our witnesses regarding the pros and the cons of this approach and what changes they might suggest to ensure that our approach to international species conservation is truly comprehensive. In light of the impacts that wildlife will experience as a result of climate change, the consideration of conservation on a broad landscape scale will be that much more critical.

And now at this time I would like to recognize Mr. Wittman, my colleague from the State of Virginia, who is standing in for the Ranking Member Mr. Brown, for any statement that he may have. [The prepared statement of Mrs. Bordallo follows:]

**Statement of The Honorable Madeleine Z. Bordallo, Chairwoman,
Subcommittee on Fisheries, Wildlife and Oceans**

The Subcommittee meets today to hear testimony on two important issues, as I noted. The first is regarding efforts by states and the Federal agencies to plan for and mitigate climate change impacts on our oceans, coasts, and wildlife.

As we heard at our hearing last year, and as numerous scientific commissions, have concluded, our land and water resources are extremely vulnerable to a wide range of effects from climate change. Some of these effects are already occurring, and even if we were to end all emissions tomorrow, they are still going to continue and grow in magnitude in the future.

The effects will be broad, ranging from droughts, floods, ocean warming and acidification, and sea level rise to increases in disease and insect infestations, coral bleaching, and changes in the distribution of numerous fish and wildlife species across their habitat ranges. Many of these habitat ranges themselves will change dramatically.

Despite this urgency, a GAO report published in August of last year found that federal resource agencies, including NO-AA, Fish and Wildlife Service, and the Park Service had not made climate changes a priority and the agencies' strategic plans did not specifically address climate change. In addition, resource managers within those agencies had limited guidance about whether or how to address climate change and were uncertain about what, if any actions to take. Nor did they have the site-specific information necessary to plan for and manage the effects of climate change on the federal resources they manage.

I am hopeful that we will hear from both the Fish and Wildlife Service and NO-AA that this situation has dramatically improved in our resource management agencies over the nine months since that report was issued. At the same time, I look forward to hearing from the States of California and Virginia who both appear to have met the challenge of climate change head on and are proactively planning for the impacts on their oceans, coasts, wildlife and infrastructure. Yet, as both of these states will point out, they cannot do it alone, and a comprehensive and strategic effort by federal agencies as well as additional resources will be needed to complement states' efforts.

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I look forward to hearing from our witnesses today regarding the pros and cons of this approach and what changes they might suggest to ensure that our approach to international species conservation is truly comprehensive. In light of the impacts that wildlife will experience as a result of climate change, the consideration of conservation on a broad, landscape scale will be that much more critical.

STATEMENT OF THE HONORABLE ROBERT J. WITTMAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF VIRGINIA

Mr. WITTMAN. Thank you, Madam Chairwoman. I really appreciate your holding this hearing and I appreciate your attention to these two very important topics. First, I am glad that we are taking the time to examine Ranking Member Young's important bill to promote international conservation efforts, capitalizing on a relatively small Federal investment. The Wildlife Without Borders program has a very large positive impact on international species management and conservation efforts. I look forward to the committee acting quickly to mark up this legislation.

I am also looking forward to hearing from today's panel about the impact of changing climate on wildlife. So far scientists are able to come to general conclusions about climate change and using models to infer how increase in temperatures will impact the planet. And it is important to note how those impacts will affect wildlife and fish populations. Our knowledge of these complex systems is far from perfect and there are still many questions to be answered. And we are anxious to make sure that the science dictates our direction.

For example, some of the questions that come up based on the science is what is the role of man versus Earth's natural temperature cycles? How much is being caused by each? And are there any benefits to a warmer climate? Regardless, the link between in-

creased concentrations of greenhouse gases and warming temperatures are certainly cause for a concentrated attention to this issue. Changing temperatures, weather patterns and sea level rise have the potential to significantly alter wildlife habitat and impact coastal communities. And those of us from the coastal areas are now more sensitive to that these days, especially with the things we have had to encounter here recently.

Virginia's wide variety of wildlife and coastal ecosystems are susceptible to rising temperatures and changing weather patterns. Virginians living on the coast are wondering if climate change will trigger stronger hurricanes and increase property damage. Virginia watermen are contemplating how climate change will impact the economic viability of crab and shellfish populations. Additionally, growing concern among sportsmen has led many to question how will changing temperatures impact hunting and fishing opportunities.

As an avid waterfowl hunter and salt water angler, I am concerned about a recent report from leading conservation organizations entitled "Season's End: Global Warming's Threat to Hunting and Fishing." The report does a great job in assessing the potential impacts of climate change. The report highlights threats to Virginia's native brook trout populations, waterfowl migration patterns, and salt water game species.

On that note, I am very pleased to welcome David Whitehurst from the Virginia Department of Game and Inland Fisheries. And David is well known for his groundbreaking work in the area of game management and also on knowledge of the fisheries side. So I have worked and known David for many years and I am confident that he will shed some very unique insights on how states and the Federal Government can work together to ensure a bright future for hunting and fishing in our great country.

Again thank you, Madam Chairwoman, for holding this hearing. And at this time I would like to ask unanimous consent that Congressman Henry Brown's statement and the article "Seasons' End: Global Warming's Threat to Hunting and Fishing" be submitted for the record.

Ms. BORDALLO. No objection, so order.

[The prepared statement of Mr. Brown follows:]

Statement of The Honorable Henry E. Brown, Jr., Ranking Republican Member, Subcommittee on Fisheries, Wildlife and Oceans

Madam Chairwoman, I want to compliment you for holding this hearing on H.R. 4455 and I hope we markup this legislation in the near future. I would also like to compliment the gentleman from Alaska, Don Young, for his leadership in introducing this important bill.

In addition, I would like to welcome Dr. Margaret Davidson to our hearing today. Dr. Davidson has dedicated her entire life to ensuring the health and vitality of our ocean ecosystems. For the past twelve years, she has served with distinction as Director of NOAA's Coastal Service Center in Charleston and prior to that as the Executive Director of the South Carolina Sea Grant Consortium.

The Wildlife Without Borders was administratively created by the U.S. Fish and Wildlife Service twenty five years ago. In fact, this program was the forerunner to the first of the Multinational Species Conservation Funds that was not created until 1988.

Since its inception, the Service has approved nearly 900 Wildlife Without Borders conservation projects which have assisted a wide range of important species including Amur tigers, California condors, jaguars, snow leopards and Swainsons' hawks.

While these species may not be considered keystone, without this small investment they would be facing extinction.

The purpose of H.R. 4455 is to establish a Congressional authorization for this program. This will help to ensure that it is funded in the future, that Congress can periodically review its effectiveness and we can evaluate whether our taxpayers are getting a fair return on their investment.

The second portion of this hearing will evaluate how fish and wildlife can adapt to changing climate conditions. This is not a new or radical process.

Wildlife have been adapting to the warming or cooling of this planet for millions of years. Depending on the species, this may mean that they hibernate during the winter, migrate to warmer climates, increase their body weight or genetically alter their physical characteristics. For those species that could not adapt, like the dinosaur, they simply ceased to exist.

While the polar bear has become the poster child of global warming, what is largely ignored in the media, is that 10,000 years ago, the earth was much warmer, the polar caps had melted and the polar bear survived by adapting to these warmer temperatures.

In my own Congressional District, we have a number of fish and wildlife that have adapted extremely well including regrettably a fair number of foreign invasive species. We also have millions of people who travel to South Carolina each winter to enjoy our 170 miles of some of the finest beaches in the world. I am confident that these visitors have very little trouble adapting to our warm temperatures, crystal clear waters, pristine beaches and delicious seafood.

Madam Chairwoman, I look forward to hearing testimony on these two topics. I would also like to ask unanimous consent to submit for the record the publication entitled: "Seasons' End: Global Warming's Threat to Hunting and Fishing." While I may not endorse all of the conclusions in this report, it is certainly worth reading and it makes a valuable contribution to this ongoing and contentious debate.

Thank you, Madam Chairwoman.

[NOTE: The article "Seasons' End: Global Warming's Threat to Hunting and Fishing" submitted for the record has been retained in the Committee's official files.]

Ms. BORDALLO. I wish to thank my colleague, the gentleman from Virginia, Mr. Wittman, for his opening statement. And now I would like to recognize our first panel of witnesses.

Before I do that I would like to apologize. This hearing will be quite lengthy as we had to have three panels. There were just so many witnesses. And normally we do not have seven witnesses sitting at the table at one time. So we will try to get through it. And I will mention a little bit later on about our time limits.

But first I would like to introduce Ms. Margaret Davidson, the Director of the Coastal Services Center for the National Oceanic and Atmospheric Administration; Mr. Tony Brunello, Deputy Secretary for Climate Change and Energy for the California Resources Agency; and Ms. Sarah Chasis, Senior Attorney and Director of the Oceans Initiative at the Natural Resources Defense Council.

I would like to recognize Ms. Davidson to be the first witness. But I would like to also remind all of you that there is a timing light on the table that will indicate when your time has concluded. And we would appreciate your cooperation to comply with the minutes that have been set. There are five minutes. And your entire statement, however, I will remind you will be entered into the official record.

And so now I would like to recognize Ms. Davidson.

STATEMENT OF MARGARET DAVIDSON, DIRECTOR, COASTAL SERVICES CENTER, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE

Ms. DAVIDSON. Thank you, Chairwoman Bordallo and Congressman Wittman, other members of the Subcommittee. I appreciate the opportunity to appear before you today. My name is Margaret Davidson. I have had the opportunity of contributing to several of the IPCC reports.

Ms. BORDALLO. Would you move the microphone a little bit closer.

Ms. DAVIDSON. Yes.

Ms. BORDALLO. Thank you, Ms. Davidson.

Ms. DAVIDSON. My background is that I have been involved in these issues for some time, have contributed to some of the IPCC chapters on adaptation. But I think more importantly, I am by both birth and affinity a marsh rat and I currently live at 8.5 feet, so these issues are personal for me, Chairwoman, as they are for you.

You have had a number of hearings on the science. I am not actually here to speak on the science but to focus on some of the efforts that are underway in my agency and the ways in which we are working with state and local governments as well as the trust resources which we manage to address the implications of climate change.

Just want to remind you of facts that you are already aware of, that while the coasts are but 17 percent of the land area and 50 percent of the nation's population, they are nearly 60 percent of the nation's gross domestic product. So it is very important that we address these issues because we can ill afford not to since the coast is an area of extreme impact. All of the physical changes that we are beginning to observe are being made manifest in the ocean and along the coast.

With regard to living marine resource management, I think one of the better examples is, as Congressman Wittman mentioned, many of the major climate changes that are affecting our oceans are temperature, changes in the temperature regime, changes in the ocean acidification and other extremes, the loss of sea ice in the Arctic and Antarctic. These have dramatic impact on living marine resources. One example is that recently the North Pacific Fishery Management Council used climate information to adjust the Bering Sea pollock quota for 2008 with a 30 percent reduction from the 2007 levels. This was because some of that climate information about warming temperatures and its relationship to the reproductive cycles of this important species led us to believe that they were going to have a reduced capability and that we needed to throttle back that harvest in order to ensure that the stock was sustainable.

Besides the trust resources which we manage directly, marine fisheries, we also have trust-related responsibility with our state and local partners in important coastal habitat areas. As both of you know, coastal habitats provide excellent buffers for storm surge and flooding, as well as important habitat for critical fish and wildlife. And, indeed, across our country erosion alone costs us over \$500 million a year. And it is important that we recognize and understand and protect this green infrastructure, not only for the

value that it provides for fish and wildlife habitat, but for those flood retention values that we have come to appreciate. With the cost of natural disasters climbing in this country I would like to point out to you that many of the things that we need to do on the coast to mitigate the cost of natural disasters, frequent, more frequent storms, more intense precipitation periods, are often exactly the same set of strategies and actions that we would take to adapt to rising levels of sea level.

For instance, in Chesapeake Bay we have been working with many local communities as well as the state agencies to identify and protect and restore the near-shore oyster reefs and sea grass beds that not only provide critical habitat but do provide us with that storm protection value and the flood value that I just mentioned. We have done similar efforts in other states such as south Louisiana, which I am sure that you are quite aware of, a state that knows a great deal about storm damage and erosion. And in the State of Maine over the last three years we worked with the State of Maine, the Land Trust Alliance, U.S. Fish and Wildlife, and about 50 local organizations to develop the first coastwide conservation mapping and strategic planning initiative which we hope to extend working with other state partners across the country.

As we look to these issues in the coastal areas in particular it is essential that we have very good elevation data. We need high resolution coastal elevation data, as well as the shallow bathymetric data. And that is why we have joined with USGS and others to put together a comprehensive ocean and coastal mapping effort. You all are aware of some of the efforts that we are doing far offshore, but the near-shore efforts are particularly important to us as we begin to think about how to identify critical habitats.

I already lost my five minutes or did it get reset?

Ms. BORDALLO. You have a few seconds left.

Ms. DAVIDSON. Great.

One of our best efforts is the Pacific climate information services that we have actually undertaken throughout the Pacific islands where I think you know that the actions that we need to do to address tsunami risk are exactly the same things that we need to do with sea level. So we are bringing together information about changes, dramatic changes in precipitation, information about the elevation of the islands, and providing web-based tools that both the local and the regional managers can use to understand where to locate communities and how to address and restore critical habitat.

And I will provide some other examples for the committee. Thank you.

[The prepared statement of Ms. Davidson follows:]

Statement of Margaret A. Davidson, Director, Coastal Services Center, National Oceanic and Atmospheric Administration, U.S. Department of Commerce

Introduction

Good morning Madam Chairwoman and members of the Subcommittee. I am Margaret A. Davidson, Director of the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center. I had the honor of participating in the Intergovernmental Panel on Climate Change (IPCC) report chapter on adaptation, am an active advisory committee member for the National Center for Atmospheric Research, and have just been elected to the rank of American Meteorological Society

Fellow. I thank you for the opportunity to testify on the effects of climate change on coastal communities, and to highlight how NOAA is working across all levels of government and with other partners on planning and adapting to climate change. Changing climate is potentially one of the most significant long-term influences on the infrastructure and function of coastal communities, and coastal and marine ecosystems. Therefore, impacts must be identified and addressed in order to meet NOAA's management and stewardship goals of ensuring healthy, resilient, and productive coastal and ocean environments.

After all, NOAA's vision is an informed society that uses a comprehensive understanding of the role of the oceans, coasts, and atmosphere in the global ecosystem to make the best social and economic decisions.

Today, I will discuss the range of risks facing coastal communities in light of climate change. I will highlight how NOAA is working to help communities plan and adapt by collaborating with our partners to support the best possible science and develop appropriately scaled products, services, tools, and training that will enable officials and key organizations to make the right decisions to prepare and sustain their communities. NOAA recognizes the pressing national interest in coordination of the nation's climate adaptation efforts, through partnerships that bridge the gap between climate science and decision-making.

Changing Climate and its Effects on the Nation

Since the beginning of human settlements, we have chosen to dwell where land and water meet and where our needs for food, transportation, and waste disposal needs are easily met. More recently in the United States and elsewhere, the rate of relative population growth along the coast has soared as a result of an expanding coastal recreation and tourism economic sector. In the past 50 years, the density and the economic value of the built environment has escalated, and so have the repetitive disaster losses. The U.S. coast comprises merely 17 percent of national land area but supports nearly 50 percent of our population. Coastal areas generate nearly 60 percent of U.S. gross domestic product, and account for the most repetitive flood loss claims with both the National Flood Insurance Program and the private casualty loss insurance industry.

An analysis of data shows that the Earth's oceans may have warmed almost .04 degree Celsius over the second half of the 20th century¹. These data, along with findings from the recent IPCC assessments of 2001 and 2007 show that not only have the atmosphere and oceans warmed, they will continue to do so during the 21st century, at least in part due to increased greenhouse gases in the atmosphere. The 2007 IPCC Working Group II report stated: "Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases." Along with increases in global ocean temperatures, the IPCC projects that global sea level will rise between 7 and 23 inches by the end of the century (2090-2099) relative to the base period (1980-1999) (model based range excluding future rapid dynamical changes in ice flow). It is projected that the average rate of sea level rise during the 21st century is very likely to exceed the 1961-2003 average rate².

As climate changes, the effects on coastal communities and economies is likely to grow. These include the potential for increased flooding due to sea level rise, more severe coastal storms, drought, increased coastal erosion due to storminess and loss of sea ice, and accelerated decline of natural resources. These changes affect many aspects of coastal community investments in critical infrastructure (such as port facilities), how and where communities are built, economic drivers (e.g., fisheries, shipping), and the social and cultural fabric of these coastal communities.

In addition to effects on coastal communities and economies, climate change also affects coastal ecosystems, human health, and living marine resources. A recent study³ by the Harvard Medical School's Center for Health and Global Environment found climate change will affect the health of humans as well as the ecosystems and species on which we depend, and that these health effects will have significant economic consequences. Some of the major climate-forced changes are changes to the

¹ S. Levitus, J. Antonov, and T. Boyer. 2005. Warming of the world ocean, 1955-2003. *Geophysical Research Letters*, 32: L02604

² IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

³ Epstein, Paul R. and Mills, Evan, editors, 2005. *Climate Change Futures: Health, Ecological and Economic Dimensions*, Harvard Medical School, Swiss Re, United National Development Programme.

physical ocean environment (e.g. temperatures, stratification, currents), the loss of sea ice in the Arctic and Antarctic, ocean acidification forced by increased carbon dioxide levels, sea level rise, changes in the incidence and geographic distribution of disease causing organisms, and changes in freshwater supply and quality. These climate-forced changes affect the availability of habitat, the movements and distributions of organisms, the timing of biological phenomena, the physiology of species, and the productivity of individual species and whole ecosystems. All of these factors need to be considered in management programs administered by NOAA, other agencies and the states.

Climate change information is being incorporated into living marine resource management decisions through an increasing emphasis on an ecosystem approach to management. Climate change is only one of a complex set of factors (both human induced and naturally occurring), that influence the productivity of marine ecosystems. Effective management of resources in this complex environment necessitates balancing many competing and simultaneous objectives. NOAA is committed to advancing an ecosystem approach to its many stewardship responsibilities as a way forward in striking this balance. Ecosystem level advice (including climate conditions and potential consequences for the living marine resources) is being integrated and made available through publications and advisories such as the Status of the California Current System Report, the Ecosystems Considerations chapter of the North Pacific Groundfish Stock Assessment and Fisheries Evaluation reports, and Ecosystem Advisories for the Northeast Shelf large marine ecosystem.

The coastal margins are the first line of defense in tackling escalating challenges linked to climate change and resulting threats to coastal communities, economies, and ecosystems. Neither the federal government, nor individual localities have thorough plans, sufficient capabilities, or communication frameworks that address these threats. Fragmented decision-making made by a single sector or locality will not adequately handle these complex regional or national challenges. When developing comprehensive action plans, partnerships among federal, state, and local governments, regional organizations, nongovernmental organizations, academia, and the private sector must be considered. In addition, a Government Accountability Office report issued in August 2007 (Climate Change: Agencies Should Develop Guidance for Addressing the Effects on Federal Land and Water Resources, GAO-07-863) recommended that Federal agencies develop guidance incorporating their best practices advising managers on how to address climate change effects on the resources they manage. In response, the relevant agencies agreed with this recommendation and are working to develop such guidance.

During the past decade, the nature and urgency of these challenges have been well documented by the IPCC, as well as in distinguished national studies conducted by the U.S. Commission on Ocean Policy, Pew Commission, Coastal States Organization, National Research Council, Government Accountability Office, the Department of Commerce Office of Inspector General, and others. Dozens of other specific assessments support these studies in verifying the need for federal, state, local, and nongovernmental organizations to address these urgent issues. NOAA is committed to continuing our service and leadership for the nation in developing these needed partnerships to address the challenges of community planning and adaptation to climate change.

Understanding Climate Adaptation

A changing climate coupled with an increasing coastal population, waterfront development pressure on natural resources, and the growing intermodal needs of the transportation industry increases the risks to communities, ecosystems, businesses, and critical infrastructure. This leaves lives and livelihoods vulnerable to the effects of climate change. If dry becomes drought, wet becomes flood, and storms become more intense and devastating, it will be crucial for communities, economies, and ecosystems to become resilient and learn to adapt to the changing climate.

The IPCC defines adaptation as, "Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. Various types of adaptation exist, e.g. anticipatory and reactive, private and public, and autonomous and planned." Planned adaptation is the result of a deliberate policy decision based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state. To remain resilient in the face of climate change, coastal communities and natural resource managers should consider the range of future climate variability and begin planning now for their actions to have the most benefit. Actions taken now will not only have a lasting value as effects of climate change manifest themselves, they will also support resilient communities and ecosystems in the short term, as the coastal regions face seasonal storms, flooding, erosion, and other nat-

ural hazards as well as the loss and migration of critical natural resources and living marine resources.

Adaptation is also critical to ensure continued economic vitality. According to the Climate Change Futures report, implementing adaptation strategies that reduce vulnerability will be particularly important to the insurance industry to help reduce future losses. Local governments may experience escalating costs and losses if they do not consider potential future conditions when siting and building critical infrastructure. For example, a recent report from the National Science and Technology Council's Committee on Environment and Natural Resources (Scientific Assessment of the Effects of Global Change on the United States) states that municipalities will see escalating costs associated with water treatment infrastructure due to climate change related effects on water quality. These effects include higher temperatures and nutrient loads.

In order to ensure social, economic, and environmental vitality both now and in the future, coastal communities must have the capacity to develop and implement adaptation plans that address their current needs as well the pressures they are likely to face as climate changes. NOAA is working every day to help these communities not only understand the changing climate around them, but to meet our goal of providing the tools and resources necessary to help them adapt.

NOAA Mandates Related to Adaptation to Climate Change

NOAA's overarching mission is to understand and predict changes in the Earth's environment. NOAA operates under a breadth of mandates that direct our efforts regarding climate prediction and adaptation, ecosystems, safe navigation, mapping, coastal planning, resource management, and balancing of uses. Addressing the effects of climate change necessarily involves partnerships among federal, regional, state and local governments, and civil society organizations. The Coastal Zone Management Act provides a basis for NOAA to work through its partnerships with the state coastal zone management programs and the National Estuarine Research Reserves to improve climate adaptation planning, including the outreach and education required to ensure that state and local decision-makers are able to apply NOAA's information and products most effectively.

Other congressional and presidential directives that guide our climate-oriented activities include the Harmful Algal Bloom and Hypoxia Research and Control Act, the Oceans and Human Health Act, the National Climate Program Office Act, the Hydrographic Services Improvement Act, and the Climate Change Science Program. In executing our responsibilities under these mandates, NOAA focuses on the needs of local, regional, national, and international users, in strong partnership with appropriate agencies and organizations.

In addition, numerous legislative mandates require NOAA to manage living marine resources in a way that must take climate change effects on these resources, and adaptation and mitigation strategies, into consideration. These include the Magnuson Stevens Fishery Conservation and Management Reauthorization Act, the Marine Mammal Protection Act, the National Marine Sanctuaries Act, the Coral Reef Conservation Act, and the Endangered Species Act. As an example, the Endangered Species Act requires use of the "best scientific and commercial data available" in making listing determinations and formulating biological opinions. In many cases this will require the incorporation of climate data and projections. For example, in recovery planning for Pacific salmon and determinations of whether to list ice-dependent seals as threatened or endangered, predictions and projections of the future climate conditions and how these might impact the species must be taken into account. When elkhorn and staghorn corals were listed as threatened in 2006, the NOAA listing decision identified 13 stressors, or specific conditions, causing adverse impacts. Among these were several climate-related impacts including: elevated sea surface temperatures, which contribute to temperature induced bleaching and may exacerbate occurrence of diseases; elevated carbon dioxide levels and associated ocean acidification, which may lead to decalcification of coral structures; and sea level rise, which may cause present corals to be located at less favorable depths in the future.

Developing Capacity to Anticipate and Adapt to Climate Change

Coastal resource managers at the state and local levels are demanding information and services to prepare their coastal communities for the effects of climate change, including the potential for increased frequency and severity of coastal hazards such as erosion and flooding. Nine states (California, Louisiana, Maryland, Massachusetts, New Jersey, North Carolina, Oregon, South Carolina, and Washington) reported to the Coastal States Organization that they have begun taking steps to plan for climate change at the state level, and Florida has recently formed

a Climate Task Force. Many of the steps include policy changes that states and communities, through their coastal programs, are undertaking to improve their resilience to flooding, storm surge, and other forms of coastal inundation will also provide capacity for adapting to accelerated rates of Sea Level Rise. Additionally, two-thirds of the coastal states reported to NOAA (through the Coastal Zone Management Act Section 309 assessments) that coastal hazards are a high priority.

NOAA's products and services, such as high resolution digital elevation models, coupled coastal inundation models as well as coastal risk and vulnerability assessments, can help these states and their coastal communities understand the effects of coastal hazards in the near term, as well as the potential changing conditions with increased sea level rise. Similarly, the protection and restoration of natural resources that serve as buffers for storm surge and flooding, such as wetlands, barrier islands, and mangroves, provide water quality protection benefits can help protect communities from coastal inundation and the future effects of sea level rise. NOAA's research on the effects of climate change on living marine resources can help federal and state managers make decisions about how best to protect these sensitive species, at sea and on shore.

NOAA's Research, Models, and Observations

NOAA engages in oceanic and atmospheric research, model development, and data collection and management focused on climate change and adaptation. NOAA's efforts spur and enhance the development of NOAA's products and services that provide the necessary tools and training for effective climate adaptation planning. Some of the key research, model, and observation projects and programs, as well as their contributions to climate change issues, are summarized below.

Regional Research Partnership

The NOAA's Regional Integrated Sciences and Assessments (RISA) program supports research that investigates complex regional climate sensitive issues of concern to decision-makers and policy planners. The RISA research team includes universities, government research facilities, non-profit organizations, and private sector entities. Traditionally, the research has focused on the fisheries, water, wildfire, and agriculture sectors. Recently, the RISA program has expanded to include coastal impacts and transportation research. Of the eight teams supported by the RISA program, the Climate Impacts Group at the University of Washington has the strongest focus on climate and fisheries issues, and is unique in its focus on the intersection of climate science and public policy. The Climate Impacts Group performs fundamental research on climate impacts on the Pacific Northwest and works planners and policy makers to apply this information to regional decision-making processes.

Ocean and Coastal Mapping

The mapping and charting of our coastal and marine waters, including the Great Lakes, continues to be an activity of great national importance especially in the face of climate change. Partnerships, such as the Integrated Ocean and Coastal Mapping initiative that was called for by the National Research Council and identified as a priority in the President's Ocean Action Plan, can provide the baseline geographic information needed to accurately predict relative sea level rise. The Integrated Ocean and Coastal Mapping effort will provide a consistent national spatial framework, increased access to geospatial data and mapping products, and increased inter- and intra-agency communication, cooperation, and coordination. Ultimately, those entities dependent on maps for navigation, national security, scientific research, energy development, location of cultural resources, and coastal and living marine resource management will all greatly benefit. The integrated mapping information is essential to understanding the effects of coastal inundation, and will allow communities to develop effective adaptation plans.

Accurate Heights and Water Levels

Accurate height and water levels are acquired through NOAA's Height Modernization Program and Continuously Operating Reference Stations. There are also two federally coordinated data collection efforts, the Joint Airborne Bathymetry Lidar Technical Center of eXpertise (JABLTCX) and the National Digital Elevation Program. In addition, relative sea level trends, developed from years of continuous tidal monitoring observations through NOAA's National Water Level Observation Network, are essential for activities such as improved transportation systems, integrated observing systems, subsidence monitoring, sea level rise estimation, flood plain mapping, urban planning, storm surge modeling, habitat restoration, emergency preparedness, coastal and resource management, and construction.

A state-based example of observation work can be found in California, where the Pacific Institute for Studies in Development, Environment and Security is working

on a “Costs of Adapting to Sea Level Rise” project for the California Energy Commission. In order to derive meaningful results, this type of climate change study requires accurate water elevation data, which NOAA has provided to the Institute.

Visualization Models

Visualization models are tools that help us better understand potential effects of climate change. Working with local partners in Charleston, South Carolina, NOAA is developing visualizations of sea level rise to enable coastal managers to identify areas at potential risk from rising water based on various sea level rise scenarios. A methodology for creation of Geographic Information System (GIS) based maps of sea level rise inundation is being developed, as well as a comparison of high and lower resolution maps. Social and economic metrics will be investigated, as well as ecological effects of sea level rise as they relate to ecosystem services. Similar locally scaled tools are envisioned as an essential component of a coastal climate adaptation partnership.

U.S. Integrated Ocean Observing System (IOOS)

NOAA recognizes the importance of a national integrated ocean observing infrastructure as a valuable tool to characterize, understand, predict and monitor changes in coastal-ocean environments and ecosystems. NOAA’s IOOS program enhances NOAA’s ability to monitor effects of climate change, including coral bleaching and sea level rise. A number of NOAA’s IOOS multi-year, regional investments are directed toward climate change issues. IOOS data products and services are targeted to high-impact decision support tools, such as coastal inundation and hurricane intensification modeling, and integrated ecosystem assessments, which will inform the management plans and policy decisions related to climate change. For example, the Chesapeake Inundation Prediction System is a partnership among federal and state agencies, industry, and academia. The System predicts inundation in the Washington, DC, metropolitan area and the tidal Potomac River, and provides a flood forecast prototype that simulates street-level flooding from storm events using a high-resolution circulation model both for immediate storm response and advanced mitigation planning and decision-making. Based on preliminary results, the tool has potential to enhance the capability of NOAA Weather Forecast Offices around the country to deliver more specific, and timely inundation forecasts to local communities.

A Regional Approach Towards Leveraging Federal Climate Capabilities

NOAA actively engages in a regional approach towards leveraging federal climate capabilities. For example, NOAA is working closely with the West Coast Governors Agreement, the Gulf of Mexico Alliance, the Northeast Regional Ocean Council, the Great Lakes Regional Collaboration, our international partners, and others, to help coastal states better define their needs in regards to understanding coastal and marine ecosystems and the effects of climate change at regional scales.

In May 2008, twelve federal agencies, representatives from seven states, and several associations in the southeast met for a workshop called Adapting to a Changing Climate. Sponsored by the Southeastern Natural Resources Leadership Group and assisted by NOAA, this workshop brought together regional federal and state executives who lead agencies with natural resource conservation as part of their mission. This regional leadership gathering addressed the current status of science, knowledge acquisition, mitigation, and adaptation for a changing climate in the southeastern United States. The workshop proceedings will help inform the focus and needs for the development of a broader climate adaptation strategy for the region.

A National Approach Towards Leveraging Federal Climate Capabilities

In addition to our local and regional efforts, NOAA is also developing national tools and services that leverage federal climate capabilities. The National Integrated Drought Information System (NIDIS) Act of 2006 prescribes an approach for drought monitoring, forecasting, and early warning at watershed, state, and county levels across the United States. Led by NOAA, NIDIS is being developed through the consolidation of physical, hydrological, and socio-economic effects data, engaging those affected by drought; integrating observing networks; developing of a suite of drought decision support and simulation tools; and delivering standardized information products through an interactive internet portal (www.drought.gov). NIDIS is a dynamic and accessible drought risk information system that provides users with the capacity to determine the potential effects of drought, and provides the decision support tools needed to better prepare for and mitigate the effects of drought.

NOAA’s Sectoral Applications Research Program (SARP) is a research service that develops the knowledge base, decision support tools, capacities and partnerships in sectors affected by climate in a substantial and increasingly visible way. SARP is

designed to catalyze and support interdisciplinary research, innovative outreach, and education activities that enhance the capacity of key socioeconomic sectors to respond to and plan for climate variability and change through the use of climate information and related decision support resources. The program is designed to systematically build an interdisciplinary knowledge base and a mechanism for the creation, dissemination, and exchange of climate-related research findings and decision support resources, which are critical for understanding and addressing resource management challenges in vital social and economic sectors such as coastal resources, water, agriculture, and health.

NOAA's Tools and Information to Support Adaptation Planning

Despite a growing awareness of climate change and sea level rise, local decision-makers often still lack the tools to examine different management objectives (i.e., coastal hazards and conservation) in relation to one another and to visualize alternative scenarios for resource management that meets multiple objectives. NOAA is working in partnership with local communities to develop a suite of tools and information services to meet their climate change adaptation needs.

Guidebooks

Guidebooks are an instructive tool designed to assist local communities in meeting their climate change adaptation needs. NOAA, in concert with local partners, produced the King County (Washington) Climate Adaptation Guidebook. The Guidebook was designed to facilitate planning for climate effects by specifying practical steps and strategies that can be used locally to build community resilience into the future. The Guidebook will enable communities to integrate climate preparedness strategies into existing hazard mitigation plans, reduce the costs associated with disaster relief, and prioritize vulnerabilities such as infrastructure, water supply, and human health.

In response to the devastating Indian Ocean tsunami of 2004, NOAA and the U.S. Agency for International Development created a new coastal community resilience guidebook. The guidebook, titled *How Resilient Is Your Coastal Community? A Guide for Evaluating Coastal Community Resilience to Tsunamis and Other Hazards*, presents a framework for assessing resilience of communities to coastal hazards. The framework, developed in concert with over 140 international partners, encourages integration of coastal resource management, community development, and disaster management for enhancing resilience to hazards, including those that may occur as a result of climate change.

Risk Management

NOAA's Pacific Risk Management 'Ohana (PRiMO) is involved in a partnership to develop tsunami risk information for U.S. Flag Islands outside Hawaii. The initial effort is focused on Guam and has been a successful collaboration with participation by many PRiMO partners from NOAA, the Federal Emergency Management Agency (FEMA), the Guam Homeland Security Office of Civil Defense, the Guam Coastal Zone Management Program, and Guam GIS. Modeling results are expected to be completed in the next few months. Once complete, there will be opportunities to integrate this risk information into projects, plans, and programs.

Regional Decision-Making

To support regional decision-making, NOAA, in partnership with state coastal management programs, provides technical assistance and funding to support projects to help state and local governments prepare for and adapt to climate change and sea level rise. Climate change related projects include creating sea level rise inundation models, developing plans for adapting to climate change, and establishing new regulations for dealing with sea level rise. For example,

- NOAA is providing technical assistance for The Nature Conservancy for a project on Long Island that will help coastal decision-makers visualize, and make informed decisions about, conservation, land protection, and coastal development. NOAA will also work with partners to effectively incorporate project outputs into the Digital Coast partnership pilot effort;
- NOAA, along with its research partners at Cornell University, is creating decision support tools related to east coast winter storm frequency and effects. Researchers are developing a rating system that quantifies the potential for coastal effects as a result of an east coast winter storm, and investigating modifying the existing seasonal forecast procedures to reflect the severity of impact of coastal storms as opposed to overall storm frequency. The network of coastal decision-makers that are accessible through NOAA and New York Sea Grant will be instrumental in assuring the climatological tools developed will be valued and used in decision support; and

- NOAA is supporting the San Francisco Bay Conservation and Development Commission's regional planning efforts to adapt to climate change in the bay area. This effort includes mapping shoreline areas vulnerable to sea-level rise; organizing a regional program to address climate change in the bay area, and updating the San Francisco Bay Plan findings and policies to address global climate change effects on San Francisco Bay.

NOAA's Capacity Building, Outreach, and Education

In addition to the resources and tools we develop, NOAA is also supporting local communities through capacity building, and outreach and education efforts. A few of these efforts include:

- The RiskWise partnership network is providing an educational approach to improve the safety and resilience of communities threatened by coastal hazards. Through the partnership's existing resources and programs, local decision-makers will have access to training, tools, and networks that better enable them to increase their resilience through community planning, economic development, and disaster management;
- The Association of State Floodplain Managers (ASFPM), in partnership with NOAA, has published the Coastal No Adverse Impact handbook, to educate local officials and residents on the benefits of a "do no harm" coastal management and development philosophy;
- The NOAA Sea Grant extension network of 350 agents and specialists in 30 coastal states and Puerto Rico serve as outreach intermediaries between NOAA's climate researchers, coastal decision-makers, and diverse constituents helping to define and deliver NOAA's climate tools and products needed at the local level; and
- NOAA's National Marine Sanctuary Program is piloting a climate change "story template" that will help each of the thirteen sanctuary sites and the marine national monument identify what the local and regional effects of climate change will be. This will aid in the development of a climate change action plan for each site to help plan and adapt to future impacts. NOAA is also developing a climate change component to its Marine Protected Areas (MPA) management capacity training program that will provide basic tools and procedures for MPA managers.

Incorporating Climate Change Information into Coastal and Ocean Resource Management

As noted previously, NOAA's work to incorporate climate change and adaptation into our mission and activities has resulted in numerous efforts that will assist the nation, states, regions, and local communities. Climate change information is being incorporated into coastal and ocean living marine resource and coastal ecosystem management decisions within NOAA itself through an increasing emphasis on an ecosystem approach to management.

