MANAGING OUR OCEAN AND WILDLIFE RESOURCES IN A DYNAMIC ENVIRONMENT: PRIORITIES FOR THE NEW ADMINISTRATION AND THE 111TH CONGRESS

OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON INSULAR AFFAIRS,
OCEANS AND WILDLIFE

OF THE

COMMITTEE ON NATURAL RESOURCES
U.S. HOUSE OF REPRESENTATIVES

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OVERSIGHT HEARING ON "MANAGING OUR OCEAN AND WILDLIFE RESOURCES IN A DYNAMIC ENVIRONMENT: PRIORITIES FOR THE NEW ADMINISTRATION AND THE 111TH CONGRESS."

Tuesday, March 3, 2009
U.S. House of Representatives
Subcommittee on Insular Affairs, Oceans and Wildlife
Committee on Natural Resources
Washington, D.C.

The Subcommittee met, pursuant to call, at 10:03 a.m. in Room 1324, Longworth House Office Building, the Hon. Madeleine Z. Bordallo [Chairwoman of the Subcommittee] presiding.

Present: Representatives Bordallo, Kildee, Sablan, Christensen, Capps, Kratovil, Pierluisi, Wittman and Hastings.

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

Ms. BORDALLO. Good morning everyone. The oversight hearing by the Subcommittee on Insular Affairs, Oceans, and Wildlife will come to order.

The Subcommittee is meeting today to hear testimony concerning ocean and wildlife conservation priorities for the new Administration and the 111th Congress.

Under Committee Rule 4[g], the Chairwoman and the Ranking Minority Member will make opening statements.

We begin the 111th Congress during a period of great uncertainty for our nation. The United States faces an economic crisis that has led to the loss of more than 3 million jobs, frozen credit markets, and resulted in large Federal and state budget deficits.

Ever-increasing energy demands are driving efforts to rapidly develop new and existing energy sources, while the threat of climate change has great potential to affect virtually every aspect of our society.

These realities are presenting new challenges to how we manage and conserve our natural resources. Spending freezes and budget cuts, in many states and the territories, have led to a reduction in, and the cancellation of, conservation projects for fish and wildlife habitat restoration.

Charitable giving from private endowments and foundations and corporations has also declined, further straining the capabilities of public-private conservation partnerships dependent on non-Federal sources of funding.

In addition to this, the push for new energy development and energy conservation has created unanticipated trade-offs for conventional fish and wildlife conservation.

Wind energy is just one example. As we seek to develop green wind farms, we still have little understanding of how wind turbines, installed on an industrial scale, might impact migratory bird populations that the Federal Government invests millions of dollars annually to conserve. At the same time, climate change is causing shifts in migration and habitats of many species that we are only just beginning to understand.

The dynamic nature of this period of time directly challenges our conventional approaches to the conservation of fish and wildlife habitat, and to the maintenance of healthy ecosystems. In fact, the dynamic nature of our time suggests the need for a new conservation paradigm, and new information and management tools to effectively conserve fish and wildlife habitat over the long term, and across an uncertain landscape in the 21st century.

We need specific practical and constructive recommendations and priorities if we are to develop a new framework to support science-based and information-driven adaptive management of our fish and wildlife resources, both on land and in the ocean.

So, I look forward to hearing from our invited witnesses, who are presently engaged in a variety of innovative approaches to address these needs. And I also look forward to engaging my colleagues in a broader dialogue to determine how we might shape a more effective, adaptive, and cooperative conservation model for the time that we live in.

[The prepared statement of Ms. Bordallo follows:]

Statement of The Honorable Madeleine Z. Bordallo, Chairwoman, Subcommittee on Insular Affairs, Oceans and Wildlife

We begin the 111th Congress during a period of great uncertainty for our Nation. The United States faces an economic crisis that has led to the loss of more than three million jobs, frozen credit markets, and resulted in large federal and state budget deficits.

Ever-increasing energy demands are driving efforts to rapidly develop new and existing energy sources, while the threat of climate change has catastrophic potential to affect virtually every aspect of our society.

These realities are presenting new challenges to how we manage and conserve our natural resources. Spending freezes and budget cuts in many states and the territories have led to a reduction in and the cancellation of conservation projects for fish and wildlife habitat restoration. Charitable giving from private endowments, foundations and corporations has also declined, further straining the capabilities of public-private conservation partnerships dependent on non-Federal sources of funding.