Climate-related ecosystem level advice is being integrated and made available through programs, publications and advisories such as the Coral Reef Conservation Program, the Status of the California Current System Report, the Ecosystems Considerations chapter of the North Pacific Groundfish Stock Assessment and Fisheries Evaluation reports, and Ecosystem Advisories for the Northeast U.S. Shelf Large Marine Ecosystem. A short summary of other efforts include:

- In 2006, NOAA and partners produced A Reef Manager's Guide to Coral Bleaching. The guide articulates the state of knowledge on the causes and consequences of coral bleaching and provides information on responding to mass bleaching events, highlighting how to develop bleaching response plans and other management strategies to help reef managers increase the resilience of coral reefs and related ecosystems to expected changes in the global climate system.
- Climate information was used for fisheries management by the North Pacific Fishery Management Council who decided to reduce the Bering Sea pollock quota for 2008 by about 30 percent from 2007 levels. Climate information supplied by NOAA indicating relatively warm ocean conditions contributed to this decision.
- The state-managed National Estuarine Research Reserve System serves as sentinel sites to monitor the effects of change, as well as reference sites for guiding mitigation and adaptation strategies in larger coastal areas and watersheds. In addition, the Reserves' education and training programs provide science-based information to help individuals, agencies and organizations mitigate and adapt to the effects of climate change. At the Waquoit Bay National Estuarine Research Reserve in Massachusetts, staff participates on the Falmouth Energy

Committee and helped to develop the Climate Action Plan for the town of Falmouth and have been active in getting towns on the Cape to commit to the Cities for Climate Protection program.

- NOAA is working with coastal managers and planners to better prepare for changes in coastal ecosystems due to land subsidence and sea level rise. Starting with southern Pamlico Sound, North Carolina, the approach is to simulate projected sea level rise using a coastal flooding model that combines a hydrodynamic model of water levels with a high resolution digital elevation model. The final products will be mapping and modeling tools that allow managers and planners to see projected shoreline changes and to display predictions of ecosystem impacts.

How NOAA Incorporates Climate Change Information - Ecosystem Services Restoration and Protection

Coastal habitats provide a variety of important ecosystem services that help protect coastal citizens and infrastructure from impacts of storms, flooding, sea level rise and other coastal hazards. Irreplaceable for floodwater retention, water filtration, fish and wildlife habitats and coastal buffers, coastal wetlands, barrier islands, mangroves and coral reefs provide a “green infrastructure,” helping to reduce erosion, storm surge and flooding, and provide buffers against the onslaught of storms and wave energy. The extensive damage caused to the Gulf of Mexico from hurricanes Katrina and Rita was due in part to the degraded state of the wetlands and barrier islands. Nationally, coastal erosion results in loss of coastal structures and property valued at an estimated \$500 million per year. Protection and restoration of coastal wetlands, estuaries, and rivers can help protect coastal communities against the onslaught of coastal hazards, sea level rise, and other effects of climate change.

We need to fully understand ecosystem processes and interactions, in order to predict and forecast how climate change will alter these ecosystem processes and interactions and the vital services they provide, and to adapt to those changes. For example, wetlands and barrier islands provide significant flood protection benefits. Recent research shows that each wetland alteration permit in Florida costs an additional \$1,000 in property damage per flood claim, and all permits combined cost the state \$30.4 million a year⁴. We need to understand how this value might change with increasing sea level rise and develop strategies to ensure that the ecosystem services are protected and maintained as the climate changes.

NOAA works with federal agencies, state and local governments, nonprofit, and private sector organizations to help coastal communities acquire, protect, conserve and restore coastal habitats, not only for the aesthetic and natural habitat benefits, but also because they provide important services to reduce the impacts of storms, flooding and other coastal hazards. NOAA’s efforts include large-scale, regional efforts involving multiple projects, to individual, local projects to protect or restore coastal wetlands, rivers, and other habitats. Some key examples of projects or programs include:

- In the Chesapeake Bay, NOAA and partners restored near-shore oyster reefs and seagrass beds that reduced wave damage and protected coastal property from erosion;
- In Maine, the Land Trust Alliance, the Maine Coast Heritage Trust, and the Maine State Planning Office entered into a cooperative agreement with NOAA to leverage the skills and resources of approximately 50 organizations engaged in protecting Maine’s coast for future generations. The project resulted in a coastal conservation plan that identifies protection priorities and strategies and implements a series of pilot projects at the local level;
- In coastal Louisiana, through the Coastal Wetlands Planning, Protection, and Restoration Act Program, NOAA has helped restore barrier islands resulting in increased protection of oil and gas infrastructure and coastal communities from risk of storm and wave damage; and
- NOAA’s Coastal and Estuarine Land Conservation Program provides a tool for states to address climate change and coastal hazards through cost-sharing land acquisition.

NOAA recognizes that it is imperative to work with states and community partners to develop ecosystem approaches to respond to the effects of climate change. NOAA has several successful programs that partner with states, local communities, and non-profit organizations to protect and restore coastal habitats. A strong plan-

⁴Brody, SD., Zahran S., Maghelal, P., Grover, H., Highfield, WE. The Rising Costs of Floods: Examining the Impact of Planning and Development Decisions on Property Damage in Florida, Journal of the American Planning Association, Vol. 73, No. 3, Summer 2007

ning element, matched by determined local involvement will lead to proactive adaptation.

Next Steps

Federal, state, and local governments, nonprofit organizations, and the private sector continuously demand more climate information and services to effectively address the challenge of climate change and adaptation. NOAA is working hard to address these needs within its current budget and programs. Climate researchers at NOAA are making progress in matching the time and space scales of climate projections with time and space scales relevant to coastal management, land-use decision making, and hazard mitigation planning. We are also working to incorporate climate observations and predictions into coastal and living marine resource management.

NOAA looks forward to working with stakeholders to prioritize future research efforts. Among the stated needs of stakeholders are integrating climate information into infrastructure decisions for ports and waterways, clarifying the mechanisms of climate impacts on coastal and living marine resources and habitats, and assessing the socioeconomic impacts of a changing climate on coastal communities.

Conclusion

Providing a comprehensive suite of climate products and services that support effective adaptation planning requires a partnership approach, particularly in the economically important and politically challenging coastal domain. No single agency can meet all of the nation's needs for climate services. But as the world's pre-eminent source for climate data and information, NOAA is uniquely positioned to help coordinate and provide climate information, products, and services across the federal government to ensure U.S. citizens, particularly those in coastal areas, have the tools required to adapt to the effects of a changing climate. NOAA is also working to ensure climate change information is being incorporated into living marine resource management decisions through an increasing emphasis on an ecosystem approach to management.

NOAA will continue to expand and improve its partnerships to meet growing constituent demands for tools, products, and services that will help them improve their resilience to the impacts of climate change on coastal ecosystems, communities, and economies.

Thank you for the opportunity to appear before you today.

Ms. BORDALLO. Thank you very much, Ms. Davidson. And now I recognize Mr. Brunello to testify for five minutes.

STATEMENT OF TONY BRUNELLO, DEPUTY SECRETARY, CLIMATE CHANGE AND ENERGY, CALIFORNIA RESOURCES AGENCY

Mr. BRUNELLO. Thank you. And I appreciate Margaret giving me her time.

Chairman Bordallo, Congressman Wittman, and distinguished members of the Subcommittee, thank you for the opportunity to appear before you today to offer testimony regarding the needs of the states and territories to successfully respond and adapt to the existing and future impacts of climate change along the nation's coasts. I should also note that I think I live at 20 feet sea level.

My name is Anthony Brunello and I serve as the Deputy Secretary for Climate Change and Energy for the California Resources Agency. I am here today on behalf of the Coastal States Organization which represents the interests of the Governors from 35 coastal states and territories and commonwealths. Over the past year, CSO's Climate Change Work Group developed a report targeting the key research, information, and policy needs designed to foster improved adaptation policies. This was a collaborative process with 26 states represented and led to a climate change policy later adopted by all 35 coastal states. During my testimony today I will

provide comments reflective of this CSO policy as well as specific observations from climate adaptation efforts in California.

As committee members may know, the Coastal State Organization just released a "Call for Action" to identify three critical steps necessary at the Federal level for ocean and coastal management. One of the three issues identified was the need for the Federal Government to assist coastal states in efforts to adapt to climate change. The nation's coastal states, territories and commonwealths will be the hardest hit by climate change impacts from sea level rise, temperature change and precipitation shifts over the next century. In California, absent successful intervention, one meter of sea level rise, for example, is being projected over the next century. This would result in flooding of more than 100 square miles of the San Francisco Bay Area, including critical infrastructure such as the Oakland and San Francisco Airports, and would inundate portions of the Sacramento and San Joaquin River Delta area. The delta is California's main artery for the state water project that provides water to more than 25 million residents.

This is actually quite an important point that I hope we will bring up later in the questions of how adaptation policies and strategies must be cross cutting. In particular, sea level rise cuts across our water sector, coastal sectors, wildlife sectors, and so shows many of the challenges that we are facing.

In particular, most coastal states are not prepared to address predicted climate change impacts such as sea level rise. States and Federal entities should assist in the development of sector-specific climate adaptation strategies for coastal areas and develop comprehensive cross-sector strategies that would aim to reduce vulnerability to climate change.

To reduce California's vulnerability to these risks, the state is developing a statewide climate adaptation strategy in coordination with its aggressive greenhouse gas mitigation policies. California's commitment to reduce our greenhouse gas emissions are clear in our 2006 Global Warming Solutions Act, the low carbon fuel standard, our renewable portfolio standard, and many other efforts to help reduce the long-term climate impacts to California. However, I always mention these efforts and the world's mitigation efforts will slow but not stop climate impacts to California and other coastal states over the next century. Therefore, adaptation of expected future impacts must occur as a parallel track to mitigation.

This is why California, through the leadership of California Governor Schwarzenegger and California Resources Agency Secretary Mike Chrisman, is planning its first coordinated climate change adaptation strategy effort that will be completed in 2009. To develop California's climate adaptation strategy, early efforts will focus on understanding where California is most vulnerable to climate change. The strategy efforts are already underway with different agencies and departments responsible for identifying policy options available to reduce California's vulnerability to future climate change. Groups focused on oceans and coastal resources, water, biodiversity, working lands, public health, infrastructure and energy will identify the most vulnerable areas in each sector and recommend policies for the state's adaptation strategy to future climate impacts.

Finally, California is working to implement certain adaptation strategies now that have been identified as necessary in the short term. Some examples include the following:

For the ocean and coastal resources sector, California is developing coastal management planning guidance to deal with sea level rise through its coastal management agencies and the California Ocean Protection Council. Departments such as the California Coastal Conservancy are changing funding guidelines to ensure preservation of terrestrial and aquatic species in coastal areas. And California chairs the Coastal States Organization which is working to ensure climate change adaptation is a priority for state and Federal partners.

For the water sector, the state Department of Water Resources is currently updating its state water plan that will guide water expenditures and planning for the next century and has climate change as a major planning priority.

Concerning biodiversity conservation, the California Department of Fish and Game has identified climate change as a key threat in its core planning document, the State Wildlife Action Plan, and is now working to address how the land it manages and the species residing on those lands will be impacted.

All of California's land management agencies are considering how to adjust planning and expenditures based on updated climate science. This is significant, since California has nearly \$500 million to spend per year over the next five years on habitat conservation and restoration in the state.

A couple more points. In California, the focus on understanding climate impacts and developing and implementing comprehensive cross-sector climate adaptation strategies is a useful framework for addressing climate adaptation efforts. The same approach could be replicated in other states across the country, as is currently happening in Florida, Washington, Oregon, and Maine, to reduce the nation's collective future vulnerability.

The CSO would support Federal efforts, along with California to: [1] develop a national coastal adaptation strategy to ensure inter-governmental coordination.

I can stop and bring those up later since that is a nice sound.

Basically just the last points are we need more assistance with developing a national adaptation strategy, funding new climate change research, assisting with on-the-ground mapping and modeling efforts that will be critical in addressing these impacts, and also recognizing the critical role of coastal states in adapting to climate change.

Thank you.

[The prepared statement of Mr. Brunello follows:]

Statement of Anthony Brunello, Deputy Secretary for Climate Change and Energy, California Resources Agency, on behalf of the Coastal States Organization

Chairwoman Bordallo, Ranking Member Brown, and distinguished members of the Subcommittee; thank you for the opportunity to appear before you today to offer testimony regarding needs of the states and territories to successfully respond and adapt to the existing and future impacts of climate change along the nation's coasts.

My name is Anthony Brunello and I serve as the Deputy Secretary for Climate Change and Energy for the California Resources Agency. I am here today on behalf of the Coastal States Organization (CSO), which represents the interests of the Gov-

ernors from thirty-five coastal states and territories and commonwealths. Over the past year, CSO's Climate Change Work Group developed a report targeting the key research, information, and policy needs designed to foster improved adaptation policies. This was a collaborative process with twenty-six states represented and led to a climate change policy later adopted by all thirty-five coastal states. During my testimony today, I will provide comments reflective of this CSO policy as well as specific observations from climate adaptation efforts in California.

CLIMATE IMPACTS TO COASTAL REGIONS

As committee members may know, the Coastal States Organization just released a "Call for Action" to identify three critical steps necessary at the federal level for ocean and coastal management. One of the three issues identified was the need for the federal government to assist coastal states in efforts to adapt to climate change. The nation's coastal states, territories, and commonwealths will be the hardest hit by climate change impacts from sea level rise, temperature change and precipitation shifts over the next century. These findings were detailed in both the Bush Administration's National Science and Technology Council (NSTC) report released last month and the U.N. International Panel on Climate Change (IPCC) Fourth Assessment Report. Coastal and Great Lakes areas are especially vulnerable to accelerated sea level rise, shoreline erosion, increased storm frequency and intensity, changes in rainfall, and related flooding. Expected impacts will vary regionally, but leading scientists tell us that many of these events are likely to be experienced in the coming decades—regardless of existing and proposed reductions in Green House Gas (GHG) emissions. In California, absent successful intervention, one meter of sea level rise is being projected over the next century. This would result in flooding of more than 100 square miles of the San Francisco Bay Area including critical infrastructure such as the Oakland and San Francisco Airports and would inundate portions of the Sacramento-San Joaquin River Delta area. "The Delta" is California's main artery for the State Water Project that provides water to more than 25 million residents (Figure 1 shows areas that could be flooded in the Bay Area with a one meter rise in sea level).

Islands and territories are especially vulnerable to sea level rise and extreme storm events. In fact, the IPCC found that sea-level rise is expected to impact island states in particular by exacerbating inundation, storm surge, erosion and other coastal hazards, in addition to threatening vital infrastructure, settlements and facilities that support the livelihood of island communities. Islands infrastructure is predominantly located on the coast, including nearly all international airports, roads and capital cities. In the Caribbean and Pacific islands, more than 50 percent of the population lives within a mile of the shoreline. And as Chairwoman Bordallo knows in her home of Guam, sea level rise is a growing concern with all development there being within 11 miles of the shoreline.

Climate change will also significantly impact coral reefs, fisheries and other marine-based resources, while adversely affecting human health, agriculture, and tourism, especially as it pertains to small island communities. Other impacts include changes in the chemical and physical characteristics of marine systems, saltwater intrusion into groundwater aquifers and coastal rivers, increase in harmful algal blooms, spread of invasive species, habitat loss, species migrations, and changes in population dynamics among marine and coastal species.

DEVELOPING A COMPREHENSIVE CLIMATE Adaptation Strategy

Most coastal states are not prepared to address predicted climate change impacts. States and federal entities could assist in the development of sector-specific climate adaptation strategies (i.e., water, oceans, infrastructure, habitat, agriculture, health, etc.) and comprehensive cross-sector strategies that would aim to reduce vulnerability to climate change. In developing climate adaptation strategies in California, there are three components needed to reduce vulnerability to future climate impacts including: (1) expanding the understanding of climate impacts to California; (2) developing a comprehensive cross-sector state climate adaptation strategy; and (3) implementing the climate adaptation strategy.

The foundation for any adaptation strategy is to understand what areas and sectors are most vulnerable to future climate impacts and what can be done to reduce the risk, if possible, of these impacts. Understanding climate change impacts requires downscaling large global climate models and their results to a more state-friendly format. The IPCC and NSTC reports mentioned provide a good starting point for understanding the national and regional impacts, but a similar state-oriented effort is needed. Although California is committed to this work through the California Energy Commission (CEC), coastal management agencies, the California Ocean Protection Council, and other sister agencies need more technical and finan-

cial assistance from the federal government. A clear federal strategy is needed for intergovernmental coordination with coastal states and local governments to assist us on coastal adaptation to climate change. A key component to this federal strategy for coastal adaptation should be a new, stronger focus on interagency cooperation between NOAA, state coastal management programs, regional efforts (i.e., West Coast Governors Agreement), and state floodplain managers. This will include assistance with mapping, modeling, and determination of the socio-economic impacts of climate change.

The first key component of adaptation is building the understanding of climate impacts. Thus, coastal states need clear idea, with maps and other tools, to identify what is at risk. It will be critical to become more familiar with the concepts of “vulnerability” and “risk management.” Vulnerability is the potential for a system to be harmed by climate change, considering the impacts of climate change on the systems as well as its capacity to adapt. Risk management is a tool to manage uncertainty related to climate change impacts through risk assessment, strategies development to manage it, and mitigation of risk. Both concepts are more common in industry than government and require new resource intensive tools based on probabilities and expert opinion rather than historical records. Both will be necessary since, to quote Yogi Berra, “The future ain’t what it used to be.”

The second key component for successful adaptation is developing the strategy. This is the most challenging component since it requires:

- Linking climate change vulnerability analysis to policy and financial investment actions that can reduce these risks; and
- Building political support to implement adaptation strategies.

Because climate change impacts are multi-dimensional, strategies must be comprehensive and cut across sectors. For example, coastal communities such as Los Angeles will benefit from a cross-sector analysis as they may face increased sea level, reduced water supply, and increased health risk from rising temperatures.

The final and most important component of a climate adaptation strategy is to implement the strategy. This is obvious, but important to emphasize since the majority of adaptation discussions focus on improving the science of climate change, which is necessary, but doesn’t fund nor promote actions to reduce known climate risks already identified. Many climate change adaptation strategies will simply be enhancing existing efforts, such as building higher and stronger flood control levies. However others sectors may require a complete restructuring of funding and planning efforts, such as funding habitat for endangered species that research shows no hope of surviving future climate change impacts.

CALIFORNIA’S ADAPTATION EFFORTS

California is already seeing significant climate change impacts now through shifting precipitation patterns and sea level rise. Sea level in the Bay Area has increased 7 inches over the last century, fires are increasing in severity and duration, and snow pack is melting earlier each year. In the future, California is expecting to see even higher sea level, more rain, less snow, and a shift and possible reduction in habitat and species diversity unlike any seen in the past.

California is now developing a statewide climate adaptation strategy in coordination with its aggressive GHG mitigation policies. State commitments in the 2006 Global Warming Solutions Act (to reduce the state’s GHG emissions 20 percent below its 1990 levels by 2020 and an 80 percent reduction by 2050) along with the Low Carbon Fuel and Renewable Portfolio Standards will help reduce the long-term climate impacts to California. However, these efforts and the world’s mitigation efforts will slow, but not stop, climate impacts to California over the next century; therefore, adaptation to expected future impacts must occur as a parallel track to mitigation. This is why California, through the leadership of California Resources Agency Secretary Mike Chrisman, is planning its first coordinated climate change adaptation strategy effort that will be completed in 2009.

To develop California’s climate adaptation strategy, early efforts are focused on understanding where California is most vulnerable to climate change. The California Energy Commission (CEC), in partnership with numerous government, academic, industry, and NGO partners, has spent millions of dollars over the last five years on building new climate change scenarios for California and funding in-depth studies of impacts to energy, forestry, water, biodiversity, and other sectors. The California Ocean Protection Council and state coastal management agencies (California Coastal Commission and the San Francisco Bay Conservation and Development Commission) are working on targeted analyses of coastal impacts. These studies will be complete this year, and will be used to develop the state’s climate adaptation strategy and to better inform policy-makers and the general public.

The strategy efforts are already under way with different agencies and departments responsible for identifying policy options available to reduce California's vulnerability to future climate change. Groups focused on oceans and coastal resources, water, biodiversity, working lands, public health, infrastructure, and energy will identify the most vulnerable areas in each sector and recommend policy for the state's adaptation to future climate impacts. To ensure California is coordinating with other state, national, and international efforts, the state will develop an "adaptation leaders" group to link with other climate change adaptation efforts, and provide varied public and private sector perspectives.

Finally, California is working to implement certain adaptation strategies now that have been identified as necessary in the short term. Some examples include the following:

- For the ocean and coastal resources sector, California is developing coastal management planning guidance to deal with sea level rise through its coastal management agencies and the California Ocean Protection Council, departments such as the California Coastal Conservancy are changing funding guidelines to ensure preservation of terrestrial and aquatic species in coastal areas, and California chairs the Coastal States Organization which is working to ensure climate change adaptation is a priority for state and federal partners.
- For the water sector, the state Department of Water Resources is currently updating its State Water Plan that will guide water expenditures and planning for the next century and has climate change as a major planning priority.
- Concerning biodiversity conservation, the California Department of Fish and Game has identified climate change as a key threat in its core planning document, the State Wildlife Action Plan, and is now working to address how the land it manages and the species residing on those lands will be impacted. All of California's land management agencies are considering how to adjust planning and expenditures based on updated climate science. This is significant since California has nearly five hundred million dollars to spend per year over the next five years on habitat conservation and restoration in the state.

California's response to climate change is not a simple choice between mitigating GHG emissions and adapting to the impacts of climate change. Adaptation and mitigation are necessary and complementary strategies for combating climate change. California's adaptation strategy effort will provide the state's best current thinking in determining the portfolio of solutions that will best minimize potential risks and maximize potential benefits to the state and its coastal areas.

MOVING TO ACTION

Reducing the United States' vulnerability to climate change impacts should be a national priority that receives the same attention as efforts to mitigate GHG emissions. The science is clear: coastal states can expect significant climate change impacts in many sectors and locations. Now is the time for state and federal policymakers to begin to take action.

Because the nation's coastal zone faces a number of challenges in adapting to the effects of climate change, coastal states must be full and equal partners in any national response. Close coordination between the federal government and coastal states in research, development of adaptive strategies, sharing of information, and education will be necessary to successfully meet these complex challenges. Given the physical and socioeconomic diversity of the nation's coastlines, individual states are best suited to determine which adaptive mechanisms will work best in their area. Therefore, state authority and sovereignty should be strongly maintained in a national strategy to adapt to climate change.

In California, the focus on understanding climate impacts and developing and implementing comprehensive cross-sector climate adaptation strategies is a useful framework for addressing climate adaptation efforts. The same approach could be replicated in other states across the country, as is currently happening in Florida, Washington, Oregon, and Maine, to reduce the nation's collective future vulnerability.

The Coastal States Organization would support federal efforts to:

- Develop a national coastal adaptation strategy to ensure intergovernmental coordination on coastal adaptation to climate change; to clearly define the roles of various agencies; and to identify the mechanisms by which federal programs will coordinate with state partners on coastal adaptation issues. This should be an important component in future strategies regarding the re-authorization of the federal Coastal Zone Management Act;
- Fund new climate change research, coordinate existing climate change research, and promote the outreach of this research to the states and territories;

- Assist with on-the-ground mapping and modeling efforts that will be critical in addressing these impacts before they occur; and,
- Recognize the critical role of coastal states in adapting to climate change.

CONCLUSION

Thank you Chairwoman Bordallo and distinguished members of the Subcommittee for the opportunity to appear before you today to offer testimony on how the nation can collectively reduce the vulnerability of coastal areas to future climate impacts. California is pleased to serve as a resource to the Subcommittee for future adaptation planning efforts.

Ms. BORDALLO. Thank you very much, Mr. Brunello.

I would like to remind the folks in the back there are still four seats up here. And I hate to see you stand. You know, it is almost just painful from the Chair's seat as it is back there. So please do not be shy, come and have a seat. There are four seats up here around the horseshoe.

All right. At this time I would like to recognize Ms. Chasis. Is that the way to pronounce your name?

Ms. CHASIS. Yes, it is, Madam Chair.

Ms. BORDALLO. All right.

STATEMENT OF SARAH CHASIS, DIRECTOR, OCEANS INITIATIVE, NATURAL RESOURCES DEFENSE COUNCIL

Ms. CHASIS. Thank you so much for this opportunity to testify on what the Natural Resources Defense Council, NRDC, sees as the expected need for Federal and state agencies to ramp up efforts to plan for global warming and its impacts.

Global warming is contributing to higher ocean temperatures, more extreme weather events, and rising sea levels. In addition, the higher concentration of CO₂ in the atmosphere is directly altering the chemistry of our oceans causing the water to become more acidic. Left unchecked, all of these changes will have profound impacts on coastal and marine ecosystems. Rising sea levels will increase erosion of beaches, cause salt water intrusion, inundate coastal marshes, and make coastal property more vulnerable to storm surges.

More extreme weather events, including intense rainfall, floods, droughts, tropical storms will alter fresh water flows into estuaries and lagoons, exacerbate polluted run-off and water supply problems, and damage coastal habitats and property. Higher ocean temperatures will cause extensive coral bleaching, enhance marine disease, alter species' ranges and population abundances, and stress many fisheries.

Increased acidity will profoundly affect many forms of marine life, particularly those with carbonate shells or other exterior structures, such as tropical and cold water corals.

While daunting, these impacts must be confronted by Federal and state governments. To prepare for sea level rise, coastal states and the Federal Government should take steps to implement ecologically and economically sound adaptive strategies that discourage new development in vulnerable areas and support efforts to site structures farther landward of eroding shorelines. This is essential, not only to help reduce serious risks to human safety, but also to ensure the preservation of beaches, dunes and other natural

coastal habitats that are so important to coastal economies and quality of life.

To deal with extreme weather events such as heavy downpours, coastal states and Federal agencies must emphasize the protection and restoration of shoreline and streamside riparian vegetation and wetlands. They must upgrade and update storm water management to take account of more frequent and heavier rainfall events and increase water use efficiency and opportunities for beneficial use.

To deal with warming of coastal waters it will require strategies that increase the overall resilience of ecosystems. It will be necessary to reduce the negative impacts of a broad range of human-induced stressors in an effort to help coastal and marine systems resist or recover from disturbances such as coastal bleaching, disease outbreaks or anoxia events. Placing greater emphasis on habitat protection and ecosystem-based management approaches will improve the likelihood that these systems and resources will be able to withstand the impacts of global warming and ocean acidification.

This shift in management will require a directive to Federal agencies and encouragement to state agencies to pursue their responsibilities in a manner consistent with the protection, maintenance and restoration of marine and coastal systems. Madam Chair, Congress' enactment of Oceans 21 legislation would promote this goal. And we applaud this Subcommittee's action in passing that legislation forward. And we urge the full committee to take that legislation up.

Finally, to address acidification, coastal states and the Federal Government must be leaders in efforts to minimize and reduce CO₂ emissions and, in addition, to restore the health and resilience of marine ecosystems, particularly coral reefs. Because ocean acidification is an emerging issue, directed research and monitoring funds should be made available as soon as possible.

Overall, and perhaps most importantly, in order to provide a comprehensive approach to addressing these challenges, Congress should enact climate adaptation legislation to direct Federal and state agencies to develop and implement adaptation strategies. And, and I underscore this, provide the scale and consistency of funding to make these efforts successful. Adaptation strategies should be coordinated at the Federal level through the development and implementation of a Presidential plan, and at the state level through the development and implementation of a Governor-level plan. Plans should be developed with input from all relevant agencies, scientists and the public. State-level plans should be consistent with the national strategy in order to receive Federal funds.

These are the types of actions that are needed to help ensure that the economic opportunities, ecological benefits and outdoor traditions that coastal and ocean resources provide will endure for generations to come.

Thank you.

[The prepared statement of Ms. Chasis follows:]

Statement of Sarah Chasis¹, Senior Attorney and Director of Ocean Initiative, Natural Resources Defense Council

I. Introduction²

Madame Chair and distinguished members of this Subcommittee, thank you for this invitation to testify on what we see as the expected need for Federal and state agencies to ramp up efforts to plan for global warming and its impacts. We believe that an essential element of this planning must be on improving the resilience of our natural systems and their ability to withstand the ongoing and expected impacts of global warming and ocean acidification. My testimony is presented on behalf of NRDC, a national environmental organization with over a million members and on-line activists, dedicated to the protection of the earth—its people, plants and animals and the natural systems on which all life depends.

Global warming is contributing to higher ocean temperatures, more extreme weather events, and rising sea levels. We are already starting to see its effects. For example, average surface water temperatures have increased about a degree Fahrenheit in the California Current off the west coast (Mendelsohn, 2005), 1.5 to 2 degrees Fahrenheit in the Chesapeake Bay (Austin, 2002) and 3 degrees Fahrenheit in Florida since the 1950s and 1960s (U.S. EPA, 1997). In addition, the higher concentration of CO₂ in the atmosphere is directly altering the chemistry of our oceans, causing the water to become more acidic (Kleypas, et al., 2005). Left unchecked, all of these changes will have a profound impact on coastal and marine ecosystems including:

- Rising sea levels will increase erosion of beaches, cause saltwater intrusion into water supplies, inundate coastal marshes and other important habitats, and make coastal property more vulnerable to storm surges.
- More-extreme weather events, including intense rainfall, floods, droughts, and tropical storms, will alter freshwater flows into estuaries and lagoons, exacerbate polluted runoff and water supply problems, and damage coastal habitats and property. An increase in wave height over the past 50 years has already been measured in the Northeast (Wolf et al., 2002) and the Pacific northwest (Allen et al., 2006)
- Higher ocean temperatures will cause extensive coral bleaching, enhance marine diseases, alter species' ranges and population abundances, and stress many fisheries. For example, unusually warm winters have resulted in lobster disease outbreaks in Long Island Sound (Glen and Pugh, 2006) as well as the northward spread of an oyster parasite, referred to as "dermo", from southern U.S. to areas north of Delaware Bay (Ford and Smolowitz, 2007). This disease has resulted in massive mortalities of the northeastern oysters in recent years.
- Changes in local and regional circulation patterns may occur causing changes in productivity. For example, recent changes in the timing and duration of upwelling along the Pacific coast—which are believed to be related to changes in wind patterns from continental warming—have triggered sea bird colony die-offs and dead zones along the west coast of the United States over the past few years (Chan et al., 2008).
- Increased ocean acidity will profoundly affect many forms of marine life, particularly those with carbonate shells or other exterior structures, such as tropical and cold water corals. This change in pH will directly affect many organisms at the base of marine food chains as well as organisms that provide critical habitat for other forms of marine life. Increased acidity may also have direct physiological effects on vulnerable juvenile stages of other types of marine organisms, such as fish and squid. Recent research shows corrosive waters are now being upwelled onto the continental shelf off the west coast of the United States due to ocean acidification (Feely et al., 2008). There is significant concern of what impacts this could have on coastal resources and ecosystems.

While it may seem daunting, state and federal agencies must confront these problems. This work will require concerted efforts on two important fronts: minimizing

¹Roberta Elias, Ocean Advocate, NRDC and Lisa Suatoni, Ocean Scientist, NRDC helped prepare this testimony.

²This testimony is largely drawn from the guide *Preparing for a Sea Change in Florida: A Strategy to Cope with the Impacts of Global Warming on the State's Coastal and Ocean Systems*, released in May 2008 by the Florida Coastal and Ocean Coalition, of which NRDC is a member. Patty Glick (NWF) was the primary author of the guide. Groups that are part of the Florida Coastal and Ocean coalition, in addition to NRDC, include the National Wildlife Federation, Environmental Defense Fund, Ocean Conservancy, Surfrider, Gulf Restoration Network, Coastal Conservation Association/Sea Turtle Survival League and Reef Relief. The guide can be found at: http://www.flcoastalandocean.org/Climate_Change_Guide_for_Florida_Preparing_for_a_Sea_Change.pdf.

global warming by reducing greenhouse gas emissions and preparing for related changes, many of which are already underway.

First and foremost, the nation must work to lessen the impact of global warming by reducing the pollution causing it. However, impacts are already occurring and will continue to occur even if emissions are capped (though at less dramatic levels than under a business as usual scenario). Because of this reality and because of the already degraded state of our ocean and coastal resources, federal and state agencies must adjust their management and conservation strategies to maximize resilience and to promote the ability of coastal and marine resources to adapt to ongoing and projected impacts.

There are a number of actions that coastal state and federal agencies can and should take to cope with the significant challenges posed by rising sea levels, more-extreme storm events, higher ocean temperatures, and acidification of ocean waters. Some of the recommended actions are summarized below and discussed in more detail later in this testimony.

Rising Seas

To prepare for sea-level rise, coastal states and the federal government must take steps to implement ecologically and economically sound adaptive policies and strategies that discourage development in vulnerable areas and support efforts to site structures farther landward of eroding shorelines. This is essential not only to help reduce serious risks to human safety, but also to ensure the preservation of beaches, dunes, and other natural coastal habitats that are so important to coastal economies and quality of life.

Extreme Weather Events

To deal with extreme weather events, such as heavy downpours and droughts, coastal states and federal agencies must emphasize the protection and restoration of shoreline and streamside riparian vegetation and wetlands, upgrade stormwater management to take account of more frequent and heavier rainfall events, and increase water use efficiency and opportunities for beneficial reuse.

Higher Ocean Temperatures

To reduce the impacts of higher ocean temperatures, coastal states and the federal government must work across sectors and agencies to protect and restore coastal and marine ecosystems in order to enhance their ability to withstand the additional stresses accompanying global warming.

Ocean Acidification

To address acidification, coastal states and the federal government must be leaders in efforts to minimize global warming through significant reductions in greenhouse gas emissions, in addition to restoring the health and resilience of marine ecosystems, particularly coral reefs. Because ocean acidification is an emerging issue, directed research and monitoring funds should be made available as soon as possible. Knowledge gained about the effects of ocean acidification at varying carbon dioxide concentrations should be used to inform any carbon cap set by Congress.

By implementing these and the other recommendations, coastal states and the federal government can help ensure that the economic opportunities, ecological benefits, and outdoor traditions that coastal and ocean resources provide will endure for generations to come. Given that the major threats to our oceans and coasts stem from activities pursued on land, along the coasts, and in the water, this shift in perspective will require a legislative directive to all agencies, not just those specifically charged with marine and coastal mandates, to pursue their responsibilities in a manner consistent with the protection, maintenance, and restoration of the health and productivity of coastal and marine ecosystem and resources.

Each of these impacts associated with increased atmospheric concentrations of greenhouse gases—sea level rise, extreme weather events, higher ocean temperatures, and increased ocean acidification—is discussed further below as well as state and federal strategies both to minimize these impacts and to improve the ability of natural systems and resources to adapt to related changes in conditions.

II. Confronting the Impacts of Sea Level Rise

Global warming is causing sea levels to rise due to a combination of thermal expansion of the oceans and rapidly melting glaciers and ice sheets. The average global (eustatic) sea level rose about 6.7 inches over the 20th century. This was 10-times faster than the average rate of sea-level rise during the preceding 3,000 years (IPCC, 2007). In the coming decades, the rate of sea-level rise is expected to accelerate. The most recent estimates from the 2007 IPCC assessment show an additional 7 to 23 inch rise in global average sea level by the 2090s (IPCC, 2007). How-

ever, scientists are becoming increasingly concerned that the rate of global sea-level rise in the coming decades and beyond will be even greater than these projections, as several new studies have determined that the ice sheets of Greenland and parts of Antarctica are melting much more rapidly than previously estimated (Otto-Bliesner, et al, 2006; Overpeck, et al., 2006; Rignot and Kanagaratnam, 2006). According to Dr. James Hansen, Director of NASA's Goddard Institute for Space Studies, if greenhouse gas emissions continue to increase on a "business-as-usual" trajectory, we could ultimately see a disintegration of the West Antarctica ice sheets. This has the potential to yield "a sea-level rise on the order of 5 meters this century" (Hansen, 2007).

Sea-level rise will increase beach erosion and associated shoreline recession and have a profound impact on beaches, the beach using public, and the tourism industry. Beaches are important economic engines. According to the Department of Commerce, travel and tourism is the Nation's largest employer and the second largest contributor to the gross domestic product—contributing over \$700 billion annually. Beaches are the leading tourist destination (U.S. Dpt. Commerce (NOAA), 2006). Beyond tourism-related revenues and employment, healthy beach/dune systems protect upland property from storm damage. Average damage from hurricanes is \$5.1 billion and 20 deaths per year (U.S. Dpt. Commerce (NOAA), 2006). Finally, beaches provide critical habitat for endangered sea turtles, shorebirds, invertebrates, forage fish, and other species.

Many of the federal and state procedures for planning and assessing conditions for coastal and shoreline development fail to incorporate effects of sea-level rise, global warming, and future development associated with a rapidly growing human population. Now is the time for coastal states and relevant federal agencies to develop a comprehensive strategy to confront sea-level rise in a way that reduces the risks to communities by discouraging building in vulnerable areas, and increase the resiliency and protection of coastal habitats by a) steering away from structural armoring of shorelines; b) avoiding beach re-nourishment projects where especially harmful for ecosystems; and c) restoring and protecting natural buffers.

Many coastal management and coastal development policies currently do not proactively take sea-level rise into consideration. Worse yet, the government continues to subsidize high risk coastal development. Defying long term planning needs in the face of global warming by allowing and encouraging high risk development is a serious mistake in terms of the economy, the health of natural systems and resources, and human safety.

Similarly, many federal agencies have thus far failed to incorporate effects of accelerating sea-level rise and reasonably foreseeable effects of global warming into their procedures, such as incorporating likely future conditions into mapping of floodplains, storm surge zones, or flood elevations affected by increasing impervious development in watersheds in the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP) and the planning of flood damage reduction projects by the Army Corps of Engineers (ACE). Current procedures are based almost entirely on looking backwards at past records only, rather than incorporating current climate science.

States and the federal government must take steps to implement ecologically and economically sound adaptation policies and strategies that discourage development in vulnerable areas and support efforts to site structures farther landward of eroding shorelines. This is essential not only to help reduce serious risks to human safety and the well-being of communities, but also to ensure the preservation of beaches, dunes, and other natural coastal habitats that are so important to our economy and quality of life.

Examples of State actions to deal with rising seas:

- The states should consider sea-level rise in their plans for land use, open space, wetland protection, public infrastructure siting and maintenance, and other relevant activities.
- The states should assess, restrict, and/or reduce state funding, tax breaks, and other incentives for private development in coastal areas at high risk from erosion and storm surges.
- States should consider the adequacy of existing coastal setbacks and post-storm redevelopment policies in light of projected sea-level rise scenarios and develop, assess, and implement a suite of planning tools and global warming adaptation strategies to maximize opportunities to protect the beach/dune system, coastal wetlands, and other coastal resources in an era of rising seas. These tools should include strategies to encourage the landward siting and relocation of structures and public facilities in areas adjacent to receding shorelines through

acquisition, transfer of development rights, stronger setbacks, and tax incentives.

- States should develop wetland conservation and restoration plans that promote designation of wetland migration corridors for wetland migration as sea levels rise, thereby protecting the valuable benefits they provide by buffering coasts against storms and erosion, improving water quality, and supporting fish and wildlife.
- Incentives should be provided to local governments and private organizations to acquire and manage ecologically important coastal lands, including upland buffers in vulnerable areas. Acquisition efforts should be strategically targeted in order to protect coastal resources, reduce insured risk, and reduce the impacts of global warming on both ecosystems and communities.

Examples of Federal actions to deal with rising seas:

- Congress should amend the Coastal Zone Management Act (CZMA) to require relevant state agencies to consider sea-level rise in coastal management programs in order to qualify for federal funding assistance.
- Congress should establish policies to restrict federal flood insurance (via NFIP) for new construction and rebuilding in high hazard coastal areas.
- Congress should also provide increased funding and technical support for hazard mitigation by states, communities, and building owners through floodplain management; establishment of greenways, open space, and building setbacks; and use of voluntary buyouts and relocations of high risk properties, higher building elevations, flood proofing, and other techniques.
- Congress should replace economic incentives for private development in high risk coastal areas with incentives to relocate and build in other areas and invest in coastal land conservation, such as by allowing tax exempt financing for acquisition of properties in hazard areas.
- Congress should resist efforts to exempt areas or roll back protections for coastal barriers that are included in Coastal Barrier Resources Act (CBRA). Coastal barriers designated under the act are ineligible for direct or indirect federal financial assistance that might support development.

III. Confronting the Impacts of Severe Weather

Global warming is disrupting the planet's climate system, causing widespread changes in regional temperatures, precipitation, and wind patterns (IPCC 2007). In particular, these changes are manifesting themselves as an increase in the frequency and intensity of "extreme" weather events like heat waves, droughts, floods, and severe storms. According to the IPCC, since 1950, the number of heat waves has increased around the world, as has the extent of regions affected by droughts due to warmer conditions and increased evaporation (IPCC 2007). Global warming is also contributing to an increase in the frequency and number of very heavy precipitation events and flooding in many areas, a trend that is attributed to higher levels of moisture in the atmosphere (Diffenbaugh, 2005; Groisman, 2004; Trenberth 2003). Several studies have also found a correlation between warmer average ocean temperatures associated with global warming and an increase in the intensity of tropical storms and hurricanes (Trenberth, 2007; Webster, et al., 2005; Emanuel, 2005).

Based on this evidence, a number of scientists believe that the trend toward more-intense storms will continue in the coming decades as our oceans warm further (Trenberth, 2007; Oouchi, et al., 2006; Knutson and Tuleya, 2004; Walsh, Nguyen, and McGregor, 2004). However, there are many factors that contribute to both the frequency and intensity of hurricanes, and some uncertainty remains about how these storms will be affected by global warming in the future (Pielke, et al., 2005). Regardless of whether or not global warming will have a direct impact on hurricane frequency and intensity, there is little question that these storms will become more destructive in the future due to a combination of increased coastal development as well as higher storm surges exacerbated by sea-level rise (Anthes, et al., 2006).

A general trend toward heavier rainfall events (whether or not associated with tropical storms) will likely contribute to a decline in coastal water quality due to enhanced stormwater runoff. This is a problem that has already been exacerbated by the destruction of wetlands, forests, and other natural buffers (which help store water and trap pollutants and sediments) and expansion of impervious surfaces associated with urban development and roads.

One of the potential impacts of additional precipitation, resulting in additional runoff, is an increase in the duration and/or extent of coastal hypoxia and anoxia events caused by eutrophication (excess nitrogen and other nutrients in coastal waters from sources such as agricultural fertilizers, sewage discharges, and septic

tanks) (Justic, Rabalais, and Turner, 2003). This nutrient loading leads to excessive algae growth that contributes to a depletion of oxygen in affected waters, a condition called hypoxia. Similarly, anoxia is a condition in which all oxygen is depleted, which can lead to “dead zones”—areas in which most marine organisms cannot survive (Joyce, 2000).

While neither hypoxia nor anoxia are new phenomena, their prevalence has become much more widespread in recent decades, which scientists attribute in part to heavier precipitation flushes triggered by global warming, causing increased nutrient runoff (Boesch, 2007; Dybas, 2005; Kennedy, et al., 2002). In addition to eutrophication, heavy runoff exacerbates hypoxic and anoxic conditions by decreasing water mixing in estuaries, as less dense fresher water rides over the top of the denser saltier water, inhibiting the replenishment of oxygen to deep waters.

Examples of State actions to deal with the impacts of more severe weather:

- Coastal states should upgrade stormwater regulations, taking the likelihood of more frequent heavy rainfall events into consideration. Emphasis should be placed on natural buffers and requiring adequate long-term capacity and infrastructure for stormwater and sewage. Policies should also focus on implementing Low Impact Development (LID) methods, both for new developments and retrofits in existing developed areas.
- States should enhance protection and restoration of wetlands and riparian floodplains to help remove nutrients and reduce eutrophication, hypoxia, and anoxia.
- State water managers should: move away from relying on historic trends to determine future water availability; place significantly greater emphasis on reducing demand (for instance by increasing efficiency in water delivery and water use); and fund strategies to make better use of reclaimed water (for instance through decentralized LID approaches).

Examples of Federal actions to address the impacts of more severe weather:

- Congress should require all federal resource-related agencies to incorporate modern climate and sea-level rise projections into their resource planning procedures and programs.
- To reduce eutrophication (and other pollution) associated with heavier rainfall events and runoff, U.S. EPA should revise its stormwater management rules under the Clean Water Act to discourage development in or near coastal and stream riparian buffers, wetlands, and other sensitive areas.
- States should be encouraged to develop and implement long-term regional water management plans that incorporate global warming and take a more coordinated approach to water management, including water conservation and reuse, in order to meet the needs of people and the fish and wildlife they depend on for food, jobs, and recreation.

IV. Confronting the Impacts of Higher Ocean Water Temperatures

Average sea surface temperatures have increased over the latter half of the 20th century, providing another important indication of global warming (IPCC 2007; AchutaRao, et al., 2007). On average, the temperature of the upper 300 meters of the world’s oceans has risen about 0.56 degrees Fahrenheit since the 1950s, a trend that scientists have determined is a direct result of human activities (NOAA, 2000; Santer, et al., 2006). The increase has been even greater in the tropical Atlantic region, where the average sea surface temperature has risen 1 degree Fahrenheit over the past three decades (Barnett, Pierce, and Schnur, 2001).

If global warming pollution continues unabated, average ocean temperatures are projected to rise by an additional 2.7 to 5.4 degrees Fahrenheit before the end of the century, with potentially devastating consequences for coastal and marine ecosystems (IPCC 2007). The primary impacts of rising sea-surface temperatures include coral bleaching, exacerbation of marine diseases, and significant shifts in the ranges and population abundances of fish and other marine species.

Lessening the impacts of higher ocean temperatures due to global warming will require strategies that increase the overall resilience of ecosystems. It will be necessary to reduce the negative impacts of a broad range of human-induced stressors on coastal and marine ecosystems in an effort to help these systems resist and/or recover from disturbances such as coral bleaching, disease outbreaks, or anoxia events (Grimsditch and Salm, 2005). Placing significantly greater emphasis on habitat protection and ecosystem-based management (EBM) approaches to managing fisheries, coral reefs, and other coastal and ocean resources will improve the likelihood that these systems and resources will be able to withstand the multitude of stressors affecting them, including global warming and ocean acidification.

This shift in management will require a broad directive to federal agencies and encouragement to state agencies to pursue their responsibilities, whether pursued under marine or non-marine mandates, in a manner consistent with the protection, maintenance, and restoration of the health and function of marine and coastal ecosystems and resources. In terms of activities pursued under marine and conservation related mandates, fish and wildlife managers and other relevant decision makers should focus on protecting the diversity of species across their spatial range, as well as protecting and restoring the habitat they depend upon (Worm, 2006; Nyström and Folke, 2001). For example, a focus on diversity would lead fish and wildlife managers to protect and restore algae-grazing fish and invertebrates known to limit the overgrowth of harmful, opportunistic algae on coral reefs, as a way of improving overall coral resilience (Nyström, Folke, and Moberg, 2000).

Examples of State actions to address the impacts of warmer ocean waters:

- States should adopt and implement policies directed to the protection, maintenance and restoration of healthy coastal and ocean ecosystems and resources.
- States should strengthen programs that support biological diversity among fish and wildlife species.
- States should prioritize the rebuilding of depleted coastal and ocean fish populations since depleted populations will have a harder time dealing with additional stresses posed by global warming and warming waters.
- States with coral reefs should expand research and monitoring of coral reef ecosystems, including ongoing assessments of factors such as water temperatures and coral bleaching, incidence and range of coral diseases, damage and recovery from storms, and assessment of water quality, including the calcium carbonate saturation state and its effects on reefs over time.

Examples of Federal actions to address the impacts of warmer ocean waters:

- Congress should enact climate adaptation legislation to direct Federal and state agencies to develop and implement strategies to maintain and improve the resilience of our natural ecosystems and should provide the scale and consistency of funding to make these efforts successful. If these provisions are included in a package that also establishes a cap and trade system, a portion of the revenues from the auction of carbon allowances should be directed specifically to federal and state adaptation activities. This funding should supplement rather than replace existing agency funding streams and should be isolated from revenue pots that may go to other adaptation activities, including protecting infrastructure. Recent Senate proposals—including America’s Climate Security Act (S 2191) and the Lieberman-Warner Climate Security Act (S 3036)—contained this type of system. S 2191 would have provided an estimated \$300 to \$950 million in new funding to the Department of Commerce for ocean and coastal management, protection, and restoration in the first year of the program (2012. S 3036 would have provided an estimated \$574 million per year from 2012 to 2030 to the Department of Commerce for this same suite of activities. This scale of additional funding will be necessary in order to address the ongoing and expected, additional strains that global warming and ocean acidification place on our ocean and coastal ecosystems and natural resources.
- Adaptation strategies, funded by this new revenue stream, should be coordinated at the federal level through the development and implementation of a Presidential plan and at the state level through the development and implementation of a governor level plan. Plans should be developed with input from all relevant federal/state agencies, scientists (possibly including a science advisory board established by the legislation), and the public. State level plans should be consistent with the national strategy and should receive federal approval, according to set criteria, in order to receive federal funds.
- Congress should enact Oceans-21, H.R. 21, which sets out a national policy to protect, maintain and restore marine ecosystem health and calls on the federal government and federal/state partnerships to implement that policy. The healthier ocean and coastal ecosystems are, the better able they will be to withstand the additional stresses associated with global warming and ocean acidification.
- NOAA should move expeditiously and effectively to implement the Magnuson-Stevens Reauthorization Act of 2006 in order to meet the deadline for ending overfishing and rebuilding healthy fish populations. The healthier fish populations are, the better able they are to withstand the impacts of global warming and ocean acidification.
- Congress should call for and support a National Academy of Sciences study, looking at the implications of global warming and ocean acidification on fish-

eries management. The study should evaluate management methodologies to mitigate impacts of global warming and ocean acidification on the nation's fisheries resources. Following guidelines recommended in the study, the National Oceanic and Atmospheric Administration (NOAA) should develop specific regional adaptation strategies to enhance adaptive capacity.

V. Confronting the Impacts of Ocean Acidification

Since the beginning of the industrial age, the world's oceans have absorbed 530 billion tons of CO₂, or at least one third of the anthropogenic CO₂ (Brewer, 2007; Feely, 2004). This has already reduced the pH of ocean waters by .1 units or, in other words, has increased overall acidity by 30%. This pH change has occurred as a result of CO₂ pumped into the atmosphere mixing with ocean waters to form carbonic acid. Under a business as usual scenario, pH will drop by an additional .3 to .4 pH units (Caldeira and Wickett 2005, Orr et al. 2005). This degree of change has not occurred in the past 20 million years (Feely, 2004).

This lower pH is eroding the basic mineral building blocks for the shells and skeletons of calcareous organisms such as shellfish and corals, as well as a number of important microorganisms that are a foundation for marine food webs (Kuffner and Tihansky, 2008; Orr, et al., 2005). For corals, lower calcification rates ultimately mean weaker, slower-growing reefs (Kleypas, Buddemeier, and Gattuso, 2001). The combination of warmer and more acidic waters means that coral ecosystems are among the most threatened marine/coastal habitats now in the world (Hoegh-Guldberg, 2007). Increased acidity may also have direct physiological effects on vulnerable juvenile stages of other types of marine organisms, such as fish and squid (Portner, 2004).

Examples of State actions to address the impacts of ocean acidification:

- Coastal States should do their part in adopting a stringent CO₂ reduction goal
- States should enhance monitoring of coral reefs, oyster reefs, and valuable shellfish such as scallops for calcification problems.

Examples of Federal actions to address the impacts of ocean acidification:

- Congress and the administration must place mandatory limits on CO₂.
- Federal agencies should invest in studies to better understand the ecological impacts of ocean acidification, both to inform the establishment of an appropriate carbon cap and adaptation strategies.
- Congress should enact climate adaptation legislation and Oceans-21, as articulated above.

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Ms. BORDALLO. Thank you very much, Ms. Chasis. And you were right at the timing cutoff there.

Ms. CHASIS. I worked on that.

Ms. BORDALLO. Consistent with Committee Rule 3[c], the Chairwoman will now recognize the members. And I will begin with myself. And I would like to mention to the panelists that Mr. Wittman went off to vote. As a territorial representative we only vote during the committee of a whole. So I am going to keep the hearing going and, hopefully, Mr. Wittman will be back to ask a few questions of our first panel.

Ms. Davidson, I have a question for you. I appreciate the efforts that NOAA has undertaken and is planning to address climate changes and the impacts that they have on our ocean and coastal environments. As you heard me mention at the outset, and as you yourself mentioned in your testimony, the 2007 GAO report recommended that Federal agencies develop guidance that reflects best practices to explain how agency resource managers are expected to address the effects of climate change. When does NOAA plan to issue this guidance? And how do you expect that it will specifically change the way resource managers at NOAA do business?

Ms. DAVIDSON. Chairwoman Bordallo, I think there are two aspects to that question. The first aspect, which refers to our management of living marine resources, I know that these discussions are underway within my agency. I believe that I will need to get the specifics on the details and the date back to you. But I know that efforts are underway to provide such guidance. And we are already beginning to incorporate them into our decision making processes, as I referenced with regard to the Bering Sea pollock.

With regard to the coastal management side of the NOAA portfolio, I have cited in my testimony some examples in which we are actually working with communities and governmental organizations like National Association of County Officials to provide some guidance. But I think that more formal guidance would need to await the passage of a new Coastal Zone Management Act. And we look forward to either receiving your congressional directive in that bill or some other bills as have been referenced here today and elsewhere.

Ms. BORDALLO. Let me follow up. Now, you said your agency is working on the guidance report, is that right?

Ms. DAVIDSON. Yes, from the fisheries side. Yes, ma'am.

Ms. BORDALLO. Yes. Now, do you have any idea then, a rough idea of when this will be finished? You know, we—

Ms. DAVIDSON. I will actually have to give that information to you. I am not from the fisheries side of the agency, I am from the coastal side of the agency so I do not have that exact information. But I believe we can get it very shortly to you.

Ms. BORDALLO. So in other words you are close to concluding a report?

Ms. DAVIDSON. I would have to check on that but I do know these discussions have been underway. We have already begun incorporating some climate information into our decision processes.

Ms. BORDALLO. You also mentioned the CZMA is a tool available to NOAA to work with states to improve climate adaptation, planning, including the outreach and the education required to ensure that state and local decision makers are able to apply NOAA's information and products most effectively. What specifically is NOAA doing to ensure that states incorporate climate adaptation into their coastal zone plans and other planning?

Ms. DAVIDSON. As mentioned by my colleague Mr. Brunello, we work with the Coast States Organization which represents these state-level programs. And most of the states have identified the issues of coastal hazards and climate change as a very high priority. We have developed a number of specific local level demonstration activities and guide books as well as some training programs. And we are looking to make that a much more systematic approach over the course of the next few years. But we have demonstration projects, if you will, on the ground at the local and state level from which we can learn.

We are also looking at what other agencies are doing like Fish and Wildlife and EPA and looking to derive the best examples that are consistent with our principles of local governance and decision making in this country.

Ms. BORDALLO. Mr. Brunello, would you like to elaborate on that?

Mr. BRUNELLO. The only thing I could add from our side is, which I did not speak enough to, is what is needed in any comprehensive adaptation effort is looking at three key things. One is getting the science right, second is developing some type of strategy, and three is moving to action. All three of those things are fundamental in anything that we do. And we need more guidance and assistance from the Federal level.

And I would say right now what we have seen has been a deficiency on the action side. There is a lot of effort and bills on the science side, which is absolutely necessary and fundamental, but it has to be all three. And so I hope that anything that NOAA is developing that would also be promoted by this committee takes all three into account.

Ms. BORDALLO. Good. And, Ms. Chasis, would you care to comment?

Ms. CHASIS. Well, I think that, and there is a recent report from the Pew Center on Global Climate Change which points out that comprehensive and proactive adaptation planning is still very much in the early stages in the states. I think there is authority under the CZMA and other existing laws to promote, to move

things forward. But I think that having a clear directive from Congress as well as funding to support it will be really necessary to get this effort going. And I think that can be done both in the individual laws like CZMA. But I think more importantly there needs to be this comprehensive directive from Congress to require the development of adaptation cross-sector plans.

Thank you.

Ms. BORDALLO. Thank you. Thank you very much.

Mr. Brunello, I would say it sounds like California has taken a leadership role in developing adaptation and mitigation strategies in response to climate change. So you mentioned that California is working now to implement certain adaptation strategies that have already been identified as necessary. And I was wondering if you could elaborate on these strategies, particularly with respect to the ocean and coastal resources sector and the water sector?

Mr. BRUNELLO. Concerning the ocean sector, a big part of what we are doing on this 3-point strategy as I mentioned as we look at how do we get the science right and how do we develop a strategy and move to action, a lot of the effort that we are doing at this point is looking at the science and figuring out what are the current impacts. So we are downscaling some of the regional or global circulation models and then bring that so that it is more relevant to California.

One area that I can show where we are trying to push the boundaries I am sure every state is involved with is looking at sea level rise. For example, we wanted to look at what might be the impact along the coast if we had a 1 to 3 meter sea level rise along the coast. And so the first thing we did was to try and look at what type of maps we have available along the coast and figure out what places would be inundated. And thinking that would be our first step in the adaptation strategy.

Well, as we try and test the boundaries of our own internal planning processes we realized we did not have the maps. So, internally, in wanting to make and move on action for sea level rise, for example, we realized before strong action could be taken, we need to get some of the information right. We can obviously focus on some of the low-level areas but one of the areas we have to focus on is getting the information at a better approach.

On the water side we are currently in the process of looking at how we transport water better in the entire state. Looking at sea level rise again, if we had a 55 inch sea level rise in California that would inundate our Sacramento-Delta-Bay area. That through that area provides drinking water for 25 million people. So what we are doing right now is looking at different scenarios as we try and look at how we might provide conveyance systems in the state, different below ground and above ground storage, how we can plan better for things such as sea level rise.

Ms. BORDALLO. Thank you very much.

I do not want to put you on the spot but do you have any knowledge about whether other coastal states are as far along with developing and implementing adaptation strategies, particularly with respect to ocean and coastal resources? To the extent that they are or they are not, do you feel that the greatest limiting factor at this

point is technical and financial resources? And please be very frank.

Mr. BRUNELLO. An easy question. A couple things: one is we are in contact with our colleagues in Florida, Washington, Oregon, Maine, Maryland. There are states that are definitely taking action that we have been paying attention to and working together with.

In terms of looking at where they are and what is needed, it is a comprehensive package, again, really takes looking at all three efforts. Right now there has been a huge deficiency of looking at a coordinated strategy. And that is across the entire state. It is very complicated to start looking at one sector. If you just go into the oceans and coastal resources sector, as I mentioned, it gets into every sector.

We had the same issues as we looked at mitigation efforts in the state. And we are having our large mitigation plan will be out in about two days, what we call our scoping plan that is produced by the Air Resources Board. But we all realize we work in stovepipes, we work in one sector. For example, I lead our state's forestry efforts. And we do not have the best communication with other sectors. It is the same thing with adaptation. This is just the way we do things.

And so I can definitely speak to the fact that having a cross-sector approach is going to be fundamental. And again, sea level rise is just an easy one for people to comprehend that you cannot just look at the coastal areas when we talk about sea level rise. When we had our water people who wanted to just look at the Delta to understand what the impacts are to the water system it was secondary to think about what that might mean if you had a state directive just for our state water system for the coastal areas.

So many of these efforts will trigger other questions. But I think as I saw with James Hansen from yesterday, as he mentioned, just starting is most important for us. Just getting the process going and starting with the science is great. But having some broad, coordinated strategy effort and then trying to push and develop some of the early action efforts is fundamental. And we are seeing that in all different states. But having more support in doing that is fundamental, which is why I am here today.

Ms. BORDALLO. Thank you. Thank you very much.

Ms. Davidson, do you have any comments on that same question that I asked Mr. Brunello?

Ms. DAVIDSON. I would just echo my colleague's comments. Getting the science, the emphasis has been on the science, putting that into an adaptation strategy I think that is where we are as a country and in our local communities. But the implementation challenge, even when you know what is the right thing to do in this country we do not always do it, for a lack of either fiscal or other sorts of capital, political capital. And so that will be, I think, our greatest challenge over the next decade will be how do we take some of these tools and capabilities that we are developing and we have some information about, there are other countries who are ahead of us, but how do we actually pay the bill. I think that is going to be one of our bigger challenges.

That is why I focus on the two-fer of disaster mitigation and climate adaptation. They are very much the same. And the temporal

scale of natural disasters in this country is such that it often takes precedence when we are coming around to paying the check. But I think that there are things that we can do for both the environment and for our communities, even as we plan for and respond to and recover from increasing extreme events: droughts, floods, tsunamis, that will enable us to address these longer time scale issues.

Thank you.

Ms. BORDALLO. Thank you very much.

Ms. CHASIS, do you feel that the states are moving along as quickly as they should?

Ms. CHASIS. Well, as I said before, this Pew Climate Center Report indicates, and they have done a survey of where the states are, that they are still at the very early stages in putting together comprehensive adaptation plans. I think we are seeing many more states have moved out front on the mitigation of climate impacts but have been slow on the adaptation side. And I think there is a lot of catch-up that needs to be done.

We have been active with a coalition in Florida and put together this report "Preparing for Sea Change in Florida: Strategy to Cope with the Impacts of Global Warming on the State's Coastal Marine Systems" which was really the basis of my testimony. And Florida, as an example in parallel with California, has put together at the gubernatorial level a task force on climate change. And one of the areas of focus is adaptation. And they are going to be developing a comprehensive adaptation strategy which will be part of what the Governor acts on this November.

So we are eagerly, you know, advocating for, in Florida for some kind of comprehensive program there. And I think though even though some states, like California, Florida and some others, have stepped out and begun doing comprehensive planning, there really is a need for Federal leadership on this issue, both from the executive but from Congress. And that is why we have been very active in trying to make sure that climate legislation on the Senate side, for example, incorporates attention to the need for states to move forward on the coastal and ocean front and that there be funding to accompany and Federal directive. So we would certainly encourage you, Madam Chair, and this committee to move forward in the House on that.

Ms. BORDALLO. Thank you, Ms. Chasis. I think I have one more question for you. Your testimony mentioned the need to increase the overall resilience of ocean ecosystems as a means of reducing the impact of climate change. Would you be so kind as to elaborate on what that would entail for state and Federal agencies as well as fisheries managers? Do you think the fisheries councils are considering climate change in the plans that they are developing?

Ms. CHASIS. Well, one point here is that obviously the more diversity, the more diverse and abundant fish and wildlife populations are the better able they are going to be to withstand the stress of climate change and the better able they will be to adapt. So this is a very critical issue.

I think that the councils are beginning to recognize this as an important issue, as Margaret Davidson mentioned, in the North Pacific. But I think as a general matter a lot more attention needs

to be given to this and factored into the setting of quotas. So, for example, and the one way this could be done is if populations seem to be moving more northward, more care given to seasonal closures and limits to protect the southern portion of the populations. So there are some very specific and concrete things that can be done which I think are not yet really being integrated into the process. Hopefully, the guidelines that NOAA is developing for how fisheries should be managed will be part of that.

But I come back to the legislation which your Subcommittee reported out, Oceans 21,—

Ms. BORDALLO. Yes.

Ms. CHASIS.—which I think is critical in setting out a national policy to protect, maintain and restore the health of ocean ecosystems, so that all agencies, not just the Fisheries Service but the other agencies that impact coastal and ocean resources are really committed to this notion of resiliency and productive ecosystems.

Ms. BORDALLO. Thank you very much, Ms. Chasis. And just to let you know, we are continuing to work on that legislation, Oceans 21.

Ms. CHASIS. That is terrific.

Ms. BORDALLO. I want to thank all the witnesses of the first panel. And I would like to ask if you could remain in the hearing room. Mr. Wittman is still on the Floor voting and I would like to give him the opportunity to ask questions. So if you would remain in the hall, in the room.

I would like now to call upon the second panel. On our second panel we have Mr. Dan Ashe, Science Advisor to the Director of U.S. Fish and Wildlife Service; Mr. David Whitehurst, Director of the Wildlife Diversity Division of the Virginia Department of Game and Inland Fisheries; Ms. Jamie Clark, Executive Vice President for Defenders of Wildlife; and Dr. William Moritz, Director of Conservation for the Safari Club International Foundation.

I would like to welcome you all. And you have been here in the hearing room so you know the time limitations, five minutes. And just to remind you again that your full testimony will be entered into the official record. At this time I would like to recognize Mr. Ashe for five minutes.

STATEMENT OF DAN ASHE, SCIENCE ADVISOR TO THE DIRECTOR, U.S. FISH AND WILDLIFE SERVICE, U.S. DEPARTMENT OF THE INTERIOR

Mr. ASHE. The Service and its partners deal with water resource allocation, species invasion, urbanization, habitat degradation and fragmentation, pollution, wildlife disease and trade, among many other factors. Now we are further challenged to deal with the significantly increased complexities and uncertainties that are raised by the scientific consensus that there is unambiguous evidence of a changing climate system.

Hitting a baseball has been described as possibly the most difficult feat in sports. A batter has about four-tenths of one second to respond once the ball has left the pitcher's hand and the bat actually makes contact with the ball only for about one one-thousandth of a second. When he was asked what he thinks about when hitting, the great ballplayer and philosopher Yogi Berra said,

“Think? How the hell are you going to think and hit at the same time?” Obviously a baseball player thinks about hitting. They study, they analyze and they plan, they evaluate their hitting successes and failures but they do not do this when they are in the batter’s box and the pitcher is winding up.

Like a batter in baseball, conservation biologists and managers must respond quickly to changing and uncertain conditions like global warming. We have to be nimble and ready to respond as changing climate throws us curveballs. We have to step up to the plate. But we will not be as effective as we can be if we are essentially thinking and hitting at the same time. Conservation is challenging already. Add the complexity and uncertainty of changing climate and it is like asking a batter to improve their average while moving pitcher’s mounds closer to home plate and raising it six inches.

In the Service, our employees are stepping up to the plate to deal with global warming. We are using our experience, our can-do attitude, we are building on our past successes. But more importantly, we are outlining a multi-faceted and forward-leaning response to global warming. We are doing this by building a climate of awareness and a spirit of partnership. For example, modeled on a highly successful climate change forum for Alaska, this year each of our regions are hosting climate workshops, bringing together partners, raising awareness and beginning to develop a direction of change in addressing global warming within the entire conservation community.

We are doing this by forming an Executive Working Group on Climate Change and just recently chartering a Climate Change Strategic Plan team charged with outlining a service vision, strategy and action plan. We hope to share this with partners for broad discussion and input early in 2009. We are doing this by beginning to take sensible and important actions like those outlined in my testimony, slam modeling for national wildlife refuges, helping managers understand and plan for sea level rise, innovative new partnerships in habitat restoration and carbon sequestration, developing a national phenology network with the USGS, the Wildlife Society and others, reducing our carbon footprint to establish the Service as a responsible corporate citizen and leader. These are all crucial beginning steps.

Most significantly, we are doing this by supporting a new direction of change that has resulted from a cooperative effort between the Service and the U.S. Geological Survey. This is a framework for adaptive landscape scale conservation that we call Strategic Habitat Conservation or SHC. Explicit population objectives for key species and population habitat relationship models are used to define the landscape scale ecological conditions that must be sustained in order to achieve those population objectives. Spatially explicit data strategically targets conservation to site scale priorities. Monitoring is used to evaluate success over time and adapt our strategies as we learn more about driving forces like climate change.

Absent a structured framework like SHC, the challenge of climate change will make conservation increasingly reactive and rapidly overcome us as we try to think and hit at the same time. With this framework we will be able to define and manage toward dy-

dynamic system states, ecological conditions that will provide representative, redundant and resilient populations of trust species, giving them the best possible chance to adapt.

We will value the committee's advice and support as we do this in the coming months and years. Thank you very much for today's opportunity.

[The prepared statement of Mr. Ashe follows:]

**Statement of Dan Ashe, Science Advisor to the Director,
U.S. Fish and Wildlife Service, Department of the Interior**

Introduction

Chairwoman Bordallo and Members of the Subcommittee, I am Dan Ashe, Science Advisor to the Director of the U.S. Fish and Wildlife Service (Service). I am pleased to be with you today to discuss the actions the Service is undertaking and planning to adaptively and strategically manage fish, wildlife and plants and their habitats in the face of increasing uncertainties that are the result of a changing climate system.

The Department of the Interior and the Service applaud the Subcommittee's interest in this issue and your focus upon what is happening on the ground today. Natural resource management is a challenging endeavor. I know that the Subcommittee and Committee Members appreciate the complexities that the Service's managers and partners face in dealing with issues such as limited water resources, invasive species introductions, habitat degradation and fragmentation, and wildlife trade and disease. Climate change adds an entirely new dimension of complexity and challenge to the stewardship of fish and wildlife resources.

Observations of the Natural Environment

There is strong scientific consensus that the Earth's climate is changing, and that the related changes in temperature, precipitation and sea level will have a significant impact on Earth's natural environment.

In 2007, the Intergovernmental Panel on Climate Change (IPCC) issued its Fourth Assessment Report concerning the observed and projected changes in the Earth's climate system, the impacts of climate change on the natural and human environment, and the capacity of these systems to adapt. Based on observational evidence world-wide, the Assessment concluded that "

"Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases (very high confidence). A global assessment of data since 1970 has shown it is likely that anthropogenic warming has had discernable influence on many physical and biological systems."(IPCC WGII Technical Summary).

The Assessment included the following examples illustrating the impact on natural systems:

- changes in freezing, thawing, and drainage in Arctic and Antarctic Peninsula ecosystems, including those in sea-ice biomes that support polar bears and walrus;
- changes in the timing of ecological events (called phenological changes—e.g., bud burst, flowering, insect emergence, etc), earlier onset of spring vegetative growth, migration, and lengthening of the growing season;
- poleward and elevational shifts in ranges of plant and animal species; and
- poleward shifts in ranges and changes of algal, plankton and fish abundance in high-latitude oceans.

The Service is a field-based organization, and biologists working on-the-ground are observing changes in many of our natural systems. Nowhere are these changes more acutely evident than in the Arctic ecosystems. In the Service's Alaska Region, observations of Arctic changes include diminishing sea ice, coastal erosion, shrinking glaciers, thawing permafrost, wetland drainage, and earlier "green-up" of Arctic vegetation. Related to the deterioration of glaciers, we are seeing changes in the hydrology of glacially-fed streams. Increased temperatures in the Arctic have also contributed to the earlier onset of snow melt and the lengthening of the melting season, resulting in decreased total ice cover at summer's end. To explore these changes and begin discussions of management strategies, the Service and the U.S. Geological Survey (USGS) co-hosted a Climate Change Forum for Alaska, in Anchorage, in February 2007. The forum provided the opportunity for the Service to collaborate

with USGS on recommendations for research and monitoring priorities, management directions, and methods to improve partner involvement.

Climate change in the Arctic will continue to affect the habitats of ice-dependent species such as polar bear and walrus. On May 15, 2008, the Service published a final rule to list the polar bear as a threatened species under the Endangered Species Act (ESA). The primary threat to this species is loss of sea-ice habitat, particularly summer sea ice, due to a combination of natural variation and climate change. Sea ice is essential habitat for many of the polar bear's life functions such as hunting, feeding, movement, and rearing cubs. To assist the Service in the decision on whether or not to list the polar bear, the USGS conducted research and modeling on the interaction between changes in the polar bear's sea-ice habitat and the distribution and abundance of bears. This decision required a level of scientific support and scrutiny that is atypical and perhaps unprecedented. The process of recovery planning will be immensely challenging because, in addition to science and management, it will require other issues, such as international diplomacy and cultural knowledge, to be addressed. Also, there are other species involved. The Service has been petitioned to list the walrus under the ESA while the National Marine Fisheries Service (NMFS) has been petitioned to list the ribbon seal. The NMFS is conducting a status review of all ice seals. Changing climate is driving ecology within the entire circumpolar arctic and our conservation efforts must address the suite of ice-dependent species in the Arctic, and thus, will require novel and collaborative solutions among scientists, managers, and native peoples—solutions that are at the landscape level and address multiple species.

Like the polar regions, the Northwest and the Mountain-West have also been experiencing reductions in annual snowpack. According to the USGS, climate changes over the last 50 years in these areas of the country have led to as much as a 17 percent decline in annual winter snowpack.¹ The result has been a decreased recharge of ground water systems, increased stress to public water systems, changes in the timing of river ice-outs, and reduced river flows that affect temperature, depth, and other characteristics of spawning environments for fish such as Pacific salmon. Snowpack declines also have been accompanied by earlier annual peaks in river run-off, as documented in stream gage monitoring and analyses across the lower 48 states and throughout Alaska. As snow pack melts earlier throughout the western United States, reservoirs designed upon 20th century hydrology may not be able to adequately store the runoff. Predictions of less frequent, but more intense summer storms may exacerbate storage and supply concerns. One study predicts that if current allocations of water persist, there is a 50 percent chance that Lake Mead will not provide water without pumping by 2023, and a 50 percent chance that Hoover Dam will not be able to generate power by 2017.² While Departmental bureaus have previously noted before the Committee that there is much room for improvement in the demonstrated resolution of climate and streamflow modeling, as land and wildlife managers we have nevertheless managed around and through weather patterns like drought on annual to decadal scales. Now, however, managers must face the growing reality that these recent observations may not be part of an annual or even decadal change in weather pattern, but are possibly linked to a long-term change in the climate system itself. If this is the case, the implications for wildlife and fisheries management are substantial and will require extensive changes in the design and placement of projects to store water, protect and restore habitats, and manage populations.

Apart from hydrological changes correlated with increased warming, Service biologists are also noting changes in abundance and distribution of species. These changes include the expansion of pests and invasive species. Expansion of the mountain pine beetle into higher latitudes and elevations—areas once too cold to support it—is well correlated with observed temperature changes. This range expansion is increasingly impacting our forest habitats, not just killing trees, but making these landscapes more susceptible to catastrophic wildfires and creating the potential to drive fundamental shifts in ecosystem function and structure.

We know that changes in temperature and moisture will affect species ecology. While some species will adapt successfully, and indeed, some will likely flourish in a warming world, some will not. The challenge for resource scientists and managers

¹ Statement of Dr. Thomas R. Armstrong, Program Coordinator, Earth Surface Dynamics Program, U.S. Geological Survey, U.S. Department of the Interior to Committee on Commerce, Science and Transportation, Subcommittee on Global Climate Change and Impacts; Hearing on Projected and Past Effects of Climate Change: A Focus on Marine and Terrestrial Ecosystems; April 26, 2006

² Barnett, T. P., and D. W. Pierce (2008), When will Lake Mead go dry?, *Water Resour. Res.*, 44, W03201, doi:10.1029/2007WR006704.

will be in developing better capacities to model and predict these changes so that we can develop conservation strategies that are timely and effective. Species most at risk are those that are unable to generalize or adapt. Long-distance migrants and birds with limited geographical ranges, for instance, may not be able to adjust to the changes caused by rising temperatures. Species at the end of geographical or elevational gradients will have difficulty adapting because they have nowhere to which they can migrate. Increased competition for habitat and the lack of suitable or available food in new locations would mean that a shift poleward may change the size of bird populations and composition of bird communities adapting to climate change. Changes in ecological communities may decouple ecological relationships among species. Climate has influenced the development of intricate ecological relationships that have evolved over millennia, and relatively abrupt changes in climate may, for example, interfere with the synchrony between the life cycle of birds, bees, or other pollinators and the flowering of their host plants or emergence of insects they eat. Monitoring of phenological changes is one example of a potential area for future focus.