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We need specific, practical, and constructive recommendations and priorities if we are to develop a new framework to support science-based and information-driven adaptive management of our fish and wildlife resources, both on land and in the ocean.

I look forward to hearing from our invited witnesses who are presently engaged in a variety of innovative approaches to address these needs. I also look forward to engaging my colleagues in a broader dialogue to determine how we might shape a more effective, adaptive and cooperative conservation model for the times we live in.

Ms. BORDALLO. And now, as Chairwoman, I recognize Mr. Hastings, the Ranking Republican Member of the Natural Resources Committee, for any statement that he may have.

STATEMENT OF THE HONORABLE DOC HASTINGS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WASHINGTON

Mr. HASTINGS. Well, thank you very much, Madame Chairman. And I have to say that I am here in place of the Ranking Member of this Subcommittee, Henry Brown, who is delayed because of the weather. And so I will just simply ask unanimous consent that Mr. Brown's full statement appear in the record, and we will go to the panel.

Ms. BORDALLO. Hearing no objection, so ordered.

Mr. HASTINGS. Thank you very much, Madame Chairman.

[The prepared statement of Mr. Brown follows:]

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

Good morning, Madam Chairwoman. As our new President has frequently reminded us, the American people are tired of partisan politics and want bipartisan solutions to the serious problems facing our country.

Today's hearing offers us an excellent opportunity to engage in bipartisanship because there are no Republican or Democratic fish, marine turtles, white tail deer or neotropical migratory birds.

It is my hope that during the next two years, we will try to work together to craft bipartisan solutions. Let me suggest some areas of potential agreement. First, we can work together to ensure through oversight hearings that the $280 million appropriated to the U.S. Fish and Wildlife Service and the $830 million appropriated to the National Oceanic and Atmospheric Administration in the stimulus package is wisely spent.

The money for the Service was allocated to undertake backlog maintenance projects, to replace old or outdated equipment, improve wildlife conservation and to improve access for the American people to our 548 national wildlife refuges and 70 national fish hatcheries. The funding for NOAA was directed toward habitat restoration, hydrographic survey backlog and for construction and vessel maintenance activities. Each agency will also receive additional funding in the Omnibus appropriations bill. It is very important that this Subcommittee oversee how these funds are being spent.

Second, we can work together to reauthorize the Sikes Act which provides valuable fish and wildlife habitat to thousands of species who reside on our 400 military installations. This law, which was first enacted nearly 50 years ago, has been a huge wildlife conservation success story.

Third, it is my hope that we can work together on the plethora of ocean-specific legislation coming before the subcommittee this Congress. Many of the bills that moved out of the Subcommittee last Congress may have been referred to as bipartisan based on the list of cosponsors, but many of the bills that were approved by

this Subcommittee were not bipartisan with respect to the legislative language included in the bill.

Finally, I look forward to our collective efforts to extend the Marine Turtle Conservation Act, the Great Ape Conservation Act and the Neotropical Migratory Bird Conservation Act at the earliest opportunity. These three landmark conservation laws have financed nearly 700 projects that have literally stopped several of these species from sliding towards extinction. Nevertheless, there is more work to be done and these laws must be reauthorized this year.

Thank you Madame Chairwoman, I look forward to hearing from out witnesses today.

Ms. BORDALLO. I would also like to, I would like to recognize other Members who are here with us. Lois Capps from the State of California, Donna Christensen from the Virgin Islands, and Mr. Kratovil, Mr. Kratovil. I welcome you to our Subcommittee meeting today.

And I thank Mr. Hastings. And I would now like to recognize our first panel of witnesses, who are already seated. Mr. Jeff Trandahl, Executive Director of the National Fish and Wildlife Federation; Dr. Peter Kareiva, Chief Scientist and Director of Science, the Nature Conservancy; Mr. Barton Thompson, Jr., Mr. Thompson is the Perry L. McCarty Director of the Woods Institute for the Environment and the Robert E. Paradise Professor of Natural Resources Law at Stanford University; and finally, Mr. John Baughman, Member of the Sporting Conservation Council.

Good morning, gentlemen. Welcome to our hearing. I will begin now with the first of the panel. And as we begin, I would note for all the witnesses that the red timing light on the table will indicate when five minutes have passed, and your time has concluded. We would appreciate your cooperation in complying with these limits, and be assured that your full written statement will be submitted for the hearing record.

And now, Mr. Trandahl, thank you for joining us today, and please begin.