Other significant changes associated with increased warming include rising sea levels and water temperatures that pose threats to marine habitats, coastal wetlands, and estuaries which are part of more than 160 National Wildlife Refuges the Service manages along the nation's coastline and over 50 coastal and marine parks managed by the National Park Service. Pea Island National Wildlife Refuge, part of the Alligator River National Wildlife Refuge Complex along the North Carolina coast, is losing ground annually to the Atlantic Ocean. The projected rise in sea level over the next 50 to 100 years will likely transform large expanses of marsh to open water, forest to marsh, and complicate habitat conservation for species such as the federally endangered red wolf and many other species of birds and wildlife. Similar threats are facing other refuges like Merritt Island National Wildlife Refuge which overlays and surrounds the Kennedy Space Center in Cape Canaveral, Florida, and serves as a home to more than 300 species of birds. At this refuge, projected sea level rise over the next few decades threatens to engulf much of the refuge. The Oregon Islands National Wildlife Refuge which supports significant seabird nesting and the Aransas National Wildlife Refuge along the Texas coast are also expected to experience substantial impacts from sea rise and subsequent loss of habitat for wildlife. Sea level rise will complicate some large scale restoration efforts, such as the effort currently underway to restore formerly diked salt ponds in the San Francisco Bay National Wildlife Refuge. It will be essential for the Service to understand not only the physical changes in habitat that will result from sea-level rise in and around our refuges, but the landscape-scale changes in population ecology that will be driven by those changes.

Increased ocean temperatures are also accelerating the intensity of algae blooms and incidents of red tide in the Gulf of Mexico. These increased incidents can cause significant fish kills, contaminate shellfish and, when inhaled, can create severe respiratory irritation to humans as well as generating more frequent and more intense events of coral bleaching and disease which can stress and kill corals. Coral reefs managed by the National Wildlife Refuge System, like other reefs world-wide, are experiencing bleaching episodes—most recently the reefs of Navassa National Wildlife Refuge demonstrated these effects after the extreme Caribbean bleaching episode of 2005.

With the rise of atmospheric carbon dioxide levels, our oceans are becoming more acidic. As oceans absorb more carbon dioxide, the availability of carbonate ions is reduced. Reef-building organisms and shellfish require an abundance of carbonate ions to build their skeletons and shells.

As field biologists and ecologists research changes correlated with observed changes in climate, it is becoming increasingly apparent that those changes are widespread, and are adding increasing complexity to the challenge of fish and wildlife conservation. For instance, University of Texas ecologist, Dr. Camille Parmesan has done an extensive survey of scientific literature and concludes that “

“Ecological changes in the phenology and distribution of plants and animals are occurring in all well-studied marine, freshwater, and terrestrial groups.

These observed changes are heavily biased in the directions predicted from global warming and have been linked to local or regional climate change through correlations between climate and biological variation, field and laboratory experiments, and physiological research.”³

This presents immense challenge for natural resource managers and scientists because we are facing what author Douglas Fox has termed “A No-Analog Future,”

³Parmesan, C., (2006, Ecological and Evolutionary Responses to Recent Climate Change, *Annu. Rev. Ecol. Evol. Syst.* 37: 637-69, doi:10.1146/annurev.ecolsys.37.091305.110100.

that is, a future in which climate change leads to entirely new ecological communities for which there is no present analog.

Creating an Atmosphere of Awareness

The Service is preparing for this no-analog future by working with other agencies, states, and partners to understand developments as quickly as possible and to develop the capacity to respond. Based on the successful Climate Change Forum for Alaska, Service Director Dale Hall instructed all Regional Directors to work in concert with their USGS counterparts and develop a series of regional climate workshops. These workshops, like one that is occurring today for the Columbia River Basin, are bringing together partners from federal, state and tribal governments, conservation organizations and universities. The Service intends to use such information to develop our capacity to address the impacts of a changing climate.

Adaptation and Mitigation Strategies

The Service is establishing an impressive track record of adapting and mitigating strategies. Most noteworthy, perhaps, are our pioneering partnerships in habitat restoration and terrestrial sequestration. In our Southeast Region, an innovative partnership was launched eight years ago aimed at restoring native habitats to bolster populations of wildlife and migratory birds through a terrestrial carbon sequestration initiative. The Service is working with The Conservation Fund, Trust for Public Lands, and energy companies like Detroit Edison, American Electric Power, and Entergy, adding 40,000 acres of habitat to our National Wildlife Refuge System and reforesting a total of 80,000 acres with more than 22 million trees that will sequester approximately 30 million tons of carbon over 70 years. This effort has been fueled by a capacity to develop landscape-scale conservation strategies that has been built through the Lower Mississippi Valley Joint Venture Partnership.

In March 2007, the Service announced a new partnership with The Conservation Fund and its Go ZeroSM initiative that gives individuals and organizations a way to offset their own annual carbon emissions calculated based on daily commuting patterns, home energy usage and other factors. The Conservation Fund then offsets the carbon footprint by working with the Service to plant native trees on refuges. It's voluntary, non-regulatory, and represents another example of partnership that restores habitats, helps achieve goals in ecosystems, and contributes towards reducing atmospheric carbon dioxide.

The next frontier for this effort is to identify ways we can create an incentive to more broadly engage private landowners to restore native habitats that sequester carbon. For example, the Service is now working with the Department of Agriculture to replicate this sequestration initiative in other state and federal land management agencies as well as territories.

The Service is also beginning to address the potential for significant sea level rise. A comprehensive modeling effort using what is called the Sea Level Affecting Marshes Model (SLAMM) has been undertaken to determine the potential effects of sea-level rise on coastal National Wildlife Refuges (NWRs). The SLAMM model simulates the dominant processes involved in wetland conversions and shoreline modifications during long-term sea level rise. Map distributions of wetlands are predicted under conditions of accelerated sea level rise and results are summarized in tabular and graphical form. Since June 2006, SLAMM modeling has been conducted for approximately 20 NWRs and at least an additional 26 are in the pipeline (see Table 1). The Service's National Wetlands Inventory (NWI) is an integral component to SLAMM modeling because SLAMM simulations run on NWI wetlands data. SLAMM results will be crucial elements in developing refuge and landscape-scale adaptation strategies and in revising refuge comprehensive conservation plans.

In addition to increased modeling and mapping efforts to better predict and understand the consequences of sea level rise on Service lands, we are assisting communities as they plan for potential environmental change. Sea level rise and subsequent increases in coastal erosion are already affecting portions of the coastline, particularly evident in western and northern Alaska. Hardening of shorelines and the relocation of vital infrastructure are already underway with potentially adverse impacts to high-value fish and wildlife habitat. In other communities, water shortages and droughts are likely to be community concerns. Service biologists are engaging to advise and assist communities across the country in planning for, and adapting to, these environmental changes while also conserving high-value fish and wildlife habitats.

Increasing Our Knowledge Base

Like the fish and wildlife populations that the Service is entrusted to conserve, we must adapt our work in an era of changing climate. This will require increasing ability to predict changes and design conservation strategies at landscape scales, to

implement conservation projects, and to learn by adapting based on observed results. Improved understanding and models of future climate change is essential to plan for potentially significant changes. To that end, the Service is working with the USGS to develop modeling capacity and other research tools for assessing potential effects of climate change.

The USGS' 2009 budget proposal includes a \$5 million Climate Change initiative. This initiative will result in science and adaptive management strategies for climate impacts and development of the methodology to assess geologic carbon storage. Results from this initiative will provide resource managers crucial information and tools to develop land and water management strategies and determine adaptive management activities in a dynamic environment affected by climate change. The USGS is also currently conducting research into water use and availability trends in order to examine the implications for managing the National Wildlife Refuge System. Part of this analysis will include projections on climate related changes in water availability.

The Service has joined an important new partnership with the USGS, The Wildlife Society, and others to develop a National Phenology Network. Our hope is that this effort will fuel a new generation of information on changes in ecological relationships in response to climate, a new generation of citizen scientists that will create opportunity for volunteerism, and support efforts to connect people with nature.

Another example of USGS-Service partnership in addressing impacts of climate change is the ongoing development of Adaptive Harvest Management (AHM) as an objective, science-based framework for establishing annual migratory bird hunting regulations. AHM, as a decision-making framework, is built upon alternative models that describe competing ideas about how hunted populations respond to the environment and to harvest. Population ecologists have traditionally attempted to exploit historical relationships between bird population dynamics, environmental factors, and harvest data to predict effects of future management decisions. Climate change has the potential to drastically alter the way that bird populations respond to their environment and to human activities such as hunting. This requires consideration of alternate potential future system states in the decisions harvest managers make today. To this end, Service and USGS scientists are evaluating ways to incorporate the predictions of climate models, which may suggest future conditions outside the realm of historical experience, within the decision-making process. These efforts represent a new scientific frontier in the general fields of structured decision-making and adaptive resource management.

A partnership with USGS and the Environmental Protection Agency involves the authoring of a case study on adaptation strategies for the National Wildlife Refuge System. This case study will be published as a chapter in the U.S. Climate Change Science Program (CCSP), Synthesis and Assessment Product (SAP) SAP 4.4: Adaptation Options for Climate-Sensitive Ecosystems and Resources (The CCSP Strategic Plan calls for the creation of a series of more than 20 synthesis and assessment reports. The lead agency for SAP 4.4 is the Environmental Protection Agency.) The 3rd draft of SAP 4.4 was posted on the CCSP web site on February 29, 2008, and the final report is scheduled to be posted in June 2008. The final report was posted on the CCSP web site on June 20, 2008. Lead authors of the National Wildlife Refuge Chapter are J. Michael Scott and Brad Griffith of USGS with three contributing authors from the Service: Robert S. Adamcik, Daniel M. Ashe, and Brian Czech. This report provides a preliminary review of adaptation options for climate-sensitive ecosystems and resources in the United States. Other chapters address National Forests, National Parks, Wild and Scenic Rivers, National Estuarine Reserves, and Marine Protected Areas.

Finally, the Service is cooperating with USGS to implement a framework for landscape scale conservation that we call "Strategic Habitat Conservation (SHC)." SHC is an adaptive management framework that begins with explicit trust resource population objectives. Because climate change affects species and habitat change globally, the Service needs a consistent approach to understand and address this challenge. This direction of change is inspiring and challenging us to reshape not just how we do the work of conservation, but how we think about conservation. Implementation of this approach and building this capacity will be an essential ingredient in our response to the changing climate system.

SHC integrates five functional elements into an adaptive framework: biological planning, conservation design, conservation delivery, decision-based monitoring, and assumption-driven research. While methods may vary, the essence of SHC begins and ends with explicit trust resource population objectives for a key species or group of key species. These objectives are met by applying predictive models and conservation biology principles to define the ecological conditions that must be sustained at the landscape scale and by using spatially explicit data to strategically target con-

servation priorities at the site scale. Landscape-level conservation through adaptive management provides a habitat conservation framework within which scientists and managers can factor in actual and projected changes in climate. Habitat fragmentation, dispersal and migration corridors, nonlinear changes in ecosystem response, and factors including intensified wildfires, droughts, and storms can be more effectively addressed through this framework. As we face the extraordinary complexity of changing climate, the Service will need to be increasingly strategic in conservation delivery. We must develop capacities to understand and anticipate change on broader landscape scales relevant to the types of climate changes likely to occur and develop new and innovative strategies such as potential climate refugia and conservation designs that result in landscape connectivity allowing habitat and populations to adapt as successfully as possible.

The SHC framework has been successfully applied in key regions for several years, most notably the Lower Mississippi Valley and Prairie Pothole regions, and increasingly is being expanded to other geographic areas. For example, in the plains of the Southwest, the Playa Lakes Joint Venture followed the SHC framework to conserve habitat for the lesser prairie-chicken and associated wildlife through strategic enrollment of land into Farm Bill conservation programs such as the Conservation Reserve Program. Applying the SHC framework (including a rigorous biological planning process to identify priority bird species in the region and habitat acres based on their potential benefit to the prairie-chicken), Joint Venture partners determined that, in the Texas Panhandle, 20,000 acres of CRP placed randomly on the landscape had no noticeable effect on the chickens' numbers. CRP acres spatially targeted and planted with native grasses, however, can support 217 prairie-chickens.

Conclusion

Critical to the Service's success in addressing these challenges will be our ability to build the capacity to understand the changing climate and to predict and adapt to its forcing effects on the natural environment, and the capacity to build partnerships with organizations like USGS, states, and other partners that have relevant expertise, tools and information. Admittedly, there is still a lot of work to be done, but the Service is making significant strides in developing adaptive and mitigation responses and expanding our knowledge of climate change trends and effects. Despite the enormity of the many challenges associated with this issue, the Service is committed to addressing climate change and its potential impacts on our Nation's fish, wildlife, and habitat. We are creating an atmosphere of awareness and an important new direction of change. We are modeling innovative new partnerships in adaptation and mitigation. We are increasing our knowledge and capacities to implement landscape-scale and adaptive approaches.

We appreciate your attention to this issue and we look forward to working with the Subcommittee, the Committee, and the entire Congress as we all work to address this challenge in the months and years to come.

Table 1. Sea Level Affecting Marshes Model (SLAMM) on coastal National Wildlife Refuges (Refuges)

Completed SLAMM Modeling	Modeling Scheduled for FY-08
ACE Basin NWR	Alligator River NWR
Bayou Sauvage NWR	Bayou Teche NWR
Big Branch Marsh NWR	Bogue Chitto NWR
Blackbeard Island NWR	Bon Secour NWR
Cape Romain NWR	Cabo Rojo NWR
Culebra NWR	Caloosahatchee NWR
Dungeness NWR	Chassahowitzka NWR
Egmont Key NWR	Chincoteague NWR
Harris Neck NWR	Crystal River NWR
J.N. Ding Darling NWR	Eastern Shore of Virginia NWR
Pinckney Island NWR	Green Cay NWR
Pine Island NWR	Island Bay NWR
Savannah NWR	Laguna Cartagena NWR
Swanquarter NWR	Mandalay NWR
Tybee NWR	Matlacha Pass NWR
Vieques NWR	Merritt Island NWR
Waccamaw NWR	National Key Deer NWR
Wassaw NWR	Passage Key
Willapa NWR	Pea Island NWR
Wolf Island NWR	Pinellas NWR
	Sabine NWR
	Sandy Point NWR
	Shell Keys NWR
	St. Johns NWR
	St. Marks NWR
	St. Vincent NWR

*Approximately 11 refuges of the Chesapeake Bay region will be parsed out of a broader analysis being conducted for the National Wildlife Federation.

**Pacific Coast Refuges may also be included in FY-08.

Ms. BORDALLO. Thank you very much, Mr. Ashe. It is my understanding from the committee up here that you once served as congressional staff for the Merchant Marine and Fisheries Committee and that you have a long history on these issues. So we appreciate your insights today and, of course, your timing as well.

Mr. ASHE. Thank you, Chairman Bordallo.

Ms. BORDALLO. I would like to now recognize Mr. Whitehurst.

STATEMENT OF DAVID K. WHITEHURST, DIRECTOR, WILDLIFE DIVERSITY DIVISION, VIRGINIA DEPARTMENT OF GAME AND INLAND FISHERIES

Mr. WHITEHURST. Thank you, Madam Chairwoman. Thank you for the opportunity to speak to you today about state efforts to incorporate the expected impacts of global climate change into our

wildlife management programs and to offer recommendations regarding additional direction and resources that Congress could provide to support these efforts.

As you have heard during previous hearings, climate change poses an unprecedented threat to the future of human communities, wildlife habitat, and the natural communities that we depend on for food, our drinking water, our recreational pursuits, the strength of our local economies and our quality of life. The implications of climate change present critically important challenges that must be met by state and territorial wildlife agencies and their conservation partners using scientific and adaptive approaches, collaboration and timely and effective communications.

State wildlife agencies nationwide have a history of successfully managing natural resources in the public trust, and we can meet these new challenges given proper resources. In 2001, Congress provided a new source of appropriated funding for wildlife conservation, the State Wildlife Grants Program. It is now the cornerstone in many states for keeping common species common and preventing wildlife from becoming endangered. Resulting state wildlife action plans provide the foundation for managing species with greatest conservation needs.

A very successful Federal/state partnership led by the U.S. Fish and Wildlife Service and the Association for Fish and Wildlife Agencies collaborated on guidelines for the states and territories to facilitate the development of these plans. I participated on this team and can attest that this partnership is one of the best that I have seen in my 40 years in the profession. Hopefully, this successful partnership can serve as a prototype for a cooperative planning process to develop an adaptation strategy for climate change.

At the time that most of these plans were being written though, most of us were focused on the more tangible threats immediately facing us such as habitat loss and fragmentation, pollution and invasive species, rather than the less documented threats from climate change. As you probably know, these plans revealed that many of the country's wildlife species are already experiencing significant declines. State wildlife agencies are now recognizing the needs and taking steps to adopt wildlife management activities to address climate change impacts on wildlife.

In Virginia, Governor Kaine established a Commission on Climate Change and charged it with developing a Climate Change Action Plan that will include impacts to the state's natural resources. Our agency has established a climate change working group and is working with the National Wildlife Federation and the Virginia Conservation Network to adapt our state wildlife action plan via workshops and stakeholder sessions to more explicitly describe the effects of climate change on wildlife and to identify actions to manage those effects. Other states are taking similar actions, as detailed in my written testimony.

I would like to offer several recommendations to you. First, we need to develop a national biodiversity climate change adaptation plan. The plan should utilize a risk assessment approach, be developed with input from the state wildlife agencies, and guide future funding resources. Furthermore, this plan should lead to the development of uniform Federal policies and interagency responses to

climate change that are well coordinated with state and natural resource agencies.

Additional uniformity can be provided by using existing tools such as state wildlife action plans, the North American Waterfowl Management Plan or programs such as the Wildlife Conservation and Restoration Program. These existing tools will require an update to address climate change.

State wildlife agencies are currently addressing the impacts of climate change with extremely limited budgets. Congress could provide necessary adequate, dedicated funding sources to support Federal, state and territorial efforts to mitigate and adaptively manage wildlife populations and habitats in response to climate change. Moreover, regional ecosystem-based cooperative programs and partnerships among states to implement this plan at the landscape level should be encouraged through the creation of incentives and various Federal funding programs.

The Association of Fish and Wildlife Agencies worked closely with the hunting and fishing conservation community, the National Wildlife Federation, the Nature Conservancy, and the Defenders of Wildlife over the last year—and with the staffs from the offices of Senator Lieberman, our own Senator Warner, and Senator Whitehouse—to perfect the natural resource adaptation provisions in Senate Bill 3036. The title has broad and diverse support in the conservation and environmental communities. Your committee staffs have been briefed on these provisions. And we all encourage you to give serious consideration to the Lieberman-Warner Natural Resource Adaptation Construct, including state match requirements in any legislative drafting you undertake.

In conclusion, climate change will fundamentally change the way that state and territorial wildlife agencies manage wildlife populations for the public trust. The potential magnitude of the impact and the time frame in which they will occur are greater than any other threat that we have faced in the last 100 years or so. The state wildlife agencies are ready and willing to work with this Subcommittee, the rest of Congress, and the Federal Government to plan and adaptively manage for the impacts of climate change on your natural resources.

Thank you for the opportunity to testify today, Madam Chair.
[The prepared statement of Mr. Whitehurst follows:]

**Statement of David K. Whitehurst, Director, Wildlife Diversity Division,
Virginia Department of Game and Inland Fisheries, Richmond, Virginia**

Madam Chairwoman and members of the Subcommittee, I am David Whitehurst, Director of the Wildlife Diversity Division of the Virginia Department of Game and Inland Fisheries. Thank you for the opportunity to speak with you today about state efforts to incorporate the expected impacts of global climate change into our natural resource planning and management programs. I also welcome the opportunity to make recommendations regarding additional direction and resources that Congress could provide to assist in these efforts.

As you have already heard during previous hearings, climate change poses an unprecedented threat to the future of human communities, fish and wildlife habitat, and the natural communities we depend on for our food, our drinking water, our recreational opportunities (such as fishing, hunting, boating, and bird watching), the strength of our local economies, and our quality of life. The implications of climate change on our rich natural heritage present critically important challenges and opportunities that must be met by state and federal fish and wildlife agencies and

their conservation partners using scientific and adaptive approaches, collaboration, and timely and effective communications.

The Virginia Department of Game and Inland Fisheries is the inland fish and wildlife management agency of the Commonwealth. The agency is also the boating entity in Virginia. The Department's mission is:

- To manage Virginia's wildlife and inland fish to maintain optimum populations of all species to serve the needs of the Commonwealth;
- To provide opportunity for all to enjoy wildlife, inland fish, boating and related outdoor recreation and to work diligently to safeguard the rights of the people to hunt, fish and harvest game as provided for in the Constitution of Virginia;
- To promote safety for persons and property in connection with boating, hunting and fishing; and
- To provide educational outreach programs and materials that foster an awareness of and appreciation for Virginia's fish and wildlife resources, their habitats, and hunting, fishing, and boating opportunities.

Healthy and intact ecosystems support our wildlife conservation needs. Hunter and anglers, farmers and ranchers, hikers and bird watchers, and citizens in all walks of life, benefit from programs at all levels of government that support our ability to sustain not just human life, but fish, wildlife, and the habitats upon which all of us depend for ecosystem services such as clean air and drinking water, recreation, and validating our natural heritage and relationship with the land.

The Virginia Department of Game and Inland Fisheries celebrated its 92nd birthday last week. State fish and wildlife agencies nationwide have an extensive history of managing natural resources, largely guided by the wisdom and foresight of great leaders of conservation—Teddy Roosevelt, Gifford Pinchot, Aldo Leopold, Rachel Carson, and Virginia's own A. Willis Robertson, to name a few. The "North American Model of Wildlife Conservation," which is distinct from other forms of wildlife conservation worldwide, includes, as one of its tenants, that wildlife are held as public trust resources by the states for the benefit of all people. Our conservation leaders have been instrumental in ensuring that our country has a strong legacy of protecting our fish and wildlife and the habitats upon which they depend.

In Virginia, the national parks, national forests, national wildlife refuges, state wildlife management areas, state parks and natural area preserves, and state forests represent a considerable investment in lands and waters recognized for their biological, cultural, recreational, and natural significance. The Virginia Department of Game and Inland Fisheries owns the most public land of any state government agency in the Commonwealth. Climate change threatens every one of the investments we have made to date and will have profound impacts on how we manage our lands, waters, and fish and wildlife populations. I can assure you, too, that with a \$51 million annual budget and existing needs that go unmet each year, we do not have the resources needed to respond appropriately to these new threats. Like many other state fish and wildlife agencies, our wildlife conservation programs are primarily funded by hunters and anglers. While we are all already making investments in assessing impacts of climate change and developing adaptive management strategies, critical funding shortfalls hamper our efforts.

Natural resources provide enormous contributions to our state economy. The 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation found that over 87 million Americans (38 percent of those aged 16 and older) pursued outdoor recreation in 2006 and spent \$120 billion that year on those activities. In Virginia alone, more than 2.9 million people participated in these activities and generated over \$2.1 billion in economic revenue that year. Natural systems also provide significant benefits to our local communities through the services that they provide—such as flood protection, storm buffers, groundwater storage, clean drinking water, and clean air. These ecosystem "services" can be and should be estimated in terms of the value that they provide to human communities. For example, a study conducted by the Minnesota Department of Natural Resources estimated that the state's wetlands provide flood abatement and storage worth \$300 per acre-foot of water. The U.S. Geological Survey's National Wetlands Research Center has estimated that Louisiana's 2.5 million acres of coastal wetlands provide storm protection valued at between \$520 million and \$2.2 billion. In Virginia, we initiated an ecosystem services evaluation last year, led by the Virginia Department of Forestry, and that work is still under development.

In federal FY2001, Congress provided the 50 states, the District of Columbia, and the trust territories with a new source of appropriated funding for wildlife conservation—the State Wildlife Grants program administered by the U.S. Fish and Wildlife Service. This program is now the cornerstone in many states for keeping common species common and preventing wildlife from becoming endangered. As a condition to receiving those funds, Congress asked each state and territory fish and wildlife

agency to develop a roadmap that documented the status and condition of fish and wildlife populations and habitats, threats to those resources, and conservation actions that could be taken to address those threats. These documents, known as State Wildlife Action Plans, were all completed by the prescribed October 1, 2005, deadline and have provided the foundation for managing species of greatest conservation need and the habitats in which they live. A very successful federal-state partnership, led by the U.S. Fish and Wildlife Service and the Association of Fish and Wildlife Agencies, collaborated on guidelines to states and territories to facilitate the development of these Plans. I had an opportunity to participate on this team as a state representative and can attest that this partnership is one of the best I have seen in my 40 years in the profession. Because this effort resulted in strong, well-established partnerships, Wildlife Action Plans should be used as a guiding framework for integrating climate change considerations into wildlife management and planning. Targeting resources to incorporate climate change into these plans will be a cost-effective and efficient mechanism for addressing impacts of global warming on wildlife.

At the time that most of these plans were being written, though, many of us focused more on the tangible threats immediately facing us, such as habitat loss or degradation, pollution, and deleterious or invasive species, rather than the less well-documented climate change threats to resources in our respective states. The effects of climate change can more properly be viewed as exacerbators of other more direct threats as mentioned previously. The Virginia Wildlife Action Plan documents 924 species of greatest conservation need, found across Virginia and in nearly every natural habitat occurring in the state. We did recognize climate change as a source of stress to barrier island and coastal marsh habitats, high elevation spruce-fir forests that are relicts from the last Ice Age, and our coldwater headwater streams, and the many declining or at-risk species associated with them. We were not, however, able to identify appropriate ameliorating actions within our sphere of influence or those of our conservation partners in the short timeframe we had to complete the Plan.

Historical species ranges are changing and should be considered cautiously when determining long-term management objectives and implementation options. We recognize that the effects of global climate change in Virginia will result in habitats and associated wildlife species shifting northward and upward in elevation. Without considerably greater efforts, it is likely that many of our imperiled freshwater muscels, the Peaks of Otter salamander, and other species found nowhere else in the world will become extinct. Some species that are currently rare in Virginia but found elsewhere, such as the snowshoe hare, will likely persist in more northern parts of Canada and the United States, but will be extirpated from Virginia. We anticipate that some species not native to the Commonwealth, such as the American alligator and the armadillo, will expand their ranges northward into Virginia and establish populations in our state. Finally, some species, such as the brook trout and many waterfowl, may continue to persist in the state, found in significantly less habitat and in lower numbers. Reducing non-climate stressors on ecosystems (such as environmental contaminants, habitat fragmentation, and invasive species) may help to reduce impacts from changing climatic conditions.

Unfortunately, unlike funding provided through the Wildlife and Sport Fish Restoration Programs (established under the Pittman-Robertson Wildlife Restoration Act and the Dingell-Johnson Sport Fish Restoration Act, respectively) for much of our wildlife management activities, the State Wildlife Grants Program is currently an annual appropriation that must be revisited each year. For federal FY 2008, the final apportionments to states from the Wildlife Restoration Fund is \$309,686,579 and from the Sport Fish Restoration Fund, \$398,337,729. The total appropriation in federal FY 2008 for the State Wildlife Grants Program (including funds for U.S. Fish and Wildlife Service administration of the program) is only \$61,522,997. The uncertainty of annual funding and low funding levels confound our abilities to initiate and sustain comprehensive long-term planning and management programs to respond to the effects of climate change.

Natural Resource Planning and Management Activities

State fish and wildlife agencies across the country are recognizing the need, and are taking steps, to adapt wildlife management and planning activities to address climate change impacts on wildlife. In Virginia, we have recently initiated a number of activities to help the Commonwealth and its citizens address likely impacts of climate change.

In 2006, the Virginia General Assembly passed legislation establishing renewable portfolio standards and directing the development of a Virginia Energy Plan. In 2007, the Commonwealth also joined The Climate Registry, a nonprofit partnership

developing an accurate, complete, consistent and transparent greenhouse gas emissions measurement protocol that is capable of supporting voluntary and mandatory greenhouse gas emission reporting policies for its Members and Reporters.

In 2007, Virginia Governor Tim Kaine released the state's first ever Virginia Energy Plan. This plan covers all aspects of energy production and consumption in Virginia: fuel demand and supply; infrastructure; impacts of energy use on the environment; and energy research and development capabilities. The Plan identifies four overall goals, including the reduction of greenhouse gas emissions by 30 percent by 2025, bringing emissions back to 2000 levels. This goal will be partially achieved through energy conservation and renewable energy actions identified in this Plan.

On December 21, 2007, Governor Kaine signed Executive Order 59 establishing the Governor's Commission on Climate Change. The Commission is charged with developing a Climate Change Action Plan for Virginia that identifies the additional steps that must be taken to achieve the goal of reducing greenhouse gas emissions by 30 percent by 2025. When completed, the Climate Change Action Plan will include an inventory of the amount of and contributors to Virginia's greenhouse gas emissions and projections through 2025; evaluate expected impacts of climate change on Virginia's natural resources, the health of its citizens, and the economy, including the industries of agriculture, forestry, tourism, and insurance; identify what Virginia needs to do to prepare for the likely consequences of climate change; identify the actions (beyond those identified in the Virginia Energy Plan) that need to be taken to achieve the 30% reduction goal; and identify climate change approaches being pursued by other states, regions, and the federal government. The Commission is chaired by the Virginia Secretary of Natural Resources, L. Preston Bryant, Jr., and includes representatives from all affected interests. The Virginia Climate Change Action Plan is due to Governor Kaine by December 15, 2008. Through its first five meetings, the Commission has heard testimony and public comment regarding, among many topics, the expected impacts of climate change to forests, fisheries and wildlife, and the Chesapeake Bay ecosystem; calculating and quantifying ecosystem services; expected economic impacts of climate change on tourism; and adaptive management strategies, particularly in association with vulnerable wildlife.

Within the Virginia Department of Game and Inland Fisheries, we have established a climate change working group that is tasked with synthesizing information both for the Commission and the Department. This group has only been together for three months, and its first task was to develop a summary of the general impacts of climate change on natural communities and potential impacts on Virginia's wildlife and habitats for use in policy planning.

The Department is also working in partnership with the National Wildlife Federation and the Virginia Conservation Network to adapt our state Wildlife Action Plan to more explicitly describe the effects of climate change on all wildlife and to identify actions to mitigate or adaptively manage for those effects. We are planning two workshops in the next year—the first to be held this fall—to gather stakeholders together, determine more specifically the projected impacts of climate change on Virginia's wildlife populations and habitats, and identify specific management strategies. Such efforts will likely include minimizing the number of extinctions (which may require us to think differently about habitats, connectivity, and species distributions); facilitating the gradual migration of species (perhaps around human-created barriers); and strategically planning the acquisition and protection of future management areas that will, eventually, be suitable for target species, all the while maximizing the efficiencies and cost-effectiveness of our actions. More specific efforts may involve triage, a complicated process to determine which species can be saved with immediate action; can be saved if actions are initiated later; and cannot be saved, irrespective of actions.

When it is possible to save species, our success or failure will depend upon our ability to identify where habitats currently exist and to work with landowners, municipalities, and agencies to facilitate the migration of those habitats across Virginia. We will not have the resources to work in our traditional "species by species" approach; habitat planning and management will be more critical than ever. From a management perspective, climate change will be the new reality, and we will have to constantly evaluate and adapt our efforts if we are to be successful. We will have to monitor the current situation to determine what we have and where it occurs, initiate management efforts to conserve species and habitats as the climate changes, monitor species and habitats to determine if our management efforts are effective, adapt our efforts as conditions change, and then repeat. This cycle will occur over the course of decades. Climate change will test our ability to think about groups of species, plan for change decades in advance, and implement the adaptive management strategies needed to bring plans to fruition.

It is important to realize that climate change is just one of many issues that threaten the future of Virginia's wildlife heritage. The Virginia Wildlife Action Plan identifies over 900 species of greatest conservation need that currently reside in Virginia. The vast majority of these species are being impacted by the loss and degradation of the habitats in which they live. At the same time, conservation-related funding programs are declining. So we have many species that are already in trouble, many of our habitats are already degraded, and less money is available for conservation. Success in a world and a Commonwealth influenced by global climate change will require more cooperation among agencies at all levels of government, non-government organizations, businesses, private landowners, legislators (at the state and national level), and other countries. The experiences in Virginia are not unique, though. Throughout the country, State Wildlife Action Plans identified many species of wildlife in serious decline due to habitat loss and fragmentation, pollution, invasive species, and other causes. In each state, scientists have also begun to turn their attention to the compounding effects of climate change on these resources.

Other states have offered information to me to help illustrate further for you the efforts of state fish and wildlife agencies to address climate change impacts on wildlife and habitats nationwide. Florida's Fish and Wildlife Conservation Commission adopted a Global Warming Resolution in September 2007 that specifically calls for the Commission to "support science and management that will effectively assess the future effects of global climate change on Florida's fish, wildlife and ecosystems...[and] to engage with other experts from government, academia, industry, and conservation organizations to develop recommendations for conserving fish and wildlife in the face of global climate change." Florida is also hosting a conference entitled "Florida's Wildlife: On the Frontline of Climate Change" in August 2008. The conference will bring stakeholders together from across the state to raise awareness about the impacts of climate change on Florida's biodiversity and to identify key research needs and actions to minimize climate change effects on fish and wildlife, which will be incorporated into the Commission's comprehensive climate change strategy.

Washington is one of the first states in the nation to develop a targeted action plan to cope with the impacts of global warming, prompted by an Executive Order from Governor Christine Gregoir in 2007 as part of her Climate Change Challenge. Stakeholder-driven Preparation and Adaptation Working Groups developed a comprehensive list of recommendations to address the impacts of climate change in several important sectors, including human health, agriculture, coastal systems, forestry resources, and water resources. In addition, the Washington State Department of Fish and Wildlife provided supplemental recommendations specific to state habitats and species. These recommendations provide an important foundation for continuing work in the coming months to enhance emergency preparedness and response; incorporate climate change and its impacts into planning and decision-making processes; restore and protect natural systems and natural resources; develop and improve water supply and management; build institutional capacity and knowledge to address impacts associated with climate change; manage and share available data more effectively; and educate, inform and engage landowners, public officials, citizens and others. The Washington Department of Fish and Wildlife also is in the process of updating its wildlife action plan to address climate change.

Maryland's Commission on Climate Change also organized Adaptation and Response Working Groups. The working groups have developed a diverse set of policy options to address climate change that the Commission will present to the Governor. Policy options include strong recommendations that will benefit wildlife and fisheries. For example, one policy option calls for identifying priority areas for restoration in the context of sea-level rise and implementing strategic management actions to protect against sea-level rise. These actions will be important for protecting key Chesapeake Bay habitats that support coastal wildlife and fish species and migratory birds. Protecting and expanding coastal forests and wetlands also will help provide wildlife replenishment areas and movement corridors. Policy options also focus on resource-based industries, including commercial and recreational fishing and sportsmen activities. Policy options for commercial fisheries include developing long-term plans that are adaptive and management efforts that conserve diverse habitats to increase resiliency of the system under climate change conditions.

The Nevada Department of Wildlife is working to address climate change challenges through innovative partnerships and cross-cutting initiatives. Together with its partners, the agency is gathering information that enables it to better understand and predict future changes. By taking a multi-pronged approach that includes habitat restoration, species research and monitoring, and conservation planning efforts, the agency is working to incorporate management strategies that reduce the

stress of climate change on wildlife populations. Examples of actions already underway include the restoration of healthy sagebrush habitats in northern Nevada, designed in part to stem the invasion of non-native cheatgrass into native habitats; implementation of discovery surveys in various areas of Nevada to better understand the current ranges of species at risk, which will then inform more effective management strategies; and collaboration with The Nature Conservancy and other non-governmental organizations to develop ecological models that predict the relative risk of Nevada's key wildlife habitats to the projected threats of climate change.

Nebraska's Game and Parks Commission has organized an agency-wide climate change working group to address impacts of climate change on wildlife and the implementation of the state wildlife action plan. The agency has also established relationships with outside partners, including the U.S. Geological Survey and the University of Nebraska at Lincoln, to support the development of a research agenda for a possible regional climate change research center and a degree program in adaptive resource management through the University's School of Natural Resources. Commission staff members are also engaging the state's Wildlife Action Plan Partners team in a comprehensive discussion of climate change and its impacts to wildlife populations and habitats. The agency faces some significant challenges, however, including increasing demands for biofuels and high commodity prices, which may result in a significant loss of conservation reserve lands and other grasslands to irrigated cropland. As with many other states, there is also considerable uncertainty in the conservation community as to what adaptation strategies are needed to offset the impacts of climate change.

Montana Fish, Wildlife and Parks is working with the National Wildlife Federation to plan a workshop to begin addressing the challenges that climate change will present for wildlife management and conservation efforts in the state. Initial steps in this process will focus on needed modifications in state management plans. The workshop will serve as a model for states in the Rocky Mountain and Dakota regions in collaboration with their state fish and game departments. Several states in the region, such as South Dakota, already have expressed interest in using the workshop as a model for similar efforts in their states. In addition, the South Dakota Department of Game, Fish and Parks is working currently with the South Dakota chapter of The Wildlife Society on climate change issues.

The Vermont Wildlife Action Plan ranks climate change as one of the top five problems facing fish and wildlife today. Many of the actions identified to address these impacts focus on maintaining and improving connectivity of habitats, although reducing other stressors is also recommended. The Vermont Fish and Wildlife Department has teamed up with the Vermont Department of Transportation over the past five years to maintain and improve fish and wildlife habitat connectivity. Those two agencies work with their colleagues in Maine and New Hampshire and have created a ground-breaking transportation collaborative. The third biennial transportation and wildlife conference, to be held later this year, will provide further opportunities for wildlife managers and transportation specialists to discuss regional needs and options for addressing those needs.

Various other states also are implementing multi-sector, consensus-building processes to develop adaptation strategies for wildlife. For example, the California Department of Fish and Game is embarking on a process to incorporate global warming into its activities, and the California Resources Agency is also about to launch a process to create a state-level Climate Adaptation Strategy which will include a component on natural lands, habitat, and species. The state of Wisconsin is measuring the impacts of climate change on its highly sensitive and fragile peatlands. Scientists there are studying the changes of the plants, insects, amphibians, and other wildlife using the bogs by looking at peat core samples. This assessment will help them evaluate which species are most susceptible to climate change and determine how resource managers must counter these changes.

The states and territories are also working with the Association of Fish and Wildlife Agencies to identify efficient and effective strategies for responding to climate change impacts on fish and wildlife habitats and populations. The Association—the organization that represents North America's fish and wildlife agencies—promotes sound management and conservation, and represents the collective perspectives of the State Fish and Wildlife agencies on important fish and wildlife issues. Through a relatively new Climate Change Subcommittee, the Association is providing a forum through which state fish and wildlife agencies can collaborate on the identification of key issues and actions pertaining to climate change and engage at international, national, regional, state, and local levels to successfully influence policy and implement vital management response for climate change impacts. The Association's Climate Change Subcommittee is also preparing a document summarizing

more specific strategic and operational considerations for state agencies responding to climate impacts, including a recommended framework for adaptation strategies, monitoring protocols, and modeling at the local level.

Recommendations—Additional Direction and Resources

I want to ensure that the members of the Subcommittee recognize that state fish and wildlife agencies are currently addressing the impacts of climate change on fish and wildlife populations and habitats with extremely limited budgets. More investment is needed to protect, manage and restore fish and wildlife populations and habitats.

The Association of Fish and Wildlife Agencies worked closely with the hunting and fishing conservation community, the National Wildlife Federation, The Nature Conservancy, and the Defenders of Wildlife over the last year with Senate staffs from the offices of Senator Lieberman (CT), our own Senator Warner (VA), and Senator Whitehouse (RI) to perfect the natural resources adaptation provisions in S3036, which the Senate considered, but failed to act on, a couple of weeks ago. This title, which prescribes the development of federal and state adaptation strategies and the requirements, terms and conditions for spending carbon-auction derived revenues under direct-spending to remediate the effects of climate change on fish, wildlife, and their habitats, has broad and diverse support in the conservation and environmental communities. Association staff and representatives from these other organizations have briefed your Committee staffs on these provisions, and we all would urge that you give serious consideration to the Lieberman-Warner natural resource adaptation construct in any legislative drafting you undertake.

On behalf of my colleagues, I would like to offer some additional recommendations for direction and resources that Congress could provide to assist the states in addressing these impacts:

- Develop a national biodiversity climate change adaptation action plan (see the Australia National Action Plan). The Plan should utilize a risk assessment approach, be developed based on state input, and should guide future funding resources based on objectives developed in the plan.
- Provide uniformity to federal climate change planning efforts by using existing tools, such as State Wildlife Action Plans, or programs, such as the State Wildlife Grants or Wildlife Conservation and Restoration programs. Provide expanded funding to accomplish an update to all Wildlife Action Plans to account more fully for the impacts of climate change on species of greatest conservation need.
- Develop uniform federal interagency response to climate change that is well-coordinated with state natural resource agencies. State fish and wildlife agencies should encounter consistent policies when engaging federal agencies on climate change issues.
- Establish national climate change information centers in all major regions of the country. Existing federal research centers could be leveraged to provide this expertise.
- Identify and commit to a direct spending, dedicated funding source that will support state and territorial efforts to mitigate and adaptively manage wildlife and fish populations and habitats in response to climate change. Include funding of education and nature-based recreational activities to more comprehensively address climate change impacts.
- Ensure future federal climate change funding is not difficult to match at the state level. Many state fish and wildlife agencies already have trouble meeting the 50/50 match requirements of the State Wildlife Grants program when traditional wildlife conservation funding sources have a match requirement of 75/25. Given the magnitude of the issue, and the speed with which it must be addressed, it would be preferable if match was at 90/10 as was identified in the Lieberman-Warner Climate Security Act.
- Encourage regional, ecosystem-based cooperative programs and partnerships among adjacent states to address conservation issues affected by climate change at the landscape level through the creation of incentives in various federal funding programs.
- Support the identification and quantification of natural ecosystem services so that they are considered in climate change policies and included in the carbon marketplace.
- Develop robust climate change awareness activities. Create funding opportunities for climate change educational outreach programs for states and regions.
- Develop additional incentives that promote sustainable technologies and low-impact development.

- Continue to support and strengthen programs that implement habitat conservation on private lands (e.g., Conservation Reserve Program; Landowner Incentive Program).
- Create innovative federal programs that assist landowners in restoring cropland back to wetlands in floodplains and further “upslope” as sea levels rise due to global warming.
- During the rule-making process for the Farm Bill Conservation title, seek opportunities to make greater use of conservation programs to lessen the impacts of climate change on wildlife.

Conclusion

Global climate change will fundamentally change the way that state fish and wildlife agencies manage fish and wildlife populations and habitats for the public trust. The potential magnitude of the impacts and the timeframe in which they will occur are greater than any other threat we have faced in the last 100 years or more. The resulting impacts on our air and water—no doubt on our overall way of life—are staggering. I urge Congress to work together on global warming as their top priority. The states are ready and willing to work with this Subcommittee, the rest of Congress, and the federal government to plan and adaptively manage for the impacts of climate change on our natural resources. Only through such collaboration can we conserve our natural heritage for future generations. Thank you for the opportunity to testify today, and I look forward to your questions.

Ms. BORDALLO. Thank you very much, Mr. Whitehurst, not only for your thoughtful testimony about the efforts of the State of Virginia but for taking the time to gather information from the other states as well.

And I now recognize Ms. Clark for five minutes.

STATEMENT OF JAMIE RAPPAPORT CLARK, EXECUTIVE VICE PRESIDENT, DEFENDERS OF WILDLIFE

Ms. RAPPAPORT CLARK. Thank you. Madam Chairwoman and Mr. Wittman, on behalf of our over one million members and supporters across the Nation thank you for holding today’s hearing on what we believe is the most important conservation challenge that we face today, the impact of global warming on wildlife. As a wildlife biologist working for many years for the National Guard Bureau, the Department of Army and then the Fish and Wildlife Service, I worked for most of my Federal career with the assumption that the climate and the way species and ecosystems functioned were relatively constant.

Well, global warming has unequivocally changed all of that. It will literally shuffle the deck of existing ecosystems and reorder assemblages of wildlife and habitats. Consequently, we need a new paradigm. While we must act immediately to substantially reduce emissions of greenhouse gas pollution, we must also assist wildlife to survive and adapt to the impacts of global warming already taking place today.

Though many Federal programs currently exist to protect and restore fish and wildlife habitat, they are not primarily designed to address the wildlife adaptation challenges posed by global warming. They can and must, however, be used more effectively to minimize and offset future impacts to global warming, of wildlife and habitats. Natural resources agencies must make greater use of their existing authorities to address global warming, and they must be given additional direction to consider these impacts in program planning, land and water management, and environmental analyses.

Equally important, new governmental processes and structures need to be explored. While each agency should develop measures for protecting wildlife from the effects of global warming, it is insufficient and ineffective for individual agencies to contemplate and plan strategies purely on their own. The problem is simply much too complex. An effective response to the impact of global warming on wildlife requires the kind of comprehensive and coordinated measures set forth in the Global Warming and Wildlife Survival Act which was adopted by the House in July of 2007 as part of the Comprehensive Energy Bill. This legislation is included in large measure in the Boxer-Lieberman-Warner Climate Security Act recently considered in the Senate, indicating the strong policy consensus emerging on the subject.

The Survival Act provides for dramatically enhanced Federal scientific capacity to address global warming and wildlife, a coordinated national strategy to ensure that wildlife impacts spanning government jurisdictions are effectively addressed, and a commitment of Federal funds sufficient to carry out measured implementing the national strategy. I would like to briefly address these measures.

First, we must have increased Federal scientific capacity to address wildlife adaptation to global warming. The scientific capacity of Federal agencies is woefully inadequate to address the magnitude of wildlife adaptation needs today. We must have a solid foundation of knowledge as well as a system of monitoring to determine changes in species' numbers and distribution or declines in ecosystem structure and function. Researchers can then propose new tools, practices and strategies to assist wildlife and habitat adaptation.

Building rigorous scientific inventory and monitoring programs within each Federal land management agency is also essential to manage wildlife in its habitat in a world undergoing continual change due to global warming. Congress recognized this urgent need by initiating through appropriations last year the establishment of a new National Global Warming and Wildlife Science Center within the U.S. Geological Survey. Once fully established and funded, this national interagency scientific support center will conduct research, develop monitoring protocols and models, and directly support land management and wildlife agencies in responding to global warming.

Second, a national strategy for addressing the impact of global warming on wildlife must be developed. This complex threat to wildlife requires strategic planning on a national scale to ensure common tools and approaches at Federal, state and local levels are coordinated and that funds provided for wildlife adaptation to global warming are spent strategically and effectively. State wildlife adaptation strategy should build on the great existing state wildlife action plans and they should be coordinated with the national strategy.

Third, Congress must increase appropriations for Federal, state and tribal conservation efforts and allocate substantial dedicated funding to address the immediate and severe harm global warming is causing to wildlife and natural resources. Because a responsible national response to climate change must both reduce greenhouse

gas emissions and address the impacts of global warming, a portion of the revenue generated from any cap-and-trade system for auctioning greenhouse gas emissions credits should be dedicated to programs to assist wildlife adaptation. In the long run this will benefit not only wildlife but people and communities which derive economic benefits and ecosystem services from conservation of wildlife and its habitat.

In conclusion, global warming truly is the conservation challenge of our time. The success of our efforts to conserve and recover fish, wildlife and other natural resources for future generations will depend on how well we respond to this challenge. We look forward to working with you to meet this challenge so that our children and our grandchildren will be able to enjoy the abundance, diversity and wonders of nature that we have enjoyed.

Thank you.

[The prepared statement of Ms. Rappaport Clark follows:]

**Statement of Jamie Rappaport Clark, Executive Vice President,
Defenders of Wildlife**

Madam Chairwoman and members of the subcommittee, I am Jamie Rappaport Clark, Executive Vice President of Defenders of Wildlife. Founded in 1947, Defenders of Wildlife has over 1 million members and supporters across the nation and is dedicated to the protection and restoration of wild animals and plants in their natural communities.

I want to thank you for holding this hearing on what Defenders believes is the most important conservation challenge we face today, the impact of global warming on wildlife. With the recent listing of polar bears as a threatened species, even the Bush administration has grudgingly and belatedly recognized the reality that wildlife and wildlife habitat are being harmed due to global warming. Unfortunately, the Bush administration is still trying to avoid actually doing anything to help polar bears or other wildlife survive the impacts of global warming. For that reason, I am pleased that this subcommittee has chosen a better path, focusing attention on the issue by holding a hearing last year, on April 17, 2007, on the impacts of global warming on wildlife and habitat, and, today, holding a hearing on the even more difficult question of what should be done to help wildlife survive global warming.

As you know, at the subcommittee's hearing in April 2007, Dr. Christopher Haney, Defenders of Wildlife's Chief Scientist, testified on the myriad impacts of global warming on America's fish, wildlife, and habitats. Rather than repeat what Dr. Haney said then, I will simply incorporate it by reference in my testimony today. I will focus my testimony today on what must be done by Congress and the Executive Branch to meet this critical conservation challenge.

Responding to Global Warming: A New Paradigm for Wildlife Conservation

Global warming increasingly will present unprecedented challenges to existing federal, state, tribal, local and private programs for conservation of wildlife, fish, plants and their habitats. Our system of conservation programs, ranging from land management and acquisition to regulatory and grant making programs, evolved with an assumption that the climate and the ways species and ecosystems functioned were relatively constant. Wildlife conservation efforts now must adopt a new paradigm, with new approaches and innovative strategies to manage the broader landscape, as well as wildlife populations, if we are to help species survive and adapt to these changes. Because impacts on wildlife and habitat from global warming already are here and will continue to grow, we must act boldly and immediately in order to help wildlife survive.

Our national approach to combating the impacts of global warming on wildlife must consist of two key approaches. First, we must take immediate steps to substantially reduce greenhouse gas emissions, to address the root cause behind climate change. Second, we must craft responses now to help wildlife navigate through a looming bottleneck of complex effects caused by global warming which are already occurring and will continue to occur for a century or more. These two approaches are usually referred to as mitigation and adaptation. Both approaches are absolutely essential for our nation to frame its policy response as we build a comprehensive

strategy to protect fish, wildlife, and other natural resources. Some ways to address wildlife adaptation are suggested in the following pages of my testimony.

1. A Coordinated, Interagency Response is Essential for Wildlife Adaptation

The effects of global warming on wildlife, fish, plants and associated ecological processes will challenge current institutional structures and policies because these effects will occur at large scales and across jurisdictional boundaries. Global warming will literally “shuffle the deck” of existing ecosystems, reordering the assemblages of wildlife and habitats that comprise ecosystems. Species that exist together now will not necessarily do so in the future as habitats change in response to global warming and species move or become extinct in response to those habitat changes. The location of some crucial fish and wildlife habitats will likely shift over time in ways that are not currently predictable and opportunities to maintain these habitats may decline. Landscape scale planning, timely action and future human adaptation to changing patterns of wildlife and fisheries use will be increasingly important to protect crucial habitats and to prevent foreclosing options to conserve habitats that may become crucial.

Climate change is, and will continue to have profound impacts on how wildlife managers at the state and federal levels manage our nation’s wildlife populations. However, federal agencies have been slow to include climate change’s impacts in their management planning and decision-making. A report released in September 2007 by the Government Accountability Office, *Climate Change: Agencies Should Develop Guidance for Addressing the Effects on Federal Land and Water Resources*, found that federal land and wildlife management agencies currently lack the capacity and guidance to effectively respond to the impacts of global warming on our federal lands and wildlife. There is, thus, an urgent need to guide agencies’ efforts through the development of climate change adaptation strategies at the federal and state levels and to provide significant resources to implement these strategies.

Many federal programs currently exist to protect and restore fish and wildlife habitat. These programs are not primarily designed to address the challenges posed by global warming; however, they are essential tools that need to be used more effectively to minimize and offset future impacts of global warming on wildlife and habitats. Federal land management agencies must make greater use of their existing authorities to address the wildlife impacts of global warming, and they must be given additional direction to consider these impacts in program planning, land and water management, and environmental analysis pursuant to the National Environmental Policy Act, the Endangered Species Act, the National Forest Management Act, the Federal Land Policy and Management Act, the National Wildlife Refuge System Improvement Act, the National Park Service Organic Act, and other relevant laws. Though the brunt of some global warming impacts may not be fully felt for a number of years, planning to address and ameliorate those impacts on wildlife and wildlife habitat must begin now.

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

An effective response to the impact of global warming on wildlife requires the kind of measures set forth in the Global Warming and Wildlife Survival Act, introduced as H.R. 2338 by Representatives Dicks, Inslee and Saxton and as S. 2204 by Senators Whitehouse and Boxer. The provisions of H.R. 2338 were included in Title IV of H.R. 2337, the Energy Policy Reform and Revitalization Act, introduced by Chairman Rahall, and passed by the House in July 2007 as Title VII of H.R. 3221, the comprehensive energy bill. Though subsequently dropped from the energy bill in conference with the Senate, the principal provisions of the Global Warming Wildlife Survival Act and the robust funding needed for implementation were also included in S. 3306, the Boxer-Lieberman-Warner Climate Security Act recently debated in the Senate. Additionally, recently introduced climate change legislation in the House—Representative Doggett’s Climate MATTERS Act (H.R. 6316) and Representative Markey’s iCAP bill (H.R. 6186) incorporate the Survival Act’s policy foundation and dedicate funding to address climate change’s impacts on wildlife and its habitat. However, Defenders believes the iCAP bill does not provide a sufficient level of investment to soundly implement these provisions. Nevertheless, the similarity of the policy prescriptions contained in these many bills indicates the strong policy consensus emerging on this subject.

The Global Warming Wildlife Survival Act provides for dramatically enhanced scientific capacity, a coordinated national strategy to ensure that wildlife impacts spanning government jurisdictions are effectively addressed, and a commitment of federal funds sufficient to carry out measures implementing the national strategy by federal, state, and tribal authorities. I will address below the need for, and purpose of, each of these measures.

A. Enhanced scientific capacity is essential.

The scientific capacity of federal agencies is, at present, woefully inadequate to address the magnitude of wildlife adaptation needs, due, in part, to the unprecedented nature of the global warming challenge and, unfortunately, to short-sighted cuts in science budgets and staffing. Effectively assisting wildlife adaptation in a changing climate requires first and foremost that adequate species and habitat data are available and that we understand the fundamental ecosystem processes that occur on the landscape.

From a research and management perspective, the way forward must be built upon a solid foundation of species and ecosystem inventories, as well as a system of monitoring to determine changes in species numbers or distribution, or declines of ecosystem structure and function. The coverage of biological inventories across federal, state and private lands is insufficient in many areas, but it provides a baseline to build upon.

Inventory and trends analyses generated through a comprehensive monitoring program can be applied to analytical and predictive models. Based on trends and predictions, federal and collaborative researchers can then propose new tools, practices, and strategies on a limited pilot or experimental basis to help identify promising approaches to assisting wildlife and habitat adaptation to global warming. In addition, building rigorous scientific inventory and monitoring programs within each federal land management agency to evaluate the effects of management decisions and to adapt management responses accordingly is essential to successful management of wildlife and its habitat in a world undergoing continual change due to global warming.

Last year, Congress recognized this urgent need for enhanced and coordinated scientific capacity to assist in addressing the impacts of global warming on wildlife and in developing effective measures to respond to those impacts by initiating, through appropriations, establishment of a new National Global Warming and Wildlife Science Center within the U.S. Geological Survey. Once fully established and funded, this national, interagency global warming scientific support center will conduct research, develop monitoring protocols and downscale models, and directly support federal land management and wildlife agencies in responding to global warming. The National Global Warming and Wildlife Science Center is to be responsive to the research needs of federal and state agencies in conducting 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 global warming impacts. A key function of the Science Center, integrated with climate change research programs throughout the federal government, is the detection of changes in wildlife abundance, distribution, and behavior related to global warming.

The Science Center will play a pivotal role in many wildlife adaptation responses to global warming that have been identified by the scientific community, including the protection and restoration of habitat corridors to assist species in shifting their ranges and the protection of climate “refugia,” areas that are not as vulnerable to the effects of a changing climate and are better able to preserve biodiversity in the face of climate change. Implementation of these and other strategies will require the assistance and direction of the Science Center in collecting and integrating many types of data, such as current native species distributions, behavior, and habitat requirements, regional estimates of how the climate will change, as well as estimates of how native species and habitats will respond to changing climate. The Science Center also will assist in development of downscaled climate-change projections—critical for land managers’ decision making—that will be needed to predict shifts in vegetation and individual plant and animal species distributions in response to global warming.

B. A national strategy for wildlife adaptation to global warming must be developed.

A national strategy for addressing the impact of global warming on wildlife must be developed, with the express purpose of helping wildlife navigate the bottleneck of global warming impacts over the next century and beyond, until the benefits of reducing greenhouse gas pollution and, consequently, global warming, are fully realized. The complex threat to wildlife from global warming requires strategic planning at a large scale. It makes little sense for each coastal national wildlife refuge or na-

tional park or state wildlife area, for instance, to develop in isolation its own strategies for assessing and adapting to rising sea levels. Instead, it would be much more effective and efficient to assemble a framework that considers the national picture of our changing climate, to ensure common tools and approaches at state and local levels are coordinated and meaningful and to ensure that funds provided for wildlife adaptation to global warming are spent strategically and effectively. An interagency national strategy for assisting wildlife in adapting to global warming will deliver this coordination.

This national strategy should examine management issues common to geographic areas and threat type (e.g. coastal habitats, sea level rise, increased hurricane frequency and intensity; arctic habitats, melting pack ice; desert habitats, shifts in precipitation patterns). It should ensure that federal agencies develop and implement plans to reduce the impact of global warming on wildlife and habitat by including prioritized goals and measures to—

- Identify and monitor wildlife populations likely to be adversely affected by global warming;
- Identify and monitor coastal, marine, terrestrial, and freshwater resources and habitat at greatest risk of being damaged by global warming;
- Assist species in adapting to the impacts of global warming;
- Protect, acquire, and restore wildlife habitat to build resilience to global warming;
- Provide habitat linkages and corridors to facilitate wildlife movements in response to global warming;
- Restore and protect ecological processes that sustain wildlife populations vulnerable to global warming; and
- Incorporate consideration of climate change wildlife adaptation strategies into the planning and management of Federal lands and waters.

State wildlife adaptation strategies are also needed. Every state has already completed a wildlife action plan, which identifies at-risk habitats and species that need special conservation attention. State wildlife adaptation strategies should build on, and be incorporated into, those set forth in state wildlife action plans to address global warming impacts on wildlife, and they should be coordinated with the national strategy. Individual federal and state agencies and land management units could then coordinate their management activities with these national and state strategies.

Coordination among federal, state, and tribal natural resource agencies is essential in planning and carrying out strategic, watershed and landscape scale adaptation activities to maintain or re-establish connectivity. Wildlife adaptation activities should be conducted in accordance with the national strategy, state adaptation strategies and wildlife action plans, and other fish and wildlife conservation strategies, including the National Fish Habitat Action Plan, the North American Wetlands Conservation Act, Partners in Flight plans, coastal zone management plans, regional fishery management plans, and recovery plans for threatened and endangered species.

C. Adequate funding to address global warming's impacts on wildlife must be provided.

Development and implementation of a national strategy to address global warming's impacts on wildlife, providing the necessary science to underpin that strategy, and taking action to reduce other stressors on wildlife will require substantially more money than is currently provided for natural resources conservation. With many of the federal land management agencies already facing a fiscal crisis, Congress must increase appropriations for federal, state, and tribal conservation efforts, and allocate substantial dedicated funding from the sale of greenhouse gas pollution allowances to federal, state, and tribal conservation agencies, in order to meet the challenge posed by global warming.

The U.S. Fish and Wildlife Service (FWS) has lost nearly 800 staff from 2004-2007, an 8 percent reduction. Another 250 staff may be cut from the Refuge System alone in the next few years if substantial increases in funding are not available. Many wildlife refuge biological programs have been reduced or cut altogether, staff has been eliminated from entire refuges, and over 200 refuges have no biologists on staff.

The National Forest System has lost 35 percent of its staff, including a 44 percent reduction in inventory and monitoring staff and a 39 percent reduction in biologists and biological technicians. Almost half of the Forest Service's budget is now consumed by wildfire costs, which will only be exacerbated by global warming. Restoring forests ecosystems to reduce fuel loads will be increasingly important to protect wildlife habitat and human communities. However, the Forest Service estimates

that 132 million acres of national forests alone are in need of restoration, at a cost of billions of dollars.

A 2000 report estimated that the cost to acquire inholdings in national parks, wildlife refuges, and other public lands was \$10 billion. Since then, national real estate values have climbed 72 percent. Climate change will require additional land protection efforts, including partnering with private landowners on term easements and leases outside existing federal lands boundaries and will cost billions of dollars.

As Congress develops legislation to cap greenhouse gas emissions, it is likely to create a system of emissions credits that can be traded. In the process, there is an opportunity to auction these credits, producing substantial revenue for the federal Treasury. Because a responsible national response to climate change must both reduce greenhouse gas emissions and address the impacts of global warming, a portion of the revenue generated from the auction of emissions credits should be dedicated to federal, state, and tribal programs to assist wildlife adaptation to global warming. In the long run, this will benefit not only wildlife, but also people and communities which derive economic benefits and ecosystem services from conservation of wildlife and its habitat. Special emphasis should be given to providing funding to address federal responsibilities for wildlife and land conservation in the face of global warming. In the absence of a new revenue source, however, Congress should increase appropriations to agencies to address the threats of global warming to wildlife and habitat.

2. Federal Agencies Can Act Now to Address Wildlife Adaptation to Global Warming

Even while Congress works toward enactment of comprehensive global warming legislation, including enactment of the measures contained in the Global Warming Wildlife Survival Act, there is much that federal agencies can and should be doing using their existing authorities to address wildlife adaptation to global warming. As many businesses are now doing, federal agencies should conduct a top to bottom assessment of federal resources at risk of adverse impacts from global warming. Agencies should use this assessment to establish priorities for maintaining their mission and protecting federal assets. While much is still unknown, there are still concrete actions each agency can take.

The assessment of risks and potential conservation problems is already generally required of each federal land management agency in developing land use plans, and agencies should begin addressing the risks of global warming in those plans now. Unfortunately, few federal land units, including national wildlife refuges, are addressing this serious issue. For example, national wildlife refuges are currently developing comprehensive conservation plans (CCPs). Defenders of Wildlife conducted exhaustive, site-specific scientific literature reviews of the impacts of global warming on wildlife and habitat on and surrounding particular national wildlife refuges developing CCPs. Defenders synthesized this information for FWS and developed recommendations for each of these refuges to address the impacts of global warming in their CCPs.

One of the refuges Defenders addressed, the Merritt Island National Wildlife Refuge in Florida, is one of the few refuges with a draft CCP that mentions climate change and associated impacts. The refuge is an overlay with NASA's Kennedy Space Center and protects low-lying coastal marshes as well as beach property. Yet the threat of global warming is given only scant treatment in the plan. The CCP states briefly that sea level rise could negatively impact the refuge with increased flooding, beach and dune habitat loss, saltwater intrusion into freshwater habitats, and inundation and accretion deficit, as well as exacerbate erosion and transform upland areas into coastal wetlands and high marsh into low marsh. Yet, the CCP proposes no actions to address this threat. The CCP does not recognize other impacts of global warming beyond sea level rise including the spread of invasive species, the range shift of terrestrial habitats, the increased risk of red tide algal blooms, and the risks of increased temperatures on the breeding success of endangered sea turtles and other reptiles.

As an example of the types of activities and strategies that individual land units should now be including in their land management plans, Defenders provided the following recommendations regarding the land management plan for Merritt Island Refuge:

- The impacts of global warming on the refuge's wildlife and habitat must be included throughout the land management plan.
- The FWS should consider the present and future impacts of global warming when developing objectives and management actions in the land management plan. In the face of uncertainty, the FWS should build natural resilience to

global warming by focusing resources to reduce non-climate related ecological threats.

- FWS should convene a panel of experts to assist Merritt Island NWR and other coastal refuges in developing adaptation strategies for coastal marshes and other habitats.
- FWS should establish a sea turtle monitoring and research network with other Atlantic coast refuges and other agencies to detect population changes associated with global warming.
- The FWS land management plan for the refuge should include comprehensive research on, and monitoring of, the impacts of global warming and their relation to non-climatic stressors to ecological systems and management actions, including:
 - Upland habitat shifts
 - Changes in fire regime
 - How fresh and saltwater marshes respond to global warming
 - Changes in seagrass habitat and the relationship to manatee populations
 - How southeastern beach mouse responds to sea level rise
 - Changes in the timing of ecological events, including horseshoe crab spawning and shorebird migration.
- Global warming should be incorporated into refuge infrastructure design and planning.
- Global warming should be incorporated into the refuge's environmental education and interpretation programs.

While these and similar measures are examples of steps national wildlife refuges and other federal land management agencies can take under existing law to address wildlife adaptation to global warming, they are not enough. As set forth in the Global Warming Wildlife Survival Act, a coordinated national strategy among federal, state, and tribal conservation agencies; expanded, coordinated science capacity at the federal level; and adequate dedicated funding for federal, state, and tribal measures to assist wildlife adaptation to global warming are critically important.

Conclusion

Global warming is the conservation challenge of our time. The success of our efforts to conserve and recover fish, wildlife, and other natural resources for future generations of American citizens will depend on how well we respond to this challenge. We must act immediately to substantially reduce greenhouse gas emissions to halt and eventually reverse the changes we are causing to our planet from global warming. At the same time, we must take immediate steps as set forth in the Global Warming Wildlife Survival Act and which I have outlined here today in order to assist wildlife to survive the now unavoidable impacts of global warming.

Madame Chairwoman and members of the subcommittee, on behalf of Defenders of Wildlife, thank you for the opportunity to share our perspective on this critical issue. We look forward to working with you to meet the challenge of reducing global warming's impact on wildlife and wildlife habitat so that our children and grandchildren will be able to enjoy the abundance, diversity, and wonders of nature that we have enjoyed.

Ms. BORDALLO. Thank you very much, Ms. Clark, for your testimony.

Now I would like to recognize Dr. Moritz to testify for five minutes.

STATEMENT OF WILLIAM MORITZ, PH.D., DIRECTOR OF CONSERVATION, SAFARI CLUB INTERNATIONAL FOUNDATION, ACTING DIRECTOR OF GOVERNMENTAL AFFAIRS, SAFARI CLUB INTERNATIONAL

Mr. MORITZ. Good morning. Thank you for the opportunity to testify today on behalf of Safari Club International and Safari Club International Foundation. Safari Club protects the freedom to hunt and promotes wildlife conservation worldwide. And Safari Club International Foundation funds and manages worldwide programs dedicated to wildlife conservation, outdoor education, and humanitarian services.

The most important point that we would like to make today is that wildlife and their habitats are critically important considerations in a discussion of potential implications of climate change, as many of the other speakers have noted. Although Congress has learned the difficulty of finding common ground in the climate change debate, we believe that most citizens would agree that the fish and wildlife resources are vital to the health and well-being of the Nation and the world. The needs of the world's fish and wildlife should be considered when determining policy direction.

Emotions have run high when discussing the potential impacts of climate change. We encourage Congress to use science rather than emotion in developing policies to respond to climate change questions and to create appropriate funding mechanisms to ensure researchers are able to address critical gaps in our current understanding of the possible impacts of climate change on fish and wildlife.

Since our understanding of climate change relies heavily on scientific modeling, SCI and SCIF recommend that adequate time and resources be allowed to enhance climate change models to minimize the amount of uncertainty that is associated with the input variables and the predictions that come forth.

The hunting community has always been and will continue to be an integral part of wildlife conservation, nationally and worldwide. Sport hunters have a long and proud tradition of supporting wildlife conservation, including the enforcement of hunting seasons and quotas for harvest. Through the Pittman-Robertson Act in the United States, revenue from hunting licenses and Federal excise taxes on equipment paid by hunters have been distributed to all 50 states for more than 70 years. Funds used by the states for matching grants under Pittman-Robertson are largely funded by license fees. However, support from the broader public community will be needed to adequately manage the potential impacts of climate change and ensure states have the necessary resources to monitor and manage fish and wildlife.

Although there is no analogue to the Pittman-Robertson program in any other country, the money spent by sport hunters goes to provide operating funds for wildlife agencies in many countries. Perhaps more importantly, the benefits of sport hunting that flow to local people provide incentives for them to value wildlife and to help sustain wildlife populations. These benefits include: jobs, direct payments to villages, the provision of funds from hunting for civic projects in rural villages, and the provision of meat from game animals. As human populations increase and more pressure is placed on wild lands from a variety of sources, it will be critical to emphasize the value of wild lands and wildlife when compared to alternative land uses. Whether future impacts are caused by climate change or other stressors, sport hunting will continue to advance sound conservation measures in countries around the world.

In recognition of the role of sport hunting in wildlife conservation, Safari Club International Foundation was recently granted non-government observer status by the U.N. and by the United National Economic and Social Council. We also participate in the deliberations on CITES, as well as the Convention on Biological Diversity.

Let me end by reiterating our main points: wildlife and wildlife habitats are essential components in the debate about climate change policy. Hunters will promote science-based conservation program that ensures wildlife populations are sustained for future generations. Climate change policy needs to be based on sound science. And funding for conservation that has historically come from hunters will need to be enhanced by broader support in order to ensure fish and wildlife populations are sustained.

SCI and SCIF, in partnership with the hunting community, thank you for the opportunity to contribute to this important conversation.

[The prepared statement of Mr. Moritz follows:]

Statement of Dr. William Moritz, Director of Conservation, Safari Club International Foundation, and Acting Director of Governmental Affairs, Safari Club International

Key points:

1. Wildlife and wildlife habitat are essential components in the debate about Climate Change policy.
2. Hunters will be part of the solution.
3. Climate Change policy needs to be based on sound science.
4. Funding for conservation has historically come from hunters but more support is needed to ensure fish and wildlife populations are sustained.

Good morning. My name is Dr. William Moritz, Director of Conservation for Safari Club International Foundation (SCIF) and acting Director of Governmental Affairs for Safari Club International (SCI). SCI protects the freedom to hunt and promotes wildlife conservation worldwide. SCIF funds and manages worldwide programs dedicated to wildlife conservation, outdoor education and humanitarian services. Thank you for allowing me to testify today on their behalf.

Mr. Chairman, the most important point that we would like to make to the Committee is that wildlife and their habitats are critically important considerations in the discussion of potential implications of climate change. Although Congress has learned the difficulty of finding common ground in the climate change debate, we believe that most citizens would agree that fish and wildlife resources are vital to the health and wellbeing of the nation and the world. The needs of the world's fish and wildlife should be considered when determining policy direction.

Emotions have run high when discussing the potential impacts of climate change. We encourage Congress to use science rather than emotion in developing policies to respond to climate change questions, and to create appropriate funding mechanisms to ensure researchers are able to address critical gaps in our current understanding of the possible impacts of climate change on fish and wildlife. Since our understanding of climate change relies heavily on scientific modeling, SCI and SCIF recommend that adequate time and resources be allowed to enhance climate change models to minimize the amount of uncertainty that is associated with the predictions and input variables.

The hunting community has always been and will continue to be an integral part of wildlife conservation, nationally and worldwide. Sport hunters have a long and proud tradition of supporting wildlife conservation, including the enforcement of hunting seasons and quotas for harvest. Through the Pittman-Robertson Act in the United States, revenue from hunting licenses and federal excise taxes on equipment paid by hunters have been distributed to all fifty states for more than seventy years. Funds used by the states for matching grants under Pittman-Robertson are largely funded by license fees. However, support from the broader public community will be needed to adequately manage the potential impacts of climate change and to ensure states have the necessary resources to monitor and manage fish and wildlife.

Although there is no analogue to the Pittman-Robertson program in any other country, the money spent by sport hunters goes to provide operating funds for wildlife agencies in many countries. Perhaps more importantly, the benefits of sport hunting that flow to local people provide incentives for them to value wildlife and to help sustain wildlife populations. These benefits include: jobs, direct payments to villages, the provision of funds from hunting for civic projects in rural villages, and the provision of meat from game animals. As human populations increase and more pressure is placed on wild lands from a variety of sources, it will be critical to emphasize the value of wild lands and wildlife when compared to alternative land uses.

Whether future impacts are caused by climate change or other stressors, sport hunting will continue to advance sound conservation measures in countries around the world.

In recognition of the important role of sport hunting in wildlife conservation, Safari Club International Foundation was recently granted non-government observer status by the United Nations and the United Nations Economic and Social Council (ECOSOC). SCIF also participates in the deliberations of the CITES treaty on wildlife trade and the Convention on Biological Diversity.

Let me end by reiterating our main points: Wildlife and wildlife habitats are essential components in the debate about Climate Change policy. Some groups will try to convince you that hunting will exacerbate the problems of climate change. But the truth is that hunters will promote science based conservation programs that ensure wildlife populations are sustained for future generations. Climate Change policy needs to be based on sound science. Funding for conservation has historically come from hunters, and we will continue to contribute, but more support is needed to ensure fish and wildlife populations are sustained.

SCI and SCIF, in partnership with the hunting community, thank you for the opportunity to contribute to this important conversation.

Ms. BORDALLO. Thank you very much, Dr. Moritz, for appearing here today and offering your testimony and your insights.

At this time as Chairwoman I would like to recognize our Ranking Member, the Acting Ranking Member Mr. Wittman who would have questions I am sure for this panel. And if you do have questions for the first panel I would like to—do you have some for the first panel?

Mr. WITTMAN. Yes.

Ms. BORDALLO. Yes. Would the, Megan, would you see that the first panel people are placed around the table. There are a couple of chairs there. We just need one more chair. Unless you can sit on each other's lap.

All right, please proceed, Mr. Wittman.

Mr. WITTMAN. Thank you, Madam Chairwoman.

A question for Mrs. Davidson. You had given quite an extensive overview about the potential impacts of climate change. In that assessment is there going to be an effort to try to estimate the cost of these adaptation strategies? And also, looking at also what the impact is on the value that we place in our fish and wildlife populations, and obviously they are in a lot of different levels of value, but in other words to try to look at what those costs are versus the value?

Ms. DAVIDSON. I believe you actually asked three different questions, Congressman. On the value of our fish and wildlife populations, at least the coastal component of that, I do believe that there are some efforts underway to do that on a more comprehensive basis. We usually tend to do that almost on a species by species basis.

And I would submit that actually I would need to get with my colleagues at this table and elsewhere to address that question. We have, NOAA funded something called the National Ocean Economics Program for the last five years but it does not focus on the fish and wildlife so much as the 2-legged critter side of coastal ecosystems.