STATEMENT OF JEFF TRANDAHL, EXECUTIVE DIRECTOR, NATIONAL FISH AND WILDLIFE FOUNDATION

Mr. TRANDAHL. Madame Chairwoman, Mr. Hastings, and Members of the Committee. I am Jeff Trandahl, the Executive Director of the National Fish and Wildlife Foundation. And I have to first start by apologizing.

Mark Rockefeller, the Chair of our board, was delayed because of the storm in New York and not able to appear. So, I am appearing on his behalf.

I will summarize some of his statement, and then be available, obviously at the end, for questions, or at the end of the panel for questions.

As we approach this year, the Foundation was created 25 years ago. And it was created specifically to generate private dollars to match with Federal seed monies on conservation projects of mutual interest between the Federal Government and the private sector.

In its history, we have managed more than $500 million in grant dollars, and have leveraged an impact of over $1.5 billion on the ground.

Ms. BORDALLO. Excuse me, could you move just a little closer to the mic, please?

Mr. TRANDAHL. Sure thing.

Ms. BORDALLO. Bring it closer. Thank you.

Mr. TRANDAHL. There you go. In its history it has managed more than $500 million, and has leveraged a total impact of $1.5 billion. The source of these leverage funds have come from corporate, individuals, state, and other non-Federal sources.

As we all know, these have been especially difficult and challenging times. While the last few years have provided a very positive trend related to increased environmental awareness and giving, the entire landscape has changed in the last six months.

Nationally, philanthropic giving has taken a sudden dip, and environmental giving is expected to lose resources as funders begin to respond to human-need programs, such as shelters and food banks.

With this unanticipated and rapid decline in the economy, and also major changes in the political environment, I believe the way to increase conservation funding from private sources, corporate and individual, is to do two things in particular.

One, provide clear prioritization of Federal goals and objectives. And two, create incentives to maintain and increase environmental giving by promoting the partner of private and Federal resources around common goals.

First I need to say that I believe strongly that there are many immediate and high-priority conservation needs. And more importantly, I strongly believe there is a significant financial giving capacity that can still be harnessed from the corporate community and other philanthropic funders if the right actions are taken, even in this difficult economy.

As the Subcommittee knows well, the Federal Government continues to be the largest funder of conservation work throughout the United States. Congress and the Federal Government oversee much of that funding directly, and other funds are distributed to state fish and wildlife agencies through Federal programs, such as Pittman-Robertson.

The Federal dollars divided among several different agencies cover hundreds, if not thousands, of different priorities. This investment has significant public benefits and positive impacts on land, sea, and air.

That said, Federal agency expenditures on conservation are also so broad and diverse, it is incredibly difficult to comprehend exactly what the Federal government's overall goal is for such spending.

What are the Federal conservation priorities? For example, many Federal statutes require agencies to treat all issues equally, rather than encouraging agencies around conservation partners to prioritize their efforts around achieving achievable conservation outcomes.

Moreover, across Federal agencies, even within individual agencies, there are differing conservation goals and objectives.

For private funders, these competing priorities cause confusion, and sometimes lead to inaction. Major private funders in conservation tend to be focused on many of the same funding priorities as the Federal government. However, often the programs are not operated as a single effort.

While funders in conservation tend to gravitate toward, not away from, the Federal government, largely because of leveraging opportunities, it is my experience that the Federal agencies are either not equipped, not interested, or otherwise constrained from working with private funders.

Federal Government lacks the necessary culture for partnership. Why?

Our experience is that private funders are generally seeking public partners to leverage their funds, ensure a strong scientific basis for their investments, identify strategic priorities, and provide appropriate oversight to ensure a project achieves the anticipated results once the funding has been initiated.

The Federal government is an attractive partner because it has financial resources; but more importantly, it has the ability to provide planning, science, strategy, and certainty of completion.

As Executive Director of the Foundation, I oversee an entity that was created by Congress to specifically fund and find those partnerships. While the Foundation continues to experience a period of growth and success, we still are not able to maximize fully the Federal partnerships that are out there.

I will submit the rest of my statement for the record.

[The prepared statement of Mark Rockefeller, Chairman, Board of Directors, National Fish and Wildlife Foundation, submitted by Mr. Trandahl follows:]

Statement of Mark F. Rockefeller, Chairman, Board of Directors, National Fish and Wildlife Foundation

Madame Chairwoman, Congressman Brown and Members of the Subcommittee "

Thank you for providing me the opportunity to appear today to discuss the current trends in conservation and environmental work throughout the United States and what can be done at the federal level, in particular, to encourage the expansion of private funding.