On your second question you asked about the cost of implementation. While you were out of the room making the vote we discussed actually at my panel the importance of the 3-prong strategy: the science, the development of the strategic plans, and then getting to

the action. And we do not yet have an idea of the cost of action because we do not yet have at all levels of government comprehensive strategies. It is in the developing of those strategy plans at all levels of government that we could actually begin to have an idea of what the actual costs of action or implementation might be.

I do know in a recent informal conference call in which we discussed the importance of quantifying these issues we did talk about we thought at least from a coastal perspective entirely, developing coastal adaptation plans that we were probably back of the envelope talking about something on the order about \$60 to \$70 million just to develop the basic frameworks. And again, the cost of actually implementing that would depend upon the content of those plans.

But if you were to give the Feds \$60 million I think we could get on that comprehensive adaptation planning process right away.

Mr. WITTMAN. Would that be \$60 million to NOAA or \$60 million to the agencies across the board?

Ms. DAVIDSON. Well, I am afraid it was kind of a NOAA-centric conversation.

Mr. WITTMAN. I just wanted to make sure I was clear.

Ms. DAVIDSON. No, I think it is an important question to ask. And one that I think that the interagency community should actually take up as soon as possible.

Mr. WITTMAN. Let us say in a perfect world that \$60 million were available do you know the time frame in which you could put together this implementation strategy or when that would be ready for you to, or if you were to have the dollars how long would it take you from that point to have an implementation strategy that you would be ready to go ahead and place some costs around to recommend what should be done?

Ms. DAVIDSON. Well, let me say, as you know from working on the committee, the more people you have around the table the more complex it is to come to a resolution. But we do have some good examples on the ground, both Fed, state and local examples. So I am just going to take a flyer on this. If the money were there I think we could probably see a comprehensive coastal strategy, now again speaking just from a coastal management standpoint, I think we could probably do that within a matter of a few years. By a few years I mean less than five.

Now, getting from the planning process to making things happen, getting folks to relocate physical infrastructure, getting people to strategically acquire and create habitat in areas where we will need them in a few decades, that could take a little bit longer. And I would at least have to discuss with Mr. Ashe in order to discuss how we could bring together, for instance, the Community Restoration Programs of Interior and NOAA to work in a more strategic way.

Mr. WITTMAN. Thank you.

Mr. Whitehurst, if you could talk a little bit about what you think the level of Federal assistance that is necessary to assist states that have primary responsibility over all resident wildlife, if you could give us an idea about what level of assistance you believe that you would need in order to make sure that that responsibility

is fulfilled over all resident wildlife in relation to coping with climate change and adaptation?

Mr. WHITEHURST. Congressman Wittman, that is a very good question. I think the first and most important thing that Congress, the direction that Congress needs to provide is to direct that a national adaptation strategy be developed. That is critical. And I use as a parallel, but on much less challenging terms, was the state wildlife action plans. Congress gave the states direction to develop those action plans. They gave us three years to do it. It took every bit of three years to do it. It was quite a challenge but it was led by a very successful collaborative effort between the U.S. Fish and Wildlife Service and the state wildlife agencies.

Something, that type of approach is needed for this issue but it is much, much larger than anything that we have ever looked at before. So I think that is the direction that we need.

Another observation is, you know, now we are in the stage of trying to implement these wildlife action plans, and while we have had great reaction from the Federal agencies, including a very strong endorsement from the Director of the Fish and Wildlife Service, it is very interesting to see, you know, while the agencies are turning toward these plans they are not turning fast enough. As Mr. Brunello said earlier, everybody goes back to their stovepipe. So we really need to have an adaptation policy strategy that cuts across all different aspects of Federal Government and state government because we need to focus in a way that we have never focused before. And, you know, the Federal Government is a large ship to turn, and 50 states and six territories also a large ship to turn.

So we have to turn together and provide the focus that we have not done before. We were facing a crisis in wildlife before we recognized climate change. That crisis is much more challenging now. And we need to have leadership that we had with President Roosevelt, Gifford Pinchot and those at the turn of the last century to meet this challenge.

Mr. WITTMAN. Thank you. An additional question.

The Virginia Wildlife Action Plan that you had mentioned identifies 900 species in need of increased conservation efforts. Can you tell us how many of these species are imperiled by climate change and what other factors are threatening these species in addition to or exacerbated by climate change?

Mr. WHITEHURST. Well, climate change is affecting most or all these species in one way or another. However, the primary stressors for most of them are habitat loss, habitat fragmentation, and degradation of habitat through pollution, through introduction of non-native species. So that is really what we are facing. You know, while we are growing at exponential rates in terms of population we have been using the land at a much faster rate than population growth. And we just really need to look at our consumption land and we need to develop new land use policies that will help us manage for these habitat needs.

And I think that is one point that we need to understand, we have to have the localities at the table, at attention and helping with this because, as you know, Congressman Wittman, most land

use decisions are made at the local level. And we will need to have some new land use planning to address this problem.

Mr. WITTMAN. You had spoken about non-native species and I just wanted to get your estimation about how you believe warmer temperatures affect the spread of non-native or invasive species?

Mr. WHITEHURST. Well, you have quite an effect. You are seeing across Virginia and with Zebra mussels which we did successfully eradicate, snakehead fish. We are looking to see alligators get to our southern border before long, armadillos, probably fire ants. We have now got didymo, which is actually a cooler water species. But we are facing tremendous challenges from invasive species. But we are facing tremendous challenges from invasive species. And as climates warm these species have advantage, competitive advantage; as native species are stressed out and declining it creates an avenue for invasive species to attack, so to speak, and they do. And we need to look very seriously at tightening our controls on the transport of non-native invasive species into this country and across state borders.

Mr. WITTMAN. Thank you.

A question for Ms. Chasis. By the year 2012, China and India will build some 800 new coal-fired power plants that will emit approximately 2.5 billion tons of carbon dioxide into the atmosphere. What is the likely impact of these plants on fish and wildlife species residing in the U.S.? And how should the international community respond to this issue? I am sorry, Chasis.

Ms. CHASIS. Chasis. That is OK.

Mr. WITTMAN. My apologies.

Ms. CHASIS. Thank you very much, Congressman.

I do not know that I am really in a position to answer that in full detail. I can certainly consult with my colleagues on that. But I do know that what happens in China and India has tremendous impacts on the resources in this country. I mean, a lot of the climate change impacts that California, for example, is experiencing are directly attributable to what is going on in China. And actually, our organization has an office in Beijing which we opened two years ago for the very purpose of providing technical assistance and advice to the Chinese government to help in the reduction of greenhouse gases in that country and to import some of the lessons learned in this country about energy efficiency and the promotion of renewables and try to encourage the promulgation of policies there to that end.

But internationally certainly in terms of our oceans, you know, we already, as you know, are seeing tremendously stressed ocean fish populations as a result of a variety of factors: over-exploitation, habitat degradation, pollution from land-based sources principally. And our firm belief is that if these stressed, already stressed populations are going to be able to handle the increased impacts of climate change and ocean acidification which is a very serious problem, we need to really promote the resilience and restoration of those.

And while you were out taking a vote, I pointed to the legislation that this Subcommittee reported out, Oceans 21, as an important step in the direction of promoting the resilience and health of ocean systems. So I think that is one very important step that this com-

mittee could take to help fish and wildlife populations deal with the impacts of climate change and ocean acidification.

Mr. WITTMAN. Thank you, Ms. Chasis.

Mr. Ashe, when developing comprehensive conservation plans are national wildlife refuges considering the potential impact of climate change? And if so, what are some of the things that they have in mind in order to, again, develop these adaptive management strategies?

Mr. ASHE. I think that I will maybe lean on David Whitehurst's response to say that as managers are developing comprehensive conservation plans for our national wildlife refuges they are considering a variety of factors that are driving wildlife population response. And for the most part those are things that we, that like habitat fragmentation, like pollution, like invasive species. And climate change is certainly an emerging factor that managers are considering.

The managers that are now in the midst of completing comprehensive conservation management plans, for instance on the Upper Mississippi River, have been working on those for probably four, three to four to five years in duration. So would I say that they have adequately, you know, considered climate change in the context of those plans based on what we know today? No, I do not believe they have.

Are they taking steps to consider and deal with climate change more effectively today than they were three or four or five years ago? I think, yes, they are by looking at things like sea level rise, by beginning to think about at least what we know at the broad scale in terms of temperature and precipitation change. And managers like Mendel Stewart at San Francisco Bay National Wildlife Refuge are thinking about climate change as they plan large scale restoration projects.

So there is a direction of change that is occurring with the organization. If we look at comprehensive conservation management plans that had been developed over the last ten years since the Refuge Improvement Act was passed, I would say most of those do not address a changing climate. But that in itself is changing now.

Mr. WITTMAN. Ms. Clark, I would like to ask if you could give us maybe your perspective on that question and how the development of those conservation plans have an impact and what your thought is on that?

Ms. RAPPAPORT CLARK. Sure. Thank you, Mr. Wittman.

I would in essence agree with Dan generally. When I was at the Service not that long ago—seems like a long time ago, but not that long ago—we were dealing, we were confronting, you know, serious and complex challenges to wildlife in this country that extended beyond refuge boundaries, working with the states to deal with issues like habitat, invasive species, pollution, water shortage. And while, you know, climate change was in our rear-view mirror it certainly did not have the visibility and the recognition of its impact that it is now rightfully enjoying today.

So the plans that came into being post-Refuge Improvement Act really did not consider that. And the ones in the pipeline are not considering it to the degree they need to. The development of comprehensive conservation plans for refuges also need to be better in-

tegrated with the work being done by the states, the state wildlife action plans, and the planning work that is being done by the Forest Service and the Park Service. And so because wildlife certainly do not recognize borders, as a Federal government the challenge of integrating the land planning work of the different agencies in concert with the state action plans and Indian Country, frankly, is extremely critical.

But I think Dan very tactfully acknowledged that the refuge system plans have a long way to go. Which needs, frankly, I think a lot of the challenge, I mean the folks in the Fish and Wildlife Service are working and doing the best they can with incredibly limited resources. And the budget cuts over the past few years and the reduction and compromise to their scientific capacity I think has really challenged their ability to do what they know they have to do.

Mr. WITTMAN. Thank you.

Dr. Moritz, wildlife has been adapting to various climate changes for millions of years. And can you tell us a little bit about what your perspective is about today's wildlife that may in any way impact its ability to adapt to changes in temperature that we are seeing today or, actually, the increases in temperature that we are seeing today?

Mr. MORITZ. Well, there will be many species that have enough mobility in order to adjust their distributions if indeed their habitat types shift as well. The question will be primarily on the sufficiency of those habitats as they move up, down or north and south, depending on where you are at. There has been a fair amount of concern that that ability of the species themselves to adjust will not be sufficient. So that really complicates the issues of the borders of Federal property or states' properties on whether or not they are large enough to maintain the habitat types that will be used by these species.

It really brings to the point something that I have not heard mentioned yet, and that is that much of the land in the United States is in private ownership. And those individuals, individual private owners will need to be involved in this conversation to a large extent because a great deal of wildlife is on that private land. There are plenty of incentive programs in a variety of places for private landowners. I will just use the conservation title of the Farm Bill as one example. The state wildlife action plans are another place where there is tremendous opportunity with partnerships on private landowners.

But because of the concerns with shifting distribution of habitat types we need to make sure those folks are involved.

Mr. WITTMAN. Thank you, Madam Chairwoman, that is all the questions I have at this time.

Ms. BORDALLO. I thank the gentleman from Virginia, Mr. Wittman. And I do have just a couple of questions before we go on with the third panel. Mr. Ashe, I recognize that you are with the Service and not the department, but perhaps you could help me with a matter very relevant to today's hearing.

In February, Deputy Scarlett advised the committee that the department had convened three working groups which prepared recommendations on steps the Department of Interior could take to prepare for and address climate change. Notwithstanding promises

from the Deputy Secretary, these reports still have not been posted on the department's website nor will they share them with GAO. Do you know when they will be available? And more importantly, do you know when these recommendations will actually be incorporated into the Department of Interior planning efforts?

Mr. ASHE. Chairman Bordallo, I would say first I would want to take just a moment to commend Deputy Scarlett, Deputy Secretary Lynn Scarlett for her leadership in convening the Department of the Interior Task Force on Climate Change. And I was a member of the DOI Task Force and I sat on one of the three subcommittees. The subcommittees were Legal and Policy, Land and Water Manager, and Science. And I sat on the Science Subcommittee along with a number of colleagues. And I would say that each of the subcommittees has submitted a report separately and those three reports are now with the Steering Committee which consists of bureau directors and assistant secretaries.

And so that is where the reports are at this point in time. I do not know when they—

Ms. BORDALLO. Mr. Ashe, do you have any idea when we will be able to see the reports?

Mr. ASHE. I do not, Chairman Bordallo.

Ms. BORDALLO. My next question then is to Mr. Whitehurst. You specifically mentioned the strong state/Federal partnership that resulted in the development of the state wildlife action plans and your belief that the wildlife action plans should be used as a framework for integrating climate change into wildlife management and planning, saying that it would be the most cost effective and efficient mechanism. Can you talk more about why you think this is the best approach?

Mr. WHITEHURST. I think for the first time ever all 50 states and the territories have a blueprint for what we need to do for wildlife management. As stated earlier, climate change is in many ways an exacerbator to many of the stresses that are currently being placed on wildlife. Those plans do require us to identify threats and to develop actions to address those threats, to monitor and to adapt over periods of time. Those are the same processes that we need to use in any type of strategy to deal with climate change.

So I think it is a very good framework. There is nothing like it in the history of wildlife management to my knowledge. So I think it does serve as a wonderful body of knowledge that can be used to address probably the greatest challenge that we have seen to wildlife in history.

Ms. BORDALLO. Thank you very much, sir, for that comment.

And I do want to commend members of the panel, you know, when they say states and territories. That pleases me because in many instances we are not mentioned.

My third question is to you, Mr. Ashe—or, I am sorry, Ms. Clark. You point out, as did the GAO and a new report issued this week by the U.S. Climate Change Science Program that few Federal land units are addressing the threats of climate change and incorporating it into their planning. The refuge system seems to be a prime example of this. And why do you think that is and what can we do about it in the short term to kick-start this effort?

Ms. RAPPAPORT CLARK. Well, the easy answer is money. But let me elaborate. The refuge system is really kind of a fantastic suite of lands that were set aside where wildlife comes first. So one could argue they should be a great kind of foundational anchor for work on wildlife and climate change adaptation. The fact of the matter is, though, the budget for the refuge system while it has been increasing is woefully inadequate to address the demands of wildlife and conservation challenges facing this nation. And, indeed, we have watched the kind of decline in biologists and certainly the decline in scientific capacity in that agency.

That is serious. It is not lack of will, it is lack of capacity. And so the ability to lift up and take it beyond just individual units and look at a national strategy, it is a national wildlife refuge system made up of five hundred and something plus units that should feed into a national strategy. This will become very cost ineffective and inefficient for wildlife if we reinvent the wheel over and over and over, which is why there has been a lot of discussion about the need for a national conservation strategy that guides all of our work, Federal work, state and territory work, and the private initiatives dealing with global warming.

Ms. BORDALLO. You also mention the need for a Global Warming Science Center. Now why would that be necessary when all the agencies are working on research?

Ms. RAPPAPORT CLARK. Well, I think it is a stretch to say all the agencies are working on research. Though it—

Ms. BORDALLO. Well, the majority maybe.

Ms. RAPPAPORT CLARK. OK. There is a fair amount of science going on. But if you were to kind of look at the science capacities of these bureaus in the Federal Government today they are incredibly unbalanced. And while I might show some bias to the Fish and Wildlife Service for obvious reasons, the science capacity, Dan notwithstanding, the science capacity of the Service is not anywhere near equipped to meet the challenges of the work necessary to support the management and policy decision making of these wildlife biologists.

A National Science Center I think we believe is also extremely important and would be helpful to provide a foundation of knowledge and monitoring inventory protocol kind of opportunity for the states and territories that too are evolving and working on their plans as it relates to climate change.

Having a central repository focuses budget, focuses outcomes and ensures collaboration and coordination.

Ms. BORDALLO. Well, I do agree with you, I believe in centralization you know, and if we are all going in different directions, so it makes sense to me.

And I want to thank all of the witnesses on the second panel. And we will now invite the third panel to come forth.

I would like to welcome the third panel at this morning's public hearing, The Honorable Kaush Arha, Deputy Assistant Secretary for Fish, Wildlife and Parks, United States Department of the Interior; Dr. John Robinson, Executive Vice President for Global Conservation Programs at the Wildlife Conservation Society; Mr. Tom Dillon, Senior Vice President for Field Programs at the World Wildlife Fund; Mr. Patrick Burchfield, Director of the Gladys Porter

Zoo; and Mr. Juan Pablo Arce, Director of Latin America and the Caribbean Programs for NatureServe. I would like to welcome all of our witnesses this morning, and thank you very much for being here with us.

And, Mr. Arha, you will be the first one we will hear from. And congratulations on your new position. Please begin. And remember, gentlemen, the timing, five minutes. Thank you.

STATEMENT OF KAUSH ARHA, PH.D., DEPUTY ASSISTANT SECRETARY, FISH AND WILDLIFE AND PARKS, U.S. DEPARTMENT OF THE INTERIOR

Mr. ARHA. Well, good morning and thank you, Madam Chair. I am Kaush Arha, Deputy Assistant Secretary for Fish, Wildlife and Parks for Department of the Interior.

Thank you for the opportunity to testify today on H.R. 4455, to present the Administration's strong support for the legislation. I offer my deep appreciation to the Chair and Subcommittee members for their continued leadership on international conservation programs, and to Congressman Young for introducing H.R. 4455.

This committee and the Congress have led the way in directing our nation's invaluable efforts in international wildlife conservation. The citizens of the United States and the world are the beneficiary of your leadership on this issue.

Secretary Kempthorne and Assistant Secretary Laverty appreciate your leadership and have placed a high priority on international wildlife conservation and Fish and Wildlife Service's Wildlife Without Borders program. Secretary Kempthorne has been personally engaged in our Wildlife Without Borders initiative and has just returned from a visit to Tanzania where he saw firsthand the real impact of our programs. I was with him, Madam Chair. And while we were there we had a chance to visit with the President of Tanzania, Mr. Kikwete. And he told us and asked for the assistance from the Secretary on the anti-poaching program that they are trying to put forth in that country.

We met with the Minister of Natural Resources and Tourism and she asked for assistance on developing tourism for that country which is now the number one industry in that particular country and Americans are the biggest sort of group that are the tourists in Tanzania.

We met with the Director of Wildlife Division of Tanzania and they sought our assistance in working with wildlife corridors between the parks and how we can help them.

And then we went down to the conservator of the Ngorongoro Conservation Authority and he thanked the Secretary for Fish and Wildlife Service providing them with the night vision goggles that helps all the rangers who are 24 hours protecting the 19 black rhinos that we have in that crater at the moment.

So we look forward to working with our Tanzanian colleagues on all those fronts.

Madam Chair, I wanted to introduce our Wildlife Without Borders Programs with this Tanzanian episode. And I am proud to be here and state that that program is working and working very well and following your lead in international conservation as we go forth. It is a program that has developed over the last 30 years and

complements the direction that the Congress and this committee has provided with the multi-national species conservation programs in protecting African rhinos, African elephants, Asian elephants, tigers, great apes and marine turtles.

Let me give you a good example of how this program complements those. While I was in Africa in Arusha I went to Mawaka where there is a college, African College for Wildlife Conservation and Management. And I met very young, fine wildlife managers from four countries, from Rwanda, from Southern Sudan, from Kenya and Tanzania. And these fine young people are fighting one of the biggest issues that is confronting Tanzania and Africa which is bush meat, illegal trading and practice of bush meat.

And it is very funny, back in 1900 we had a similar situation here. We used to call it market hunting before we came up with the Lacey Act and tried to address it. Similar challenges are being faced by these people and there is no other country and there is no other service that is better positioned to address these because Fish and Wildlife and we have been at it for the last 100 years and have the rich experience of learning from our mistakes and sharing those so others do not have to repeat it.

The Wildlife Without Borders program, as I mentioned, has started off and come to age over the last 30 years. It provides a comprehensive and strategic view of addressing the pressing wildlife conservation needs that are there. And the way we do it is a 3-pronged strategy. We focus on the species, under your leadership again, on the species that we have the fund on. And we complement that with broad regional and national programs through the regional, national and also global programs. I think since 1995 we have given or awarded grants in excess of \$18 million under this program. Now, those \$18 million have leveraged in excess of \$54 million. So we are talking about a match in the leverage of more than 1 to 3 of a ratio. In short, I think we are delivering one of the most cost-effective, on-the-ground conservation efforts with our Wildlife Without Borders program.

Now, having said that one has to make the case, and I am here to do that, that this program has earned its reputation and deserves your recognition as it goes forward. And if it got your recognition it will be the better for it, and so will be the countries that benefit from this particular program.

I would shortly also mention that in my humble opinion we are talking about wildlife conservation overseas internationally, and we look at what the challenges are. We have gone through a phase of developing and marking protected areas and national parks. We have gone through a phase after that in working with our community natural resources to work with the communities around these protected areas. But the challenge we face now is to work with wildlife and humans where they coexist. This is the land between the protected areas where a lot of wildlife is, and a lot of these big animals like the elephants, like the rhinos, like the tigers need to go through from one protected area to another. And that is the issue that we have confronting and a challenge we need to face.

I come from Wyoming. Where is the wildlife in this great nation that we have? We have one of the greatest wildlife resources of anywhere in the world. But most of that is not in our parks or our

refuges, most of them are out there on private lands or in the multi-use public lands, Forest Service lands or BLM lands. When I drive from Cheyenne to Cody that is where most of the deer and antelope in Wyoming are, not in Yellowstone Park. That is the challenge we have in these countries like Tanzania, India and Latin American countries. And nobody else has managed this wildlife over multiple jurisdiction lands where human beings and their activities are given due and equal consideration as wildlife than the United States has, both at the state and Federal level. That is what we have to offer as we go forward.

One other thing I will mention before I conclude. One of the great things that our Wildlife Without Borders program does is grow leaders. It grows young leaders in these places that can go forth with wildlife management. I have behind me sitting Dr. Herbert Rafael. He started the first Master's program in Latin America. Today there are 500 graduates from that program having a Master's Degree in wildlife. And I have one of the theses in my hand that talks about how best to sustainably harvest whistling duck eggs so that you can preserve the population and also use the eggs at the same time.

We started the Wildlife Institute of India, developing all the wildlife leaders in India that came out of that particular program. And I talked to you about the mentor program early on.

So I would conclude by saying it is a good program. We appreciate your support. And we can do a lot more as we go forward. Thank you again.

[The prepared statement of Mr. Arha follows:]

Statement of Dr. Kaush Arha, Deputy Assistant Secretary, Office of the Assistant Secretary, Fish, Wildlife and Parks, U.S. Department of the Interior

Thank you for the opportunity to present the Administration's views on H.R. 4455, the Wildlife Without Borders Authorization Act. The Administration would like to express its support for this legislation. H.R. 4455 recognizes the crucial role that the United States plays in the conservation of wildlife and natural resources around the globe.

Wildlife and natural resources are under pressure from growing human populations and corresponding changes in land use, pollution, and consumption of natural resources. The complexity and diversity of these challenges require a coordinated approach led by skilled natural resource managers. Unfortunately, many countries containing the highest levels of biodiversity are faced with a shortage of wildlife professionals who have the capacity to lead multifaceted strategies to address the most pressing threats to wildlife.

Protection of domestic wildlife also requires internationally coordinated actions. Many migratory species in the United States, including 340 species of migratory birds, rely on foreign soils to complete some part of their seasonal cycles. In fact, approximately 30 percent of the species covered by the Endangered Species Act (ESA) occur primarily outside of the United States. In addition, our native animals are increasingly exposed to the possibly devastating effects of zoonotic diseases that can be introduced through trade and human travel. These problems are best addressed in the countries where they begin.

Long-term, sustained wildlife management, capacity building, endangered species conservation, strategic habitat conservation and environmental outreach, education, and training are tools that can address emerging issues in wildlife conservation. The United States Fish and Wildlife Service (Service) is in a strong position to influence and shape the outcome of wildlife conservation abroad, using expertise in management of refuges, fisheries, endangered species as well as employment of law enforcement techniques and the best available technologies.

Since its inception, the Wildlife Without Borders program's goals have been to initiate, facilitate, and promote meaningful conservation efforts across the globe to

help ensure conservation of the world's diverse species. The first conservation grants issued under the program were awarded through the Wildlife Without Borders-Latin America and the Caribbean program, to implement the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere and to provide expertise in wildlife and habitat conservation throughout the region. Since that time, the program has supported more than 800 conservation projects around the world.

Wildlife Without Borders projects provide critical capacity building to participants from small grassroots organizations to high level government officials. Through the Wildlife Without Borders program the first Masters level graduate program in conservation in Latin America was created and has since graduated over 400 students. Similarly, in India, Wildlife Without Borders financially and technically supported the creation of the Wildlife Institute of India, which trains all of the nation's wildlife resource managers. The program also created RESERVA, the first regional program for training protected areas managers of Latin America and the Caribbean.

Wildlife Without Borders also serves a key role within the Service in facilitating bilateral and multilateral dialogues through organization of fora such as the United States-Russian Federation Joint Committee on Cooperation for Protection of the Environment and Natural Resources; the Western Hemisphere Migratory Species Initiative; and the US-Mexico-Canada Trilateral Committee for Wildlife and Ecosystem Conservation and Management. These fora offer government representatives from various countries opportunities to share experiences, develop best practices and coordinate international wildlife conservation efforts. The Service, through participation in such meetings, has developed an understanding of techniques used around the world and can better facilitate technology transfer, making wildlife conservation more efficient and effective.

H.R. 4455

H.R. 4455 would codify the Wildlife Without Borders Program, incorporating various activities of the Division of International Conservation, such as the Multinational Species Conservation Funds and the Ramsar Convention on Wetlands, into a more unified and cohesive Wildlife Without Borders program. This should provide a coordinated approach toward existing and emerging international threats to wildlife and natural resources at varying scales.

H.R. 4455 creates three sub-programs that will operate in concert with one another to address threats at the appropriate level. The Wildlife Without Borders Species program will implement the Multinational Species Conservation Acts and their associated grants programs. The Species Program currently allows specialists to share information, conduct research, and implement management activities on a species by species basis.

The Wildlife Without Borders Regional Program will address grass-roots wildlife conservation problems from a broader, landscape perspective using capacity building and institutional strengthening as primary tools. It will also take the lead in providing assistance to and coordinating with other Service programs in conducting international activities. While the Service is already involved in such efforts, H.R. 4455 will provide additional flexibility in establishing conservation partnerships.

As noted above, under H.R. 4455, the Wildlife Without Borders Global Program will implement global habitat and conservation initiatives such as the Ramsar Convention on Wetlands and the Convention for Nature Protection and Wildlife Preservation in the Western Hemisphere. This program will assist the Service in addressing threats to wildlife that are global in nature, such as the spread of invasive species and wildlife disease.

The Service has actively cultivated strong relationships with other Federal agencies, states, foreign governments, academic institutions and non-governmental organizations around the world. The three-pillared approach formalized in H.R. 4455 will allow the Service to support these relationships in a holistic and comprehensive manner.

H.R. 4455 also authorizes additional components that could strengthen the role of the Service in international conservation, such as advisory committees that could help ensure that all Wildlife Without Borders activities are strategically developed and implemented. These committees could also provide a venue for information sharing and gap analysis to help ensure that the Service's International Conservation program remains effective and complementary to the work of other federal agencies, state and foreign governments, and outside organizations.

International conservation of natural resources is a complex task. H.R. 4455 creates a balanced approach to addressing serious global wildlife conservation problems while strengthening the Service's ability to effectively partner with institutions involved in international wildlife conservation. This approach will support efficient

use of human and financial resources, development of effective conservation strategies and sustained commitment of partners in maintaining wildlife resources. For these reasons, we support the legislation.

Thank you for the opportunity to testify on H.R. 4455. I would be happy to answer any questions at this time.

Ms. BORDALLO. Thank you. Thank you very much, Mr. Arha, for very interesting testimony. And your complete testimony will be entered into the official record.

I please remind the panelists because of the hour in the day that we stick to the five minute time.

Our next speaker will be Dr. Robinson to testify for five minutes.

STATEMENT OF JOHN ROBINSON, PH.D., EXECUTIVE VICE PRESIDENT, GLOBAL CONSERVATION PROGRAMS, WILDLIFE CONSERVATION SOCIETY

Mr. ROBINSON. Madam Chair, Congressman Wittman, thank you very much for the opportunity to testify on H.R. 4455. I am John G. Robinson, Executive Vice President of Conservation and Science with the Wildlife Conservation Society which is headquartered at the Bronx Zoo. Over our more than 100 year history we have established some or helped establish some 150 national parks, and today help manage scores of others. We work to save some of the world's most iconic wildlife species across their whole geographic range. Accordingly, we have a keen interest in Wildlife Without Borders Act.

The U.S. Fish and Wildlife Service International Program is really a leader in the conservation of global priority species. The Service's cost-efficient programs have built technical and management capacity, they have leveraged private and corporate philanthropy and engaged other Federal agencies in efforts to conserve wildlife species. The impact of the Service has been enhanced with the multinational species conservation funds which have funded the protection of tigers, rhinoceros, great apes, elephants and sea turtles.

I would like to offer three brief points on these funds. The first is to stress that the enactment of the Wildlife Without Borders Act should not replace the U.S. Government's commitment to these species funds.

The second is a plea to increase budget allocations to these funds which are authorized at about \$30 million. But only appropriations in Fiscal Year 2008 have reached about \$8 million.

And third, the Wildlife Conservation Society urges augmenting these single species efforts with a comprehensive approach to conserve flagship or priority species. And I joint with my colleague from World Wildlife Fund in submitting to the record a joint statement to that effect. The United States has a longstanding commitment to assist other countries with the conservation of global priority species through the U.S. Fish and Wildlife Service. And this regional program has trained wildlife professionals around the world in the skills necessary to manage their resources.

Kaush has mentioned some of these and I will mention some of them again. I have a personal involvement over the years in the establishment and support of the training programs in Costa Rica, Brazil, Venezuela and Argentina. I have worked with the programs in India. The International Program was responsible for the estab-

ishment and support of the Wildlife Institute of India, among other initiatives.

The Wildlife Conservation Society would recommend continuing to support the successful grant program in Africa, maintaining the effective regional programs in Mexico and Latin America. And we are starting the Asia program, especially in India. In Asia, burgeoning populations and expanding economies lead to dwindling natural resources. And the Asian traditional trade does prey on bears for their gall bladders, tigers for their bones, and rhinos for their horns.

In order for the U.S. Fish and Wildlife Service to effectively administer these regional programs our recommendation is the authorized funding level should be at least \$30 million.

In addition to these regional programs, the U.S. Fish and Wildlife Service's global programs have strong capacity to develop strategies to address global threats to conservation like climate change, invasive species, emerging wildlife diseases and wildlife trade. Let me comment on some of these.

Wildlife disease spreads as natural habitat is destroyed and there is increased contact between wildlife and domestic animals. The great risk to wild populations from emerging diseases spread through the trade is evidence in part by disease-related declines in 43 percent of all amphibian species worldwide. Perhaps 60 percent of these emerging diseases are zoonotic diseases that pass from animals to people: Asian influenza, HIV/AIDS, Ebola, West Nile Virus.

Second, the illegal wildlife trade and unsustainable hunting of wildlife poses critical threats to biodiversity around the world. A voracious appetite for almost anything that is large enough to be eaten, potent enough to be turned into medicine, or lucrative enough to be sold is stripping wildlife from wild areas.

Climate change, as we have already heard today, directly threatens wildlife species. Up to 10 percent of the world's biodiversity may be directly threatened with extinction over the next 100 years.

So the Wildlife Conservation Society recommends that this act can help build capacity for wildlife disease monitoring and surveillance, that the Service also has the capacity to coordinate the U.S. Government's initiatives toward illegal wildlife trade and coordinate efforts to mitigate impact on climate change.

The U.S. Government invests significantly in global biodiversity conservation through the U.S. Fish and Wildlife Service, through the U.S. Agency for International Development and the like. But the U.S. Fish and Wildlife Service International Program is ideally positioned to help develop new relationships and strengthen existing ones among U.S. Government agencies.

I appreciate the opportunity to come before you to share my perspective. And the Wildlife Conservation Society appreciates the continued support provided by the U.S. Government to wildlife conservation. And we strongly support the reauthorization of the Wildlife Without Borders Act.

[The prepared statement of Mr. Robinson follows:]

**Statement of Dr. John G. Robinson, Executive Vice President,
Conservation and Science, Wildlife Conservation Society**

Madame Chairwoman, Members of the Subcommittee: Thank you very much for the opportunity to testify on the H.R. 4455, Wildlife Without Borders Act. I am Dr. John G. Robinson, Executive Vice President, Conservation and Science with the Wildlife Conservation Society, which was founded with the help of Theodore Roosevelt in 1895 as the New York Zoological Society. Headquartered at the Bronx Zoo, WCS seeks to conserve wild lands and wildlife, and we operate in 64 countries around the world. Over our more than 100 year history, we have helped establish more than 150 national parks, and today help manage scores of others. We work to save some of the world's most charismatic wildlife species across their whole geographic range. Accordingly, we have a keen interest in the Wildlife Without Borders Act.

The Wildlife Conservation Society would like to thank Don Young (R-AK), the Ranking Member of the Full Natural Resources Committee for introducing this piece of legislation and the Subcommittee Chair, Congresswoman Bordallo (D-GU) and the Members of the Subcommittee for recognizing the need and urgency expressed in the Wildlife Without Borders Act. The Act will provide additional support for global priority species and landscape level conservation beyond our own borders, and recognizes the sentiments of the American people about the desperate urgency to conserve the last remaining wildlife and wild places of our planet. The Wildlife Without Borders Act both strengthens in-country wildlife management and global initiatives to address key threats to species conservation, such as climate change, emerging wildlife diseases, human wildlife conflict, and the impact of extractive industries on wildlife habitats.

Congressional authorization for the Wildlife Without Borders program affirms the leadership of the U.S. Government within the international community, underscoring our commitment to our international wildlife treaty obligations, and encouraging coordinated international efforts to save wildlife species. Passage of this legislation supports the objectives of species conservation and capacity building of the U.S. Fish and Wildlife Service.

We should conserve wildlife species because they are integral to the functioning of the ecological systems upon which we all depend, they are prized across most cultures, and they are critical to many of the economic relationships that link people with nature. Species are threatened by deforestation, habitat loss, over hunting and fishing, emerging diseases, and the dislocations wrought by climate change. Many of the most critically threatened species are found in the developing countries of Africa, Asia and South America, and as citizens of the world, we have a collective duty to protect this planet's biological richness. The passage of this legislation will take us a step closer in that direction. The Wildlife Without Borders Act will complement existing species and landscape-based initiatives and strengthening partnerships between the U.S. Fish and Wildlife Service and local governments, conservation organizations, other federal agencies mandated to assist with global biodiversity conservation.

My testimony recognizes that the Wildlife Without Borders Act will backstop existing U.S. Government commitments to the Multinational Species Conservation Funds through the support of programs of the U.S. Fish and Wildlife Service to strengthen management capacity in countries with globally important species. That capacity is essential if we are to address global threats to wildlife species.

Wildlife Without Borders Program—Species Program

The U.S. Fish and Wildlife Service International Program is recognized as being a leader in the conservation of global priority species, those species which are biologically, culturally, and socio-economically important, and which are subject to both anthropogenic and natural threats. The U.S. Fish and Wildlife Service has provided both funding and technical support to countries around the world. Its cost efficient programs have built technical and management capacity, leverage private and corporate philanthropy, and engaged other federal agencies in efforts to conserve wildlife species.

The impact of the USFWS International Program has been enhanced with the Multinational Species Conservation Funds, which, starting in 1990, has funded successful programs for the protection of tigers, rhinoceros, great apes, elephants and sea turtles. Thanks to the support of Chairwoman Bordallo (D-GU), Rep. Tom Udall (D-NM) and Rep. Henry Brown (R-SC) the House of Representatives has passed a bill just last month to develop another species program for great cats and rare canids.

With your permission, I would like to offer three brief points on the Multinational Species Conservation Funds. The first is to make clear that the enactment of the Wildlife Without Borders Act should in no way impact the implementation or limit or reduce the authorization levels of the existing and pending species funds. The second is a plea to increase budget allocations for these funds. Existing Multinational Species Conservation funds have authorized funding levels totaling \$30 million, but only recently have reached \$8 million in the FY08 Interior Appropriations Act. Actual funding levels for existing programs need to be at or near authorized levels. And third, the Wildlife Conservation Society urges a more comprehensive approach to species conservation, augmenting single species or single taxa efforts, with a flexible approach to conserve “flagship” or priority species. I know that with an appropriate commitment of staff and resources a science-based strategy for prioritizing conservation funding for global priority species and the cross-cutting threats to conservation, including but not limited to climate change, emerging wildlife disease and wildlife trade, can be developed.

Wildlife Without Borders Program—Regional Program

The United States has a long-standing commitment to assist other countries with the conservation of global priority species. Training wildlife professionals with the skills necessary to manage these resources is a hallmark of science-based conservation. The Wildlife Without Borders Act emphasizes the focal role capacity building in foreign countries plays in promoting conservation action.

The U.S. Fish and Wildlife Service International Program, beginning in the 1980s, helped establish and support, both technically and financially, graduate training programs in wildlife conservation in Costa Rica, Brazil, Venezuela and Argentina. These programs have provided the foundation for the growing management capacity in Latin America. In India, the International Program was responsible (through its management of India’s repayment in rupees of PL 480 humanitarian assistance) for the establishment and support of the Wildlife Institute of India, as well as conservation assistance to local non-governmental organizations, state governments and private entities. Strong national programs for the conservation of such species as the tigers, Asian elephants, and Asian lions, were the direct result of this support.

The Wildlife Conservation Society has a long history of working with the U.S. Fish and Wildlife Service International Program. Let me give one recent example. The northern part of Guatemala, an area known as the Peten, is home to the multi-use Maya Biosphere Reserve, established in 1990 to protect approximately 16,000 kilometers of Guatemalan forests. This is the largest protected area in Mesoamerica, and home to more than 95 species of mammals and 400 species of birds. WCS has worked with local partners for over 15 years to protect the wildlife and forests of northern Guatemala from a wide range of threats such as forest fires, unsustainable agricultural expansion, wildlife poaching and poorly planned large-scale development projects. With the help of the U.S. Fish and Wildlife Service, WCS has been able to: (1) plan and monitor the sustainable extraction of non-timber forest resources, including local wildlife management initiatives; (2) train local people in field research, fire fighting and vigilance skills; and (3) monitor populations of key wildlife species.

The Wildlife Without Borders Act should continue to support a successful grant program in Africa, a continent characterized by stunning wildlife species living in a huge range of ecosystems, but where many governments lack the capacity to steward their natural resources. The result is that pressures for short-term results to improve living standards often trump sustainable management options. The U.S. Fish and Wildlife Service International Program has used its limited resources wisely to increase human and institutional capacity, mitigate the impact of extractive industries, address issues of the illegal trade in bushmeat, and develop species specific conservation programs.

The Wildlife Conservation Society would recommend restarting the regional program in Asia, which closed with the exhaustion of PL 480 funds in 2002. Across Asia, ancient cultures and religions evolved with a deep respect for, and dependence on, the natural world. Many of Asia’s border regions run along the ridges of some of the world’s great mountain ranges—the Himalayas, Pamirs, Tien Shans, Karakorams, and Hindu Kush. These ranges serve as both some of the last great wild places left on earth and home to some of the most majestic wildlife. The continent contains the last great temperate grasslands left on earth—the great steppes of the Central Asian states, Mongolia, China, and Russia—as well as significant tropical forests in South Asia, South East Asia and Indochina. Everywhere, burgeoning populations and expanding economies lead to dwindling natural resources. The Asian medicine trade preys on bears for their gall bladders, tigers for their bones, and rhinos for their horns. Logging demands destroy forest habitats that are

home to countless rare wildlife species, and local agriculture draws from watersheds, sucking them dry. And wildlife markets in Asia have helped spawn emerging diseases, such as SARS, that represent a global threat to public health, food security, as well as to conservation itself.

Let me draw on two examples, where the Wildlife Conservation Society is especially active. An expansion of the Wildlife Without Borders Regional Program could support institution and capacity building to help save the unique Pamir Mountains—called “the roof of the world”—shared by Tajikistan, Afghanistan, Pakistan, and China. This region is renowned for spectacular scenery, diverse cultural traditions, and a great variety of plants and animals. The snow leopard and the Marco Polo sheep—both symbols of this mountain world—wander across international borders from one country to another, visible symbols of a common resource. A regional program could also contribute to saving Central Asia’s great steppes, which represent the last intact temperate grassland remaining on earth. Here, huge herds of Mongolian gazelles still number in the millions, moving across the landscape (and across borders) in a manner comparable to the migratory spectacle of Alaskan caribou or Serengeti wildebeest. Yet for species like the saiga antelope, threats have reduced herds once numbering in the millions by 97% in only 15 years.

In order for the U.S. Fish and Wildlife Service International Program to effectively administer its Regional Program with the recommended growth areas in India and Asia the authorized funding level would need to be at least \$30 million or roughly \$5 million per Regional Program.

Wildlife Without Borders Program—Global Program

In furtherance of its mission, the U.S. Fish and Wildlife Service implements initiatives through a variety of domestic laws, international treaties, and voluntary agreements, and build global partnerships critical to benefit international wildlife and wildlife habitat conservation. The U.S. Fish and Wildlife Service International Programs also works in partnership beyond formal treaties and agreements to address cross-cutting threats such as emerging wildlife diseases, climate change, invasive species, wildlife trade, and human-wildlife conflict. While the section of the bill entitled “Global Program” is crafted in general terms with little criteria, I suggest that congressional authorization would allow the agency to address these types of threats with increased capacity and flexibility. Let me elaborate on three threats in which the USFWS International Program has a special capacity.

Wildlife Diseases

As natural habitat is disrupted, and there is increased contact between wildlife and domestic animals, disease have increasingly threatened wildlife species. The great risk to wild populations from emerging diseases spread through trade is evidenced in part by the declines of 43% of all amphibian species worldwide, with one major cause being Chytridiomycosis, a fungal disease believed to have been spread by the international trade in African Clawed Frogs. Avian Influenza threatens a wide variety of different species, often dramatically. For instance, an estimated between 5% and 10% of the world population of the barheaded goose (*Anser indicus*) perished in an avian influenza outbreak at China’s Qinghai Lake in spring 2005. Many of these emerging diseases (and perhaps 60% of the 1,400 known infectious diseases) are zoonotic—diseases that can pass from animals to people. Avian influenza, HIV/AIDS, SARS, Ebola, monkey pox and West Nile virus are just some examples of the link between the health of people, domestic animals, wildlife and the environment. More than 35 new infectious diseases have emerged in humans since 1980—one new infectious disease in humans every 8 months. Consequences of new, more virulent and mutating pathogens can be devastating for humans and animals. An estimated 40 million people worldwide live with HIV/AIDS, a disease that came from wild primates and spread to people through the consumption of primates, with 3 million AIDS-related deaths reported in 2006. Infectious diseases affect food production, food security and impact virtually every major global industry—including financial, travel, trade, and tourism sectors worldwide. In the current avian influenza crisis, with hundreds of millions of domestic fowl culled to date, direct economic costs are already in the tens of billions of dollars.

Emerging wildlife-related disease threats, including but not limited to those arising at the wildlife / livestock / human interface, should be addressed at national, regional or global levels as needed through adequate surveillance, science-based policy and interdisciplinary response to reduce the risk of negative impacts on wildlife conservation, livestock agriculture, and/or public health. The Wildlife Conservation Society recommends that the Wildlife Without Borders Act strengthen increased capacity building for wildlife diseases monitoring and surveillance activities and lay the foundation for U.S. Fish and Wildlife Service to establish a comprehensive

worldwide wildlife health surveillance system to enhance preparedness. We believe that the Service is strongly placed to coordinate interactions and dialogue between other U.S. government agencies, multilateral institutions, national governments, conservation organizations, veterinary and medical schools, and other partners.

Illegal Wildlife Trade

The illegal trade and unsustainable hunting of wildlife pose critical threats to biodiversity around the world. While ecologically rich tropical forests tend to be the genesis for most of global wildlife trade, the practice has become extremely pervasive with illegal wildlife and wildlife products being traded in markets around the world and often transported to countries such as the United States in large quantities. The problem has escalated dramatically in recent years with depleting forests and massive economic development manifested through construction of roads that have opened up forests to loggers and other resource extractors. Hunting rates by local people rise as they hunt increasingly for sale as well as for subsistence, and as new roads facilitate access to better hunting technologies.

The result is that, across the landscape, both inside and outside parks and reserves, people are harvesting wild species at ever-increasing rates. A voracious appetite for almost anything that is large enough to be eaten, potent enough to be turned into medicine, or lucrative enough to be sold, is stripping wildlife from wild areas—leaving empty forests and an unnatural quiet. This not only is a conservation crisis but also remains a key issue of global health and security as wildlife and animal products transported around the world could potentially can transmit serious diseases.

Due to existing U.S. Government and international investment such as the Coalition Against Wildlife Trade (CAWT) and the Convention on International Trade of Endangered Species of Flora and Fauna (CITES) a global effort to curb illegal wildlife trade is currently underway. WCS recognizes the leadership of the U.S. Fish and Wildlife Service in addressing this crisis through the existing species funds and the regional programs. I urge this panel to ensure that illegal trade of wildlife and wildlife products remain a priority concern for the Wildlife Without Borders Act and support to curb these activities continue to be funded at maximum levels.

Climate Change

Recent estimates suggest that up to 10% of the world's biodiversity may be directly threatened with extinction over the next 100 years by global warming. Mitigating the impact of climate change on wildlife species will require the maintenance of connectivity across the landscape. Global warming is a threat equal to deforestation and habitat loss in many areas. Species living in high latitude and high altitude environments will be the first to see rapid changes in their habitat. The iconic Polar bear is just the harbinger of a wider problem that is already directly affecting the health and persistence of many species. And of course as climate changes, so does the distribution of pathogens and the vectors that carry them, reinforcing the importance of emerging and resurging diseases to conservation, agriculture, and of course human health and well-being.

Climate change related legislation proposed in both the House and the Senate have included provisions for wildlife adaptation. Strategies to direct general revenue generated from the sale of emission allowances to a Wildlife Adaptation Fund should include both wildlife in the United States as well as global priority species around the world. In 2007, WCS joined 20 other member organizations of the Multinational Species Conservation Funds Coalition to urge Chairman Rahall to include wildlife adaptation funding though the New Direction for Energy Independence, National Security and Consumer Protection Act to benefit key programs administered the U.S. Fish and Wildlife Service International Program. I include a copy of this letter in the appendix section of my testimony. Such wildlife adaptation set asides are likely to generate significant new resources for wildlife related programs, and I encourage this panel to ensure that programs administered by the USFWS International Program and outlined in the Wildlife Without Borders Act continue to be considered in these strategic investment decisions.

In order for the USFWS to effectively administer its Global Program with the recommended growth areas to address cross-cutting threats related to climate change, emerging wildlife disease and illegal wildlife trade the authorized funding level would need to be at least \$50 million or such sums as are necessary.

Strengthening Coordination of U.S. Government Investment in Wildlife Conservation

The U.S. government invests significantly in global biodiversity conservation, through the U.S. Fish and Wildlife Service International Program, the U.S. Agency for International Development, the U.S. State Department and other agencies. Such

investment is important for (1) directly supporting the conservation of biological diversity, globally important wildlife species, and significant wild lands and ecosystems, (2) promoting good governance and management capacity in countries around the world, and (3) supporting peace and security initiatives. Supporting and promoting transparent and equitable resource governance systems has beneficial social, economic, and environmental consequences, and is an important pathway towards democracy at local, regional, and national levels.

The success of the Wildlife Without Borders program has traditionally been in providing support for capacity building, long-term in-country wildlife management, endangered and migratory species conservation, strategic habitat and natural area conservation, and environmental outreach, education and training. Leveraging funds granted by the U.S. Fish and Wildlife Service International Program has been one of the hallmarks of the department's success. Since 1990, the Multinational Species Conservation Funds has provided \$73 million in grants for programs in Africa, Asia and Latin America and leveraged \$225 million in partner contributions. Wildlife Without Borders has made \$18 million in grants and generated \$54 million in matching funds.

Grants from the U.S. Government funds can also amplify fund raising opportunities for other organizations. For example, funding from the Rhino-Tiger Conservation Fund has been instrumental to the Wildlife Conservation Society in the development and on-going implementation of tiger conservation projects across the range of the species. The funds have directly leveraged private support from the Save the Tiger Fund of the National Fish and Wildlife Foundation which receives funds from ExxonMobil. In addition, early support from the U.S. Government has helped WCS develop our Tigers Forever initiative which, in turn, has garnered commitments of \$10 million over the next decade. Leverage can also be measured through long-term sustainable partnerships. Our experience working in partnership with implementing agencies of the Congo Basin Forest Partnership and the Amazon Basin Conservation Initiative have led us to believe that a coordinated effort in cooperation with other federal agencies, foreign governments, international institutions and non-governmental organizations ensures the maximum utilization of limited financial resources. The Congo Basin Forest Partnership and the Amazon Basin Conservation Initiative—made up of a consortium of international institutions, national governments and international NGOs—has leveraged millions of dollars and has institutionalized the protection of valuable tropical forests.

Because of the pivotal and catalytic role played by the U.S. Fish and Wildlife Service International Program, I am confident the Wildlife Without Borders Act will help develop new relationships and strengthen existing ones through increased collaboration among U.S. Government agencies. I also urge the Subcommittee to take note of the success in leveraging private donations, matching grants and in-kind contributions by conservation groups, corporations and other private entities.

Conclusion

I appreciate the opportunity to come before this distinguished panel to share my experiences and expertise on global wildlife conservation. The Wildlife Conservation Society appreciates the continued support provided by the U.S. Government to wildlife conservation, and we strongly support the reauthorization of the Wildlife Without Borders Act. We also urge that you consider authorizing a budget of between \$30 and \$50 million, which would allow strengthening Regional Programs in Africa, Asia and Latin America, and develop Global Programs that would be able to address cross-cutting global threats such as emerging wildlife diseases, the illegal trade in wildlife species, and climate change. I would be happy to answer any questions

Ms. BORDALLO. Thank you very much, Dr. Robinson.

And now, Mr. Dillon, I want to thank you for being here today to testify on H.R. 4455.

STATEMENT OF TOM DILLON, SENIOR VICE PRESIDENT, FIELD PROGRAMS, WORLD WILDLIFE FUND

Mr. DILLON. Madam Chair, Representative Wittman, thank you for the opportunity to testify today. My name is Tom Dillon, I am the Senior Vice President at World Wildlife Fund for Field Programs. For more than 45 years, WWF has been protecting nature

throughout the world. We work in about 100 countries with the support of six million members worldwide.

Let me begin by recognizing your leadership, Chairwoman Bordallo, as well as that of Ranking Member Brown, in raising the profile of species conservation throughout the 110th Congress. With the series of hearing and legislation that this Subcommittee and the Committee as a whole have considered during this Congress, I think you have done a tremendous job in advancing U.S. efforts in international species conservation.

From my own observations from spending most of my career working in international conservation and living outside of this country I have seen a lot of great examples of the multinational species funds working. I think one of the astounding ones, for instance, is Cambodia where tigers are coming back to eastern Cambodia which is an area that suffered from 50 years of civil war and strife and which while the habitat was still there all the mammals basically were killed off. And they are returning. And that is the Fish and Wildlife Service support is critical for that.

There are a lot of other examples I could give, some of them are in my written testimony.

I think the regional program also fulfills a critical need by providing flexible international conservation funding that is not targeted at a single species. And it has been really successful in capacity building. And I think that that was pointed out well by Dr. Arha in terms of the, for instance, the mentor program in Africa.

WWF reads this legislation to take the three programmatic areas of the Fish and Wildlife Service International Program and place them under one heading of the Wildlife Without Borders programs. And we see great value in doing that in that it will foster greater synergy among these programs and greater consolidation.

While we do not read the bill as subsuming or superseding the independent authorized levels of the specific species bills, we hope that there is not any confusion on that point. We understand the resources provided by this bill to be additional to those resources. And that they would also not supersede the baseline funding the Fish and Wildlife Service receives, that this would be outside of the international affairs administrative budget.

We think that the \$5 million proposed though is far too low. The \$30 million as proposed by Dr. Robinson I think would be much, much more appropriate. And that most of the new funding should go into the regional and global programs.

The global program, however, that is proposed in this bill I think needs more specific language. It appears to be very useful in terms of providing flexibility to the Fish and Wildlife Service and to programs that are not already covered but its language I think needs greater elaboration on scope, description of activities, priority setting for potential funding. The language establishing the global program could, for instance, address some of the global crises we are seeing, such as the one discussed in the last panel, the climate change and how it is affecting species.

I think that the disease issue that Dr. Robinson brought up is also highly, very important. And it ties into a lot of other issues outside of the environmental field such as national security when you think about diseases such as Ebola and the potential for them

to reach the U.S. And we can be dealing with this through species conservation, in fact they are making efforts to do that already.

So we consider the global program to be a useful addition to the current Fish and Wildlife Service suite of programs but not an adequate response. What is needed probably is a new paradigm for international conservation. And this program could be considered, the one we are talking about today, a place holder potentially for further congressional direction and funding on addressing the current extinction crisis that is taking place across the planet. But we believe that a broader approach is necessary and ought to be discussed. WWF would be very happy and prepared to work with the Subcommittee and Committee on discussing best ways to address these broader needs. We would support a separate hearing on a global approach to species conservation with the goal of developing legislation consistent with the attachments to this testimony that I have provided.

In conclusion I would like to thank you for the opportunity to testify today. My organization would like to endorse this bill with the suggested changes that I mentioned. There is much to be gained in authorizing the international conservation programs of the Fish and Wildlife Service and creating one umbrella to promote synergies, efficiencies and coordination. We think it is an important step toward redefining the approach to international species conservation.

Madam Chair, I cannot emphasize how important your work has been in protecting some of the world's most endangered and iconic species. We look forward to working with you and other members of the Subcommittee and your respective staff on these most important efforts. Thank you.

[The prepared statement of Mr. Dillon follows:]

**Statement of Thomas Dillon, Senior Vice President for Field Programs,
World Wildlife Fund**

Madam Chair, Mr. Ranking Member, and members of the Subcommittee, thank you for the opportunity to testify today. My name is Thomas Dillon, and I am the Senior Vice President for Field Programs at the World Wildlife Fund (WWF). For more than 45 years, WWF has been protecting the future of nature. Today we are the largest multinational conservation organization in the world. WWF's unique way of working combines global reach with a foundation in science, involves action at every level from local to global, and ensures the delivery of innovative solutions that meet the needs of both people and nature. We currently sponsor conservation programs in more than 100 countries, thanks to the support of 1.2 million members in the United States and more than 5 million members worldwide.

I am pleased to be here today to discuss H.R. 4455, the bill being considered by the Subcommittee that would improve the Wildlife Without Borders Program of the U.S. Fish and Wildlife Service (FWS) International Affairs Office, and to discuss international species conservation more broadly.

Let me begin by recognizing your leadership, Chairwoman Bordallo and Ranking Member Brown, in raising the profile of species conservation throughout the 110th Congress. With the series of hearings and legislation that this Subcommittee and the Committee as a whole have considered during this Congress, you have done a tremendous job in advancing U.S. efforts in international species conservation. This includes enactment into law of bills to reauthorize the Rhinoceros and Tiger Conservation Act and the African Elephant Conservation Act (H.R. 50), sponsored by Rep. Young, as well as to reauthorize the Asian Elephant Conservation Act (H.R. 465), introduced by Rep. Saxton. It also includes House passage of the Great Cats and Rare Canids Conservation Act (H.R. 1464), introduced by Rep. Tom Udall and the co-chairs of the International Conservation Caucus, as well as the Crane Conservation Act (H.R. 1771), introduced by Rep. Baldwin, both of which have moved to the Senate for its consideration. This success would not be possible with-

out the strong bipartisan support within the Congress that these programs enjoy, and the exemplary management of these programs by the FWS. I would also like to take a moment to commend the staff of the Subcommittee and Committee members for their dedicated work.

My testimony today will discuss: (1) the overall importance of H.R. 4455 and the Wildlife Without Borders Program; (2) WWF collaboration with the FWS as a partner in the WWB Program; (3) some specific comments on the legislation; and (4) lastly, our recommendation that the Subcommittee begin to consider a new paradigm in international species conservation, modeled on the existing multinational species conservation programs, and incorporating the elements of the WWB program, but on a scale that seeks to address the magnitude of the extinction crisis now taking place around the world.

The Wildlife Without Borders Program

The Wildlife Without Borders (WWB) Authorization Act, H.R. 4455, defines the purpose of the bill as:

“to provide capacity building, outreach, education, and training assistance in endangered species and strategic habitat conservation to other nations by providing international wildlife management and conservation programs through the Wildlife Without Borders Program”.

The WWB Program brings three elements of the FWS international programs together under a single title. It incorporates the Multinational Species Conservation Fund (MSCF), benefiting African elephants, rhinoceros and tigers, Asian elephants, great apes, marine turtles, and potentially soon great cats and rare canids, and cranes. These programs are referred to as the Species Programs. It also incorporates the Wildlife Without Borders regional program, which helps strengthen local wildlife management capabilities and provides flexibility to FWS in regions not covered by the species programs. These programs are referred to as the Regional Programs. A third category addresses the Service’s support for international conventions and treaties, and provides a vehicle for addressing cross-cutting issues that are not covered by the previous two programs. These activities are referred to as the Global Programs.

Species Programs. The five mammal and turtle programs of the Multinational Species Conservation Funds (MSCF) provide funding for grants to support law enforcement, mitigate human-animal conflicts, conserve habitat, conduct population surveys, and support public education programs. The first of these species programs was authorized in 1989 when Congress passed the African Elephant Conservation Act to help protect African elephants from rampant poaching for ivory. Subsequent programs were added as Congress saw the need to protect other keystone species that were threatened by poaching, habitat destruction, civil strife, or demand for bushmeat in impoverished areas.

Since 1990, Congress has authorized five programs at a total of \$30 million, while appropriations in Fiscal Year 2008 were \$7.9 million. These programs have an excellent record of leveraging additional funds from public and private partners. Total funding for the MSCF from FY 1990 to FY 2007 totaled \$52 million, and was supplemented by \$128 million in matching contributions, a ratio of 2.5 to 1. Partners have included other developed countries, such as Holland, Germany, France, UK, and the European Union, private corporations like Exxon-Mobil and Disney, non-government organizations, and host country agencies.

These funds provide critical assistance to struggling species. Tigers are seriously threatened in India, where populations have fallen from an estimated 3,600 animals in 2002 to 1,400 today, and in Sumatra, where poaching and open sale of tiger products continues unabated. In China, the government is considering lifting the ban on internal trade in tiger parts to accommodate tiger farmers, an action that would unleash another round of poaching pressure on these great cats in neighboring countries.

Asian elephants face ongoing difficulties in South and Southeast Asia, where reduced habitat and human-animal conflicts over cropland threaten remaining wild populations. FWS has worked with its partners to develop innovative solutions—such as the use of domesticated elephants to guard plantations in India and Indonesia and the use of chili peppers as a deterrent to elephant depredations around cultivated areas—which have succeeded in reducing deaths of both animals and humans. In South Sudan, crucial support from the African Elephant Conservation Fund allowed for aerial surveys of this war-torn region, revealing large herds of elephants and migrations of antelope that rival the Serengeti. The promise of future tourism will contribute to greater economic security for an area that has seen much civil strife.

This year, the Marine Turtle Conservation Fund (MTCF) is expected to receive almost 100 qualified proposals totaling more than \$5 million, far surpassing the available funding. These projects relieve pressure on turtles and their eggs on nesting beaches by guarding against poaching and supporting turtle-based tourism as an alternative source of local employment. The Great Apes Conservation Act has made critical contributions to the control of bushmeat hunting and the spread of wildlife diseases like ebola to humans.

Regional Programs. The Wildlife Without Borders Regional Programs have focused largely on capacity-building and training to augment conservation management capabilities in developing countries. The Regional Programs were initiated in 1995 and have largely benefited Mexico, Latin America and the Caribbean. Smaller programs in Russia, China and India have recently been joined by a regional program for Africa. These programs not only complement the species programs by providing capacity-building, they also provide added flexibility to the FWS when conservation needs arise outside the habitat of species covered by the MSCF. The WWB Regional Programs have enjoyed a corresponding record of leveraging additional funds from external partners, having awarded a total of \$18 million and generated more than \$54 million in partner contributions.

Global Programs. The third set of programs managed by the USFWS are the Global Programs, which currently include support for United States involvement in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the RAMSAR Convention on Wetlands of International Importance, the Western Hemisphere Migratory Species Initiative, and other international treaties and conventions. Participation in these accords provides opportunities for the United States to exercise leadership in shaping international conservation policy.

Up until now "Wildlife Without Borders" has generally referred to the Regional Programs of FWS International Affairs. H.R. 4455 would expand the definition of "Wildlife Without Borders" to encompass all of the international programs of FWS—the Multinational Species Conservation Funds, the Wildlife Without Borders Regional Program, and several cross-cutting global initiatives.

Given these distinct responsibilities, we see H.R. 4455 as an effort to bring the three functions together under a single title, to supplement existing sources of funding for these activities, to codify the Regional Programs as a grant program distinct from the administrative functions of the International Affairs Division, and to set the stage for a broader global program that would provide greater flexibility for FWS to respond to conservation needs that are outside the realm of the species programs or the regional programs.

WWF Collaboration with FWS International Programs

Before commenting on specific aspects of the legislation under consideration, I'd like to speak for a moment about some of the partnerships between WWF and FWS through its international programs, in particular WWF's experience working in collaboration with the individual species programs and the WWB regional programs.

The grants for individual species conservation come through a number of separately authorized funds, and while these grants can be modest in size, their focused nature and their proven ability to leverage private funding (on the order of 2.5 to 1) has made them highly effective programs for supporting targeted programs in priority areas. Through the Rhinoceros and Tiger Conservation Fund, WWF has partnered with FWS on a number of projects to protect tiger populations in Asia, including work to update information on populations and habitat in order to determine what areas will be able to support viable tiger populations in the future. Particular effort has been focused on the Indonesian province of Riau on the island of Sumatra, which supports one of the last remaining habitats for the critically endangered Sumatran tiger. There were once two other subspecies of tigers on the Indonesian islands of Bali and Java, but these populations were driven to extinction over the course of the 20th century. The last observation of a Javan tiger was recorded in 1976. Sumatra is now the last stronghold of tigers in Indonesia, and their future there is uncertain as well, with the Sumatran tiger now numbering fewer than 400 individuals in the wild.

The main drivers of species loss in this instance are rapid deforestation and rampant poaching. A recent survey found that tiger body parts—including teeth, claws, skin, whiskers and bones—were available for sale in 10 percent of the 326 retail outlets surveyed in 28 cities and towns across Sumatra. These body parts are sold for use in traditional Chinese medicines and as souvenirs and decorative pieces. The problem is largely one of law enforcement, with a need for much more vigorous anti-poaching efforts on the part of Indonesian authorities. WWF has partnered with FWS to provide accurate and up-to-date data on tiger distribution and ecology while building local capacity for tiger conservation. We have also been working to raise

awareness among local communities about the need to protect the last populations of these great cats before they are gone for good.

Through the Asian Elephant Conservation Fund, WWF has also partnered with FWS to protect populations of Asian elephants in a number of priority regions. In Cambodia, WWF has engaged in protected area management and law enforcement patrols, as well as monitoring and research in areas containing important elephant populations. At the same time, WWF has worked to build local capacity for these elephant conservation efforts. In Nepal's Terai Arc region, WWF has used money provided by FWS to restore transboundary biological corridors between Nepal and India, helping to improve elephant habitats, address human and elephant conflicts in the corridor areas, and increase awareness in local communities—an important step to prevent such conflicts from arising. Also in Nepal, WWF has used funding from FWS to treat park patrol elephants for tuberculosis, which can appear in captive elephants and subsequently put wild populations at risk of transmission.

Through the Marine Turtle Conservation Fund, WWF has worked with FWS to study and protect vulnerable turtle populations in Mexico, the Caribbean and East Africa. The work undertaken through this Fund has helped to support community-based conservation projects that strengthen local capacity for marine conservation as well as local livelihoods. Some of this funding has also gone towards studying climate change impacts on marine turtles.

WWF has been a partner with Wildlife Without Borders Regional Programs on a number of initiatives. Through the WWB Program for Latin America and the Caribbean, WWF has received funding for a regional "Train-the-Trainer" workshop on protected area management in the Tropical Andes and Amazon region. The workshop, based in Ecuador's Podocarpus National Park, is helping to teach new skills, techniques, and methods to park rangers throughout the region. WWB has also helped to fund a guidebook on "Migratory Species of the Western Hemisphere" to support awareness of the Western Hemisphere Migratory Species Initiative (WHMSI). This document will act as an essential educational and promotional tool to raise the profile of WHMSI while communicating the importance of conserving migratory species.

WWF has received significant funding from FWS through the newest of the WWB regional programs, Wildlife Without Borders—Africa. FWS launched the Africa regional program in 2007 by awarding a \$500,000 grant for the Mentoring for Environmental Training and Outreach in Resource Conservation (MENTOR) Fellowship Program. The grant, which is one of the largest ever given by FWS, is shared between the Africa Biodiversity Collaborative Group (ABCG)—a consortium of major U.S. conservation NGOs with field programs in Africa currently based at WWF—and the College of African Wildlife Management in Mweka, Tanzania, established 45 years ago by WWF's founder, former president and chairman emeritus, Russell E. Train. MENTOR is supporting capacity building, training and career development of emerging African conservation leaders in order to build a network of leading wildlife professionals in East Africa who can develop and implement solutions to reduce illegal and unsustainable bushmeat exploitation at local, national and regional levels.

Eight MENTOR Fellows were selected from four East African nations—Kenya, Southern Sudan, Tanzania and Uganda—and are currently pursuing academic studies at the College of African Wildlife Management. One-on-one mentorship is the foundation of the 18-month program. Four highly experienced African conservation professionals are working side-by-side with the Fellows to conduct bushmeat assessments, implement field projects, and draw up plans for interventions in their respective countries. Upon completion, the Fellows will have received substantial practical, solutions-based field training, in addition to a post-graduate diploma.

MENTOR Fellows are currently engaged in conducting bushmeat assessments and drawing up plans for interventions in their respective countries. Among the planned interventions that Fellows are working on are education and awareness campaigns targeted at both local and urban markets for bushmeat, and efforts to expand and enforce wildlife laws. In some formerly war-torn areas, such as Southern Sudan, there are programs underway to train unemployed ex-combatants to become paid park rangers, providing a double benefit by helping to achieve conservation goals through wildlife protection while at the same time helping to achieve security goals by reducing the potential for armed conflict and stabilizing East African communities. These programs will be greatly enhanced by Fellows who have trained in the MENTOR Program and who can return to their home countries to act as mentors themselves while at the same time having access to a network of East African wildlife professionals who are working to combat the bushmeat trade on a regional basis.

The MENTOR Program, which involves the collaboration of U.S. experts with environmental NGOs, African institutions, and wildlife professionals from throughout East Africa, provides a clear example of the strength of the regional approach employed by FWS through the Wildlife Without Borders Regional Programs. It was recently highlighted by Secretary of the Interior Dirk Kempthorne in his address at the Opening Ceremony of Sullivan Summit VIII, attended by thousands of people including many African heads of state, and broadcast live on national TV in Tanzania on 2 June 2008.

Projects currently pending include building the capacity of government agencies and NGOs in the Ruvuma Wilderness of Tanzania and other ecoregions in East Africa to use Geographic Information Systems (GIS) as a guide to their decisions regarding wildlife and protected area management. Another would build and enhance the capacity of women currently working in protected area management and conservation in the Democratic Republic of Congo, in order to provide them with training focused on human/wildlife conflicts, illegal trade in bushmeat, wildlife/livestock diseases, and alternative sources of livelihoods for communities living around protected areas.

In WWF's experience, the species program has many decades of proven success, and the regional program has fulfilled a crucial need by providing flexible international conservation funding that is not targeted at any one species or habitat, but which can be used in a broader regional context. The regional program has been particularly successful in supporting capacity building, education and training on a regional and local scale—a critical component for bringing about a culture of conservation in those developing countries where WWB-funded projects are underway. It is only by creating a homegrown capacity for conservation in developing countries, by instilling an appreciation of the globally important biodiversity found in those countries and its value to local communities, and by ensuring the desire among local individuals to preserve their natural heritage that any conservation efforts can be confident of success over the long-term. Through its regionally focused Wildlife Without Borders Program, FWS has done much over the past twelve years to bring us closer to that goal.

WWF Comments on the Legislation

WWF reads H.R. 4455 to take the three programmatic areas of FWS responsibility for international conservation and place them under the one heading of the Wildlife Without Borders Programs. The bill would define the Wildlife Without Borders Program as an umbrella for the Species Programs, the Regional Programs and the Global Programs. As noted above, we see great value in tying the three programs together, in that it will foster greater synergy among the programs, and greater consolidation and coordination of efforts towards international species conservation within the FWS.

However, we are concerned that it may cause at least initial confusion among Congressional supporters of the Multinational Species Conservation Funds when they are renamed as the WWB Species Programs, and the erstwhile WWB Regional Programs lend their name to the new umbrella structure. We do not see renaming as an insurmountable problem, but are concerned that the MSCF might be compromised by shifting these well-established programs into a broader collective. This might be addressed by amending the bill language to clarify the relationship of these programs, and it certainly can be addressed through report language if the bill is approved by the Subcommittee and full Committee.

More to the point, while we do not read the bill as subsuming or superseding the independent authorized levels of the existing MSCF laws, we do not want there to be any confusion on this point. We understand that the resources provided by this bill would be additional to the resources already authorized for the MSCF, and are intended to provide additional support for FWS international conservation efforts beyond what they get in MSCF line-item appropriations, and what they get in baseline funding. To this end, we recommend that the funding authority in this bill be increased to \$15 million.

We support the codification of the WWB Regional Program as a separate program outside the International Affairs administrative budget. A higher profile will inevitably draw more attention to the essential need for grants for local capacity building and emphasize the complementarities of these programs with the species programs. The Regional Programs provide greater flexibility to address a broader range of species and issues than are covered by the formal species programs. We recommend that the funding authorized in this bill be directed primarily to increasing the available resources for the Regional Program.

The Global Program proposed in this bill would expand the current range of International Affairs activities beyond the support of international treaties and conven-

tions, and would provide a vehicle for addressing cross-cutting issues as a complement to activities under the Species and Regional Programs. This would provide useful flexibility to FWS in implementing conservation programs that are not currently covered by the Species Program or located in regions covered by the Regional Programs. However in its current form, the language in Section 4(b)(3) of the bill could benefit by greater elaboration on scope, description of activities, and priority-setting for potential funding. Education efforts and the use of tool-kits, and enforcement training efforts certainly have a global significance and might be improved and made more efficient if they were coordinated through a global program. A sense of other activities that might fall under the Global Program would be valuable. In addition, the language establishing the Global Program would need to address the global crises affecting species. There is none more profound than climate change, and we recommend that the Global Program specifically include activities addressing the impacts of climate change.

We consider this Global Program to be a useful addition to the current FWS suite of programs, but not an adequate response to the need for a new paradigm for international conservation. This Program can only be considered a placeholder for further Congressional direction and funding on addressing the current extinction crisis that is taking place across the planet.

Recommendations for a New Paradigm in International Species Conservation

H.R. 4455 takes the status quo and improves it in terms of the FWS programs currently in existence. However, a new paradigm for species conservation is needed, one that evolves from the current single-species programs and a focus on implementing terms for individual grants programs, towards one that embraces a strategic vision towards species conservation worldwide, with adequate resources to accomplish that vision.

Several efforts have been made to craft a bill that would take an omnibus approach to species conservation, including the Keystone Species Conservation Act of 1999 and the Flagship Species Conservation Act of 2004. While to be praised for taking the initiative towards a broader approach, these initiatives did not offer adequate funding to address the need that they recognized, nor did they offer sufficient Congressional direction or oversight to effectively address that overwhelming need.

Scientists estimate that approximately 1/10 of the world's known biological diversity is currently in danger of extinction, including at least 1/4 of all mammals, 1/3 of all primates, 1/3 of all amphibians, and 1/8 of all birds. The initial stages of a major worldwide extinction event are occurring now and it is estimated that by the end of the 21st century as much as 2/3 of the world's plant and animal species could be in danger of extinction. It is also estimated that approximately 3/4 of the world's terrestrial plant and animal species reside in whole or in part in developing nations where in many cases poor management of natural resources has exacerbated the threat of extinction to many species and directly harmed local communities. Yet the conservation of species and habitats are vital to alleviating poverty for many communities in developing countries that depend on these resources for their livelihoods, food, medicinal compounds, housing material, and other necessities. In addition, there are significant risks to the global and U.S. economies from the loss of species and their habitats around the world and the valuable services they provide. Opportunities for conserving viable populations of species and their habitats rapidly diminish with each passing year. The U.S. has maintained the tradition of serving as a leader in international conservation efforts for over 100 years, and it has an opportunity to lead the world in confronting this challenge yet again.

WWF has long seen the need for a global conservation initiative that would encompass future species needing protection, and recently has worked with conservation partners and the FWS to identify a new paradigm for conservation funding. We recognize that such an approach would be in addition to, and have no bearing on, the current MSCF, which would be considered grandfathered into the law.

In brief, we recommend that this new paradigm should:

- Be broad-based and flexible, but subject to scientifically based criteria for eligibility (e.g. IUCN Red List)
- Focus primarily on international programs in developing countries.
- Include a clearly defined system for establishing priorities among species, while retaining administrative flexibility.
- Provide adequate funding commensurate with conservation objectives, including sufficient fees to enable USFWS to meet administrative costs.
- Encourage but not require grant recipients to obtain matching funds from public and private partners.

- Require host country approval and encourage local support for programs and projects.
- Provide for coordination among Federal agencies with overlapping jurisdictions.
- Allow for outside oversight and review of program implementation.

The attached White Paper and Statement of Principles elaborate these principles and may be considered a “work in progress”. Many questions remain to be addressed in both documents, and we look forward to further productive dialogue with your staff and with our partners in conservation organizations.

We believe that a broader approach is necessary and are prepared to work with Subcommittee and Committee staff on the best way to address this need in legislation. We would support a separate hearing on a global approach, with the goal of developing legislation consistent with the principles outlined above and in the attachments to this testimony. • Conclusion

I thank you again for the opportunity to testify before you today. WWF would like to endorse H.R. 4455 with the suggested changes mentioned earlier in my testimony. There is much to be gained in authorizing the international conservation programs of FWS, and creating one umbrella to promote synergies, efficiencies and coordination. We think it is an important step toward redefining the approach to international conservation programs. Because of the continued demand on these programs, the continual strained resources available to these programs, and their proven track record of success, we recommend an authorized annual appropriations level of \$15 million.

At the same time, we urge the Subcommittee to begin consideration of new legislation to address the overarching need of species conservation globally, and to craft legislation in which Congress provides direction, parameters and priorities for FWS efforts in this regard, balanced with flexibility for FWS to use its discretion and expertise when fulfilling the need.

Madame Chair, I cannot emphasize how important your work has been in protecting some of the world’s most endangered and iconic species, which find themselves on the brink of extinction. We look forward to working with you, other members of the Subcommittee, and your respective staff, on these most important efforts.

Ms. BORDALLO. Thank you. Thank you very much, Mr. Dillon. And my colleague from Virginia has to leave to go down on the Floor to vote but we will continue on with the testimonies.

I would like now to recognize Mr. Burchfield. And, Mr. Burchfield, you are representing the Gladys Porter Zoo. And I would like to say that I had the honor of visiting the zoo when I was in Brownsville, Texas. And I think what impressed me the most was that you are taking care of many sea turtles with disabilities. And I visited and I was very impressed with the zoo. So I am very pleased that you are here to testify today.

**STATEMENT OF PATRICK M. BURCHFIELD, ED.D., MSC,
DIRECTOR, GLADYS PORTER ZOO**

Mr. BURCHFIELD. Thank you, Madam Chair, for the opportunity to testify today on H.R. 4455, the Wildlife Without Borders Authorization Act. My name is Pat Burchfield. I am Executive Director of the Gladys Porter Zoo in Brownsville, Texas.

I have had the pleasure of working with the Fish and Wildlife Service, National Marine Fisheries Service, Texas Parks and Wildlife Service, and 26 other NGO’s and industry in both Mexico and the United States in the conservation effort for the Kemp’s ridley sea turtle.

Today I am testifying on behalf of the 218 accredited institutions of the Association of Zoos and Aquariums, AZA. Our zoo is an accredited member of AZA. In general, AZA supports the conservation tenets of H.R. 4455, but we would strongly encourage the Subcommittee to consider raising the authorization limits placed on the bill to capitalize on the successes, cost effectiveness, and future op-

portunities associated with the Wildlife Without Borders programs. AZA and its member institutions are proud to work with Congress, the Federal agencies, conservation organizations, the private sector, and the general public to conserve our wildlife heritage. With 116 million visitors to 218 accredited zoos and aquariums, AZA's focus on connecting people and animals provides a critical link to helping animals in their native habitats.

Far-reaching conservation programs at AZA institutions have provided support for over 3,700 field conservation and research projects in more than 100 countries. AZA accredited zoos and aquariums are among the leaders in the protection of endangered species. Today I will highlight one of these many programs.

In reviewing the language of H.R. 4455 I took particular note to section 4[a] which states that the purpose of the bill is "to provide international wildlife conservation assistance through the initiation, facilitation, and promotion of locally adapted wildlife management and conservation programs in coordination with non-governmental organizations, governments, private businesses, and community leaders." In a microcosm that is exactly the philosophy of the Gladys Porter Zoo and our field work, and probably the same for other AZA accredited zoos and aquariums.

Because of our close proximity to Mexico and our interest in its diverse fauna, for the past 35 years we have been engaged in the conservation of the world's most critically endangered sea turtle. On one day in June in 1947, Andres Herrera of Tampico filmed what is now a classic documentary or tens of thousands of Kemp's ridley sea turtles crawling up onto shore to and from in their effort to lay their eggs and perpetuate their species.

By 1961 when science became aware of this massive nesting aggregation which is termed "arrivada" in Spanish, the numbers had dwindled to 5,000, to 2,000, and by 1978 when the Mexico-U.S. effort to save what was left of this critically endangered sea turtle began, the entire nesting production for the year 1978 was 902 nests. Despite our efforts, the population continued to decline and in 1985 we saw a total of 702 nests for the entire nesting season. That represents approximately 280 nesting females. When we think of the tens of thousands that came ashore in a single day in June of 1947, that is the most precipitous decline in any species since the extinction of the passenger pigeon.

Well, 30 years later, thanks to support from the U.S. Fish and Wildlife Service, its International Program, SEMARNAT and CONANP of Mexico, the National Marine Fisheries Service, the Texas Parks and Wildlife Department, and the fishing industries of both countries, last year we protected 15,000 nests and released over a million hatchlings into the Gulf of Mexico.

Madam Chair, according to recent estimates, 20 percent or more of the world's biodiversity could disappear over the next two decades due primarily to habitat fragmentation and alteration, climate change, and over-exploitation of threatened and endangered species. It is therefore vital and more citizens, governments, institutions and organizations become involved in efforts to conserve our imperiled environment. H.R. 4455 provides this framework for building that capacity. What makes these programs effective is that the U.S. Fish and Wildlife Service distributes these funds in

a timely and efficient manner and with very few bureaucratic entanglements. The funds are targeted to high priority field conservation efforts that most directly benefit the species or region of most concern.

Madam Chair, while we strongly support the intent and passage of H.R. 4455, we applaud Congressman Young and you for this effort. We are also concerned about the size of the Wildlife Without Borders budget. While we have seen some incremental growth in dollars appropriated by Congress for these critical conservation programs, thanks in large to the support of this Committee and Subcommittee and the actions of the Interior Appropriations Subcommittee, the overall international conservation account is not growing fast enough to meet the significant wildlife and habitat needs.

I thank you for the opportunity to be here today, applaud your efforts, and hope that you will continue with your enhancement of funding for these vital programs. Thank you so much.

[The prepared statement of Mr. Burchfield follows:]

**Statement of Dr. Patrick Burchfield, Director,
Gladys Porter Zoo, Brownsville, Texas**

Thank you Madame Chair for the opportunity to testify today on H.R. 4455—the Wildlife without Borders Authorization Act.

My name is Dr. Patrick Burchfield and I am the director of the Gladys Porter Zoo in Brownsville, Texas. Today, I am testifying on behalf of the 218 accredited institutions of the Association of Zoos and Aquariums (AZA). The Zoo is an accredited member of the AZA.

In general, AZA supports the conservation tenets of H.R. 4455 but we would strongly encourage the Subcommittee to consider raising the authorization limits placed on the bill to capitalize on the success, cost-effectiveness and the future opportunities associated with the Wildlife without Borders programs.

AZA and its member institutions are proud to work with Congress, the Federal agencies, conservation organizations, the private sector and the general public to conserve our wildlife heritage. With 160 million visitors to 218 accredited zoos and aquariums, AZA's focus on connecting people and animals provides a critical link to helping animals in their native habitats. Far-reaching conservation programs at AZA institutions have provided support over 3,700 field conservation and research projects in more than 100 countries. AZA-accredited zoos and aquariums are among the leaders in the protection of endangered species. Twenty years ago, AZA established the Species Survival Plan (SSP) program—a long-term plan involving genetically diverse breeding, habitat preservation, public education, field conservation and supportive research to ensure survival for many threatened and endangered species. Currently, AZA members are involved in 110 SSP programs that include more than 160 species.

As centers for conservation volunteerism, AZA-accredited zoos and aquariums offer the public a great way to discover connections to their environment and to learn how they can make a difference in conservation. Annually, more than 58,000 volunteers invest over 3,000,000 hours of their time supporting virtually every aspect of zoo and aquarium operations. AZA-accredited institutions also teach more than 12 million people each year in living classrooms, and have provided training to more than 400,000 teachers.

Opened in 1971, the Gladys Porter Zoo was built directly out of concern for endangered wildlife and to educate the community of South Texas about the importance of preserving the planet's resources. We strive to maintain a world-class zoological and botanical park, and to provide a positive recreational experience to an increasingly large group of visitors, both national and international. Through our daily routines, we aspire to making significant contributions to the cooperative captive management of threatened and endangered species. Our education programs are geared to establish a conservation ethic in the beneficiaries of our presentations. We present them with enthusiasm, in hopes that our efforts will ultimately help preserve the diversity of remaining wild creatures and their habitats. Like all AZA institutions, we also make contributions to scientific studies that will aid in the conservation of wildlife.

In reviewing the language of H.R. 4455, I took particular note of Section 4 (a) which states that the purpose of the bill is to “provide international wildlife conservation assistance through initiation, facilitation and promotion of locally adapted wildlife management and conservation programs in coordination with non-governmental organizations, government, private businesses and community leaders.” In microcosm, that is exactly the philosophy of the Gladys Porter Zoo and our field work—and probably the same for other AZA accredited zoos and aquariums.

We are in a unique position at the Gladys Porter Zoo. Located at the southernmost tip of Texas, Brownsville sits right on the border between the United States and Mexico. It is one of the few federally authorized wildlife ports of entry. We have historically worked closely with state and federal wildlife agents in our area. We are the logical candidate to provide veterinary and rehabilitation services for sick and injured local wildlife, as well as housing and placement of animals confiscated at U.S./Mexico border crossings.

Because of our close proximity to Mexico and our interest in its diverse fauna, for the past 35 years we have also been engaged in the conservation of the world’s most critically endangered sea turtle, the Kemp’s ridley. On one day of June 1947, Sr. Andres Herrera, from Tampico, Tamaulipas, made an historic film of tens of thousands of nesting sea turtles coming ashore and returning to the Gulf of Mexico after depositing their clutches of eggs. The film lay unknown to science until screened by Dr. Henry Hildebrand at an annual convention of Ichthyologists and Herpetologists in 1961. This massive nesting phenomenon, termed “arribada” in Spanish, along with the location of these turtles then came to light. In the ensuing years—between 1947 and the early 1960s—this population endured unrelenting exploitation for eggs, meat and leather; and when Mexican biologists began efforts to save what remained of the population, the arribadas of up to an estimated forty-thousand individuals had plummeted from five-thousand to two-thousand, and were dropping rapidly. In the late 1970s, the governments of Mexico and the United States joined together in a desperate attempt to salvage what was left of the Kemp’s ridley. In 1978, 902 nests for the entire season were all that remained of the reproductive effort. Despite strict protection of the nesting females and their eggs, the total take of the reproductive effort resulted in the most rapid decline of any species since the extinction of the passenger pigeon. The population reached its all-time low in 1985 with a total of 702 nests representing approximately 280 nesting females for that year. Mexican and U.S. federal, state, and local government agencies, NGOs and individuals stayed the course, despite discouraging results and harsh conditions.

Thirty years later there is good news. Thanks to support from the U.S. Fish and Wildlife Service and its international program, SEMARNAT / CONANP of Mexico, the National Marine Fisheries Service, the Texas Parks and Wildlife Department, the fishing industries of Mexico and the United States, and countless other businesses and individuals—more than 28 cooperating entities—the Kemp’s ridley sea turtle is crawling and swimming its way back from the brink of extinction. We are well on our way toward the downlisting of this species. In 2007, 15,000 nests were protected and more than one million hatchlings were released into the Gulf of Mexico.

Were it not for the long term support by the governments of both countries, this species would surely already have become extinct. Many individuals may have difficulty understanding the impact that one species can have on entire ecosystems. To put it in a different context, liken the loss of a species to the loss of a cog in the gears of your automobile. Clearly it is the forerunner of more serious problems to come.

Like other AZA-accredited zoos, the Gladys Porter Zoo is involved with other conservation programs around the world. This includes programs for endangered crocodilians, iguanas, margay cats, ocelots and tree kangaroos, to mention a few. The rapid loss and degradation of wild places around the world necessitates that all countries work together to try and maintain what is left of our global marine and terrestrial ecosystems for our very own survival and for that of future generations.

Madame Chair, according to recent estimates, 20 percent or more of the world’s biodiversity could disappear over the next two decades, primarily due to habitat fragmentation and alteration, climate change and the over-exploitation of threatened and endangered species. It is therefore vital that more citizens, governments, institutions and organizations become involved in efforts to conserve our imperiled environment. HR4455 provides the framework for building that capacity.

For example, over the duration of the African elephant, Asian elephant, great ape, marine turtle and rhino/tiger conservation funds, the U.S. Congress has appropriated tens of millions of dollars that have been leveraged more than three-fold from host countries and local/international non-governmental organizations (NGOs).

This is a significant partnership—especially in terms of government programs. The funds provided by Congress have served as the catalyst for the implementation of hundreds of projects worldwide ranging from highly sophisticated and innovative data collection, tracking, research and monitoring programs to simply providing essential on-the-ground resources—weapons, ammunition, vehicles and communication systems—to game wardens and law enforcement officials who have been entrusted to protect these magnificent animals from the ravages of civil unrest, poaching and habitat exploitation.

What makes these programs effective is that the U.S. Fish and Wildlife Service distributes the funds in a timely and efficient manner with very few bureaucratic entanglements. The funds are targeted to high-priority field conservation efforts that most directly benefit the species or region of most concern. More importantly, these programs have long-recognized the value of promoting cooperative projects among government entities, NGOs and the affected local communities in the range states. This is essential because it is only through local action, local education, and local support that realistic solutions for saving these species and critical habitats can be effectively devised and implemented.

Madame Chair, while we strongly support the intent and passage of H.R. 4455 and applaud Congressman Young and you for this effort, we are also concerned about the size of the Wildlife without Borders budget. While we have seen some incremental growth in the dollars appropriated by Congress for these critical international conservation programs—thanks in large part to the support of this Committee and Subcommittee and the actions of the Interior Appropriations Subcommittee—the overall international conservation account is not growing fast enough to meet the significant wildlife and habitat needs.

Therefore, AZA respectfully requests that the Subcommittee amend H.R. 4455 to significantly increase the authorization levels for Fiscal Years 2009 through 2013. The demands are too numerous, the opportunities too boundless and the stakes are too high not to reward a small, efficient program that has made tremendous contributions to wildlife conservation—especially in these times of global economic, social and environmental uncertainty.

Again Madame Chair, AZA wholeheartedly supports this effort and we look forward to working with you and the Subcommittee to secure swift passage of this bill. In addition, AZA member institutions will continue to raise the awareness of our 160 million visitors each year to bring focus on threatened species and habitats worldwide for it is public awareness and public appreciation of their plight that has helped engage the U.S. as a major catalyst for world concern.

Thank you again for this opportunity to comment on this important wildlife conservation measure. I would be happy to answer any questions that you may have.

Ms. BORDALLO. Thank you very much, Mr. Burchfield.

And, finally, I would like to recognize the last gentleman on our panel, our third panel, Mr. Arce.

**STATEMENT OF JUAN PABLO ARCE, DIRECTOR,
LATIN AMERICA AND THE CARIBBEAN, NATURESERVE**

Mr. ARCE. Good morning. My name is Juan Pablo Arce, and I am the Director of the Latin American and Caribbean program for NatureServe. Thank you very much for the opportunity to appear before the committee to speak about our experience with the Wildlife Without Borders program.

NatureServe is a non-profit conservation organization. Our mission is to provide the scientific basis for effective conservation action. We represent an international network of conservation programs operating across the U.S., Canada, Latin America and the Caribbean.

Since 2001, NatureServe has been helping to build conservation capacity in Latin America and the Caribbean by developing a series of training activities for biodiversity conservation, conservation planning, species distribution modeling, and environmental policy.

For the last two years we have worked with the U.S. Fish and Wildlife Service's Wildlife Without Borders program to carry out

training programs in Latin America. I would like to share with you the results from a two-week course on effective implementation of environmental policy that we held at the National University of Costa Rica just one month ago, in late May. The training was for graduate-level wildlife management students and protected areas decision-makers.

Thanks to support from the Wildlife Without Borders program the students received this training at no cost. It was attended by 10 graduate students from Costa Rica, Mexico and Chile, five professors from Costa Rica and Mexico, and five middle-level decision makers from Guatemala. Also attending were six current decision makers and protected areas managers from Costa Rica, Nicaragua, and El Salvador.

Using a practical case study from Guatemala, we demonstrated ways to integrate biodiversity data with social and economic information, using methods from the social sciences as well as the natural sciences.

I was the principal organizer and instructor of this integrated training activity, joined by several expert colleagues. I can tell you from this personal experience that the enthusiasm and commitment to conservation shown by the students we reached was remarkable. These are the future leaders, policy makers, and protected areas managers of their countries. It was clear that the personal connections across borders that grew among the participants were as important as the subject matter itself.

In delivering these training sessions over the past two years, we have learned some important lessons which I would like to share today.

First, focus on people. No conservation effort in Latin America will be successful in the long run unless it builds the capacity of the people who live and work there. External advice and assistance can help, but ultimately people in each country must have the tools, expertise, and resources to conserve their own lands and waters.

Second, work across borders. It is clear that biodiversity threats cross borders: habitat fragmentation, deforestation, invasive species, and climate change are just a few examples. Our responses have to cross borders too. As Conrad Lautenbacher, head of the National Oceanic and Atmospheric Administration, recently stated: "Everything is connected in our Earth system. It is science without borders."

Third, embrace innovation. The students and policy makers we are working with in Latin America are just as sophisticated as those here in the United States. They are tackling complex questions using the latest innovations and scientific methods, information technology tools, and social sciences methodologies. In fact, in the true spirit of "training the trainers," perhaps someday soon the Wildlife Without Borders program can bring these Latin American graduate students here to share their knowledge and train us in the United States.

In conclusion, we at NatureServe strongly endorse the Wildlife Without Borders Act and encourage Congress to authorize this program and strengthen it in the years to come. On behalf of NatureServe, I want to once again thank the committee for this op-

portunity and also to salute the staff of the U.S. Fish and Wildlife Service for their excellence and professionalism. Thank you.

[The prepared statement of Mr. Arce follows:]

Statement of Juan Pablo Arce, Director of Latin America and the Caribbean, NatureServe, Arlington, Virginia

Introduction

Good morning. My name is Juan Pablo Arce, and I am the Director of the Latin America and Caribbean program for NatureServe. Thank you very much for the opportunity to appear before the committee to speak about our experience with the Wildlife Without Borders program.

NatureServe is a non-profit conservation organization. Our mission is to provide the scientific basis for effective conservation action. We represent an international network of conservation programs—known as natural heritage programs or conservation data centers—operating across the U.S., Canada, Latin America and the Caribbean. We have three major objectives: First, to inform natural resource decision-making; second, to advance scientific understanding about our environment; and third, to work with partners to build conservation capacity.

Training Program

Since 2001, NatureServe has been helping to build conservation capacity in Latin America and the Caribbean by developing a series of training activities for biodiversity conservation, conservation planning, species distribution modeling, and environmental policy.

For the last two years we have worked with the U.S. Fish and Wildlife Service's Wildlife Without Borders program to carry out training programs in Latin America. I'd like to share with you the results from a two-week course on effective implementation of environmental policy that we held at the National University of Costa Rica just one month ago, in late May. The training was for graduate-level wildlife management students and protected areas decision-makers.

The primary goal of the training was to share innovative procedures for analyzing and evaluating the implementation of environmental policy within the existing social, economic and biodiversity conservation context. The course was held at the International Institute of Conservation and Wildlife Management and was part of the masters degree program in conservation at the National University of Costa Rica. Thanks to support from the Wildlife Without Borders program, the students received this training at no cost to themselves. It was attended by 10 graduate students (from Costa Rica, Mexico, and Chile), five graduate program professors (from Costa Rica and Mexico), and five middle-level decision makers (from Guatemala). Also attending were six current decision-makers and protected areas managers from Costa Rica, Nicaragua, and El Salvador, representing government and non-profit organizations.

Using a practical case study from Guatemala, we demonstrated ways to integrate biodiversity data with social and economic information, using methods from the social sciences as well as the natural sciences. The course was divided into two sessions: First, a four-day Species Distribution Modeling course, towards completion of a short modeling project using the student's own data for a species of interest. Second, a five-day Analysis of the Implementation of Environmental Policy course, integrating selected biodiversity data from the first session into the social and economic framework of analysis.

I was the principal organizer and instructor of this integrated training activity, joined by several expert colleagues. I can tell you from this personal experience that the enthusiasm and commitment to conservation shown by the students we reached was remarkable. These are the future leaders, policy-makers, and protected areas managers of their countries. It was clear that the personal connections across borders that grew among the participants were as important as the subject matter itself.

It was fascinating to see how the students and the professionals interacted and what they learned from each other. Particularly since it's clear that these graduate students, once they enter the professional world, will be the ones making the decisions for those organizations in just a few years.

An important part of the training was the fact that we were looking not just at environmental factors alone, but at how environmental policy is affected by the social and economic situation in each country, and must take them into account. Policies and recommendations that may make sense here in Washington, D.C. often look very different to a policy-maker working in a relatively poor area in Central

America. Here, for example, we may think of the value of forests principally for the wildlife that they protect. To people living there, however, an even more important value of forests may be providing clean drinking water, wood for fuel, and preventing the hillside from eroding during the next tropical storm.

Lessons Learned

In delivering these training sessions over the past two years, we have learned some important lessons which I would like to share today.

First, focus on people. No conservation effort in Latin America will be successful in the long run unless it builds the capacity of the people who live and work there. External advice and assistance help, but ultimately people in each country must have the tools, expertise, and resources to conserve their own lands and waters.

Second, work across borders. It's clear that biodiversity threats cross borders: habitat fragmentation, deforestation, invasive species, and climate change are just a few examples. Our responses have to cross borders too. The training we presented crossed borders, both in terms of the case studies used, the students who have attended, and the subject matter. As Conrad Lautenbacher, head of the National Oceanic and Atmospheric Administration, recently stated: "Everything is connected in our Earth system. It's science without borders."

Third, embrace innovation. The students and policy-makers we are working with in Latin America are just as sophisticated as those here in the United States. They are tackling complex questions using the latest innovations in scientific methods, such as predictive modeling of species ranges), information technology tools, (such as advanced GIS software), and social sciences methodologies (statistical analysis tools). In fact, in the true spirit of "training the trainers", perhaps someday soon the Wildlife Without Borders program can bring these Latin American graduate students here to share their knowledge and train us in the United States!

In conclusion, we at NatureServe strongly endorse the Wildlife Without Borders Act and encourage Congress to authorize this program and strengthen it in the years to come. On behalf of NatureServe, I want to once again thank the committee for this opportunity and also to salute the staff of the U.S. Fish and Wildlife Service for their excellence and professionalism. Thank you.

Project Background

As the world community seeks to replace unsustainable development patterns with environmentally sound management, a key challenge is the need to create a sense of common purpose, especially among the academic and government sectors. Our project was based on the premise that sound methods for analyzing the distribution of endangered species and the implementation of environmental policy are a fundamental prerequisite, as well as a catalyst for collaboration between the scientific community and concerned decision-makers. Even though the distribution of biodiversity is a key factor in establishing effective environmental policy, making a meaningful connection between the two remains a major challenge in Latin America.

This graduate-level training provided practical tools for assessing species distributions, social and economic conditions, and legislative policy information that can be used to monitor the status and effectiveness of protected areas. The case study for this training was developed based on an existing NatureServe project, funded by the Tinker Foundation, about the conservation of Dry Forests in Guatemala. The social, economic, and environmental data generated by the Guatemala project was the basis for the examples used during the training. Thus, we were able to leverage the results of current work funded through private sources to improve the quality of the training funded via the Fish and Wildlife Service.

Goal and Objectives

The goal of this initiative is to train students, faculty and decision makers to analyze the distribution of high priority species within and near Latin American protected areas, and apply the results from a Central American case study in development of sound environmental policies for biodiversity conservation in a sustainable development framework.

Project Outcomes, 2008

- Trained 20 participants (graduate level students and decision makers) in the use of methods, mathematical models and statistical tools for environmental policy analysis and species distribution modeling.
- Informed participants about the importance of evaluating policy and conservation as key factors for sustainable development and opportunities to declare and/or evaluate protected areas status.

- Provided participants the ability to apply this knowledge to protected areas work in their own countries in the future.
- Created personal and professional connections among future protected areas decision-makers from four countries.

Description

Species Distribution Modeling course (May 19-23, 2008):

- Lectures providing background on the development of distribution modeling techniques, their application in conservation biology and resource management, modeling environments to choose from, statistical considerations, use and availability of environmental data layers, and interpretation of results
- Hands-on practice using distribution models such as BIOCLIM, MAXENT, and Random Forests
- Completion of a short modeling project using the student's own data for a species of interest
- Class presentations and discussion of independent projects

Analysis of Implementation of Environmental Policy course (May 26-30, 2008):

- Presentations on basic concepts, methodology, and statistical tools for policy analysis
- Interactive GIS training within a group-study framework
- Analysis of a Central American case study in implementation on Environmental Policy using
- Integration of Species Distribution Modeling results into the statistical and spatial analysis of environmental policy
- Spatial representation of products using Geographic Information Systems (GIS)

Coordination and Instructors

Juan Pablo Arce, Director, LAC Section Support. Juan Pablo has extensive experience in policy, and conservation, which was gained through previous employment as the Bolivia Country Director for Conservation International, former Vice Minister of Natural Resources and Environment in Bolivia, and former project manager for the Paraguay Environmental Policy project. In June 2007, Juan Pablo was the instructor of an Environmental Policy training activity at UNA. Sponsored by the FWS, the course trained 16 graduate students representing four Latin America countries. He has a Master of Science in Rural and Land Ecology Survey from ITC, The Netherlands.

Bruce E. Young serves as NatureServe's Director for Species Science and will oversee the Species Distribution Modeling course. Young has 20 years of experience collaborating with Latin American scientists on conservation-related projects. Based in Costa Rica (and thereby facilitating coordination with UNA colleagues), Young has previously coordinated a species distribution modeling course in Lima, Peru, for 30 participants representing five countries. In addition, he coordinated the Moore Foundation project that used distribution modeling techniques to predict the distributions of 782 species of plants, birds, mammals, and amphibians endemic to the Andes in Peru and Bolivia. He has a Ph.D. in Zoology from the University of Washington, USA.

Santiago F. Burneo is biologist at the Pontifical Catholic University of Ecuador (PUC) whose research has focused on Mastozoology. He has Masters in Conservation Biology of the International University of Andalusia, Spain and currently serves as curator of the Mastozoology Section of the Museum of Zoology and professor at the College of Biological Sciences and Biogeography in areas such as geographic information systems. He has worked in geographical distribution model since 2002 in collaborative projects and workshops with Dr. Robert Anderson and Dr. Catherine Graham.

Kazuya Naoki is responsible for the Centre for Spatial Analysis (Laboratory GIS) Institute of Ecology at the Universidad Mayor de San Andres, La Paz, Bolivia. He has taught various subjects: Ecology of populations and communities, Conservation Biology, Biostatistics, Wildlife Management, among others, for both undergraduate and graduate from four universities. His main research interest is the spatial pattern and the determinants of distribution and abundance of different agencies at the micro and macro in the Andes. He has a BA in Biology at the University of Costa Rica and Ph.D. in Biological Sciences from Louisiana State University, USA.

Participant Comments

Participant comment, 2007 training:

"I think that the training sessions in legislation, analysis of information and interpretation of the results were of major benefit for our individual capacity building.

Since in many cases we are more familiar with the biological aspects, learning about these other aspects helped us see the problem in a much more global way.”—Carol Sánchez, International Institute for Wildlife Management and Conservation. Graduate student, Universidad Nacional de Costa Rica (UNA), Costa Rica

Participant comment, 2008 training:

“This training really expanded my knowledge. I appreciate the opportunity to participate. This course has awakened my expectations in terms of how to seek information needed to implement the theme of environmental policies with data from my own country.”—Mildred Rivera, National Environmental Information System (SINIA), Ministry of Environment and Natural Resources (MARENA), Nicaragua

Ms. BORDALLO. Muchas gracias, señor.

Mr. ARCE. De nada.

Ms. BORDALLO. For keeping it within the time limit. Thank you very much, Mr. Arce, for your testimony.

I have a few questions to ask the panelists. And Mr. Wittman had to leave for voting and he asked me to also ask this particular question; it has to do with funding.

So during the testimony this afternoon we have heard that the Wildlife Without Borders program should be authorized to receive anywhere between \$5 million and \$50 million in appropriations. Now that is quite a wide disparity. Is there any number within this range that is reasonable compromise? Could any of you answer that, possibly you, Mr. Arha?

Mr. ARHA. Thank you, Madam Chair. I would answer it by saying every dollar that this program spends it is able to match more than three to go forward on it. So as a legislative body in which there are competing demands on scarce funds in your committee and this hallowed body, one has to look at where we can use them efficiently. I would just submit to you that this program uses it as efficiently if not more than many other conservation programs.

We certainly have tremendous need, as my colleagues have said, on the ground, and that need speaks for itself. And I will let my colleagues do that. At this juncture I would leave it in your best judgment as to with all the information that you have how best to go forth on this. It certainly presents a rather odd situation when the limit may be lower than what we are already spending. But if you look at it as an additional money and what we may possibly do in the future I will leave it in your good judgment and my colleagues after.

Ms. BORDALLO. Thank you. Thank you, sir.

Perhaps somebody here could answer, what is currently being spent? This was part of Mr. Wittman’s question. Does somebody have that amount?

Mr. ARHA. The amount that we have laid out we do get under the multinational species conservation for 2007 we are looking at almost \$6 million. And the total appropriated fundings, the numbers that I have in front of me it is in addition to \$10 million right now.

I can get your more specific numbers.

Ms. BORDALLO. What is the number, Mr. Arha, is it \$10 million or?

Mr. ARHA. Ten million for multinational species conservation and 5.4 for the additional programs related with Wildlife Without Borders.

Ms. BORDALLO. So 15.

Mr. ARHA. So it is 15 millions and more, ma'am.

Ms. BORDALLO. All right. That is the number we wanted to hear.

Does anybody else have a compromise amount that they would like to? Yes, Dr. Robinson.

Mr. ROBINSON. Just that our understanding is that the discussion here is not specifically at the multinational species conservation funds, that we are really talking about a program which is the global program and the regional program. And in a very general way WCS works with a number of Federal agencies. I would say that the cost effectiveness of the U.S. Fish and Wildlife Service international program probably surpasses all. And the impact of these programs is recognized within the conservation community in a very, very significant way. And so if we are talking about a budget of \$4.5 million for all the impact, that is where the \$30 million figure came from. We looked at it in comparison to some of the other programs that we are involved in and we really felt that each of the regional programs themselves could probably spend effectively on their regional and global efforts at least that amount.

So I think there is a real opportunity to have a significant impact here.

Ms. BORDALLO. Let me ask the panel members, could a sharp increase in Federal funding create a disincentive for non-Federal matching contributions?

Mr. DILLON. Let me try to answer that. We are quite involved with leveraged funding for these projects. And I do not think there could be a disincentive at all. I think actually it would provide an incentive for more matching funds.

Right now if we are considering just these multinational species funds which we had thought were not—the funding for that was not in this bill, but if it were to become so that \$8 million, you know, leverages many times more than that. And the limitation is that \$8 million really is not very much money for the number of species that are benefiting from it, particularly given that many of them are wide-ranging species that are in multiple countries and there are many sites that need attention. So I mean I think you could ramp up the funding significantly both on the species funding and on the regional and still obtain multiples of leverage.

Ms. BORDALLO. Thank you. Thank you very much.

I also have a question here I guess I would like to hear from all of the panelists either a yes or a no. It is my understanding from reading your statements that you all agree that the bill would be clarified to ensure that any funding for the Wildlife Without Borders Program is in addition to any funds authorized and appropriated for the funds administered under the multinational species conservation fund. Is that correct?

Mr. ARHA. A very strong, yes, ma'am.

Ms. BORDALLO. All right.

Mr. ROBINSON. A very strong yes.

Ms. BORDALLO. Our next panelist?

Mr. DILLON. Yes, that is what I would say.

Mr. BURCHFIELD. Madam Chair, as I stated in previous testimony, Association of Zoo and Aquarium Institutions provided support for over 3,700 field conservation programs in more than 100 countries. If we are going to have the knowledge we need to deal

with issues like global warming, habitat degradation, these types of projects are critical to get baseline data and have good science on the species that we are talking about. In many cases we do not have the answers for how these animals will or will not adapt to changing climates, their ability to migrate, the requirements for corridors that have been discussed.

I think that the figure that was put out by our colleagues is very, very minimal.

Ms. BORDALLO. So your answer to my question then would be yes?

Mr. BURCHFIELD. Yes.

Ms. BORDALLO. Señor?

Mr. ARCE. Yes. Something that was really important here is that capacity building in Latin America it is very complex. And obviously all the funding from this program helps a lot our existing training needs. And however the most important thing here is that we are just covering part of our geographic region. We're just focusing in Central America right now. And we would like really to expand our training activities in, for instance, Mexico and for Caribbean, South America. Those are still the gaps of these training activities, especially where we would like to enhance some other audience.

These particular training activities, and thank you so much to this, to the remarkable Federal agency, was developed based on an existing NatureServe project funded by the Tinker Foundation. And that means that all of these data generated to set up a training activity was funded by another donor. And at the end if we are just considering the training activity itself that the cost was almost \$30,000 in total. The training activity probably was more than 100K. And I think that is important.

Ms. BORDALLO. Thank you very much. And I, after hearing from all of you the answer is in the affirmative; is that correct?

Mr. DILLON. Yes.

Ms. BORDALLO. Very good.

Now, you know our committee is always looking at all aspects of any bill or resolution that Congress introduces. And so some of these questions have to do with their concerns. So when we are preparing the final bill with amendments that we want to be sure that everything is included. And so this is to Mr. Tom Dillon.

There seems to be agreement on the scope of the species grant programs and to an extent with the regional program. There is far less consensus on the global program. Dr. Robinson suggested that such a program could be structure to promote coordinated Federal responses to address specific issues such as climate change, wildlife disease, and illegal trade. Would you say that this makes sense? Should the statute then include specific guidance regarding what issues should be the focus of the global program?

Mr. DILLON. Thank you for the question, Chairwoman Bordallo. My reading and WWF's reading of the bill is that it is mostly to consolidate the three existing programs that Fish and Wildlife Service has internationally. And it is quite weak I would say in the global piece. If there is going to be, you know, funding of say \$10 million I think it should focus on the regional area and there should be different legislation for the global program that would

have very specific language about the global threats to species such as climate change, invasives, disease, habitat destruction, particularly from industrial agriculture, and we are seeing a spike in that right now with fuel prices, fuel and food prices rising so quickly.

These are big issues and they take substantial amounts of money to deal with that I think the current bill as envisioned could not really handle. And so it depends on what the ambition really is of this bill. It could enhance the regional program that exists significantly and then you could consider the global program later. Or you could open this up and try and have a real global program in here. It seems to me that is a decision that the Subcommittee could make.

Ms. BORDALLO. Thank you. Thank you very much.

And, Dr. Robinson, so you have any thoughts on the same question? We want to be sure that we get everybody's input here.

Mr. ROBINSON. I mean I think with these large global threats it has an impact on a number of different areas. But what we are considering here in this bill is the impact on wildlife species. So when we begin thinking about something like wildlife disease, obviously wildlife disease is of concern to a number of Federal agencies. CDC is very involved in it, for instance. And yet there needs to be a focus on the impact of wildlife diseases on wildlife species.

Equally, the emphasis on climate change. We need to think about what is the impact on wildlife species and how to mitigate climate change on those wildlife species, recognizing that climate change has other impacts that we need to be aware of and other agencies that have interest in these things. And so what we are I think looking at is trying to identify a set of commonalities that relate to wildlife that the U.S. Fish and Wildlife Service international program could directly address and coordinate.

Ms. BORDALLO. Thank you very much.

My last question here to wrap up the discussion is to Mr. Arha. Some of you have argued that the scope of the bill should be much broader than the existing framework. In other context people have also argued that we need to look comprehensively at all the Federal programs that could be leveraged and applied to promote U.S. leadership in the global wildlife conservation. Would you then support amending the bill to direct the Secretary of Interior to appoint a Blue Ribbon Panel to conduct analysis of all the Federal programs that benefit global wildlife conservation and to offer any other recommendations? Would you go along with such an idea?

Mr. ARCE. With the sage advice and suggestion, Madam Chair, I would strongly follow, yes, that I would go along with that particular provision. I follow up with two thoughts. I agree with my colleagues on the scope of the global program. I do not see at the moment as the bill is written, and if you look at section 4[3][B] it says "address the international aspects of global conservation threats, such as invasive species and wildlife disease." Those two are mentioned. It can stand more specificity. It does not by any means exclude any of the ambitions that have been laid out here. But having a panel would certainly be a very worthy course of action and would lead us in the right direction.

One other thought I would share with you, Madam Chair, you raised a question early on about spending more money, would that

be a disincentive? And I just want to give you some figures. We at the moment are funding about half of the proposals for the grants that we have. So we have a lot of room there and I think we could rest aside and for good any concern that by raising more funds there would be any disincentive for funding as we go forward.

Thank you, Madam Chair.

Ms. BORDALLO. Thank you very much, Mr. Arha, for that statement. And all of this will be placed in the record.

Is anyone who would like to make any kind of a closing remark before we adjourned? Do you all support the blue ribbon concept? Yes, I see.

Mr. ARCE. Yes.

Ms. BORDALLO. Very good. All right.

Well, I want to thank all of you very much for being with us. I know this has been a long hearing but very worthwhile. And there being no further business before the Subcommittee, as Chair I would like to thank the members of the Subcommittee and our witnesses. And if there is no further business, the Subcommittee meeting is adjourned.

[Whereupon, at 12:40 p.m., the Subcommittee was adjourned.]