As we all know, these have been especially difficult and challenging times. While the last few years have provided a very positive trend related to increased environmental awareness and giving—the entire landscape has changed in the last six months. Overall philanthropic giving has taken a sudden dip and environmental giving is expected to lose resources as funders begin to respond to more "human need" related programs (such as shelters, food banks, etc.).

With the unanticipated and rapid decline in the economy and also major changes in the political climate, I believe the way to increase conservation funding from private sources (corporate, individual, and foundations) is to:

1. Provide clear prioritization of federal goals and objectives; and
2. Create incentives to maintain and increase environmental giving by promoting the partnering of private and federal resources around common goals.

First, I need to say that I believe strongly that there are many immediate and high-priority conservation needs. And, more importantly, I strongly believe there is significant financial giving capacity that can be harnessed from the corporate community and other philanthropic funders if the right actions are taken, even in this difficult economy.

As this Subcommittee knows well, the Federal Government continues to be the largest funder of conservation work throughout the United States. Congress and the Federal Government oversee much of that funding directly and other funds are distributed to state fish and wildlife agencies through federal programs such as the Pittman-Robertson Act.

The federal dollars are divided among several different agencies and cover hundreds (if not thousands) of different priorities. This investment has significant public benefits and positive impacts—on land, in the sea, and in the air. As a conservationist and father, I strongly support these efforts.

That said, federal agency expenditures on conservation are also so broad and diverse, it is incredibly difficult to comprehend exactly what the Federal Government's overall goal is for such spending. What are the federal conservation priorities?

For example, many federal statutes require agencies to treat all issues equally rather than encouraging agencies and conservation partners to prioritize their efforts around achieving measurable conservation outcomes. Moreover, across federal agencies—and even within individual agencies—there are differing conservation goals and objectives. For private funders, these competing priorities cause confusion and lead to inaction.

State Wildlife Action Plans have helped to establish priorities at the state level; however, many of these plans are still quite broad and don't adequately address conservation issues that cross state boundaries (e.g., conservation of habitat for migratory species).

Major private funders in conservation tend to be focused on many of the same funding priorities of the Federal Government. However, often the programs are not operated as a single effort. While funders in conservation tend to gravitate towards (not away from) the Federal Government (largely because of leveraging opportunities), it is my experience that the federal agencies are either not equipped, not interested, or otherwise constrained from working with private funders. Federal Government lacks the necessary culture of "partnerships."

Why?

Our experience is that private funders are generally seeking public partners to leverage their funds, ensure a strong scientific-basis for their investments, identify strategic priorities, and provide appropriate oversight to ensure a project achieves the anticipated results once funding has been initiated.

The Federal Government is an attractive partner because it has financial resources, but most importantly, it has the ability to provide planning, science, strategy and certainty of completion.

As Chairman of the National Fish and Wildlife Foundation (NFWF), I oversee an entity that was specifically created by Congress to promote and fund public-private partnerships. What started as a small experiment to leverage federal funding for conservation through public-private partnerships has grown into a highly successful, major catalyst for conservation action. Since our inception 25 years ago, NFWF has successfully leveraged nearly $500 million in federal funds into over $1.5 billion in on-the-ground and in-the-water conservation.

A few recent successes exemplify how NFWF has been able to establish partnerships among corporations and federal agencies with great success. For example, NFWF and the National Oceanic and Atmospheric Administration (NOAA) recently established a partnership with Covanta Energy, a waste-to-energy company located in the U.S., and Schnitzer Steel, to pilot a program, Fishing for Energy, through which fishermen dispose of derelict gear, free of charge, that Covanta in turn burns to create energy. And the results have been extraordinary; in one year, the partnership has collected and disposed of over 122 tons of derelict fishing gear from 10 gear collection ports in the Northeastern United States. Each ton of debris burned produces enough electricity to power one home for 25 days. That is enough recycled energy to run a U.S. home for eight years!

In 2008, NFWF also announced a landmark partnership with ArcelorMittal—the world's largest steel company—to address the ever increasing pressure on the freshwater ecosystems of the Great Lakes. The pooled resources of ArcelorMittal and several federal agencies has facilitated unprecedented coordination of partners and resources to support projects including habitat improvements for the endangered piping plover in Michigan, stream corridor restoration in Illinois, invasive species removal in Wisconsin, and wetland restoration in New York. With the President's FY 2010 budget request including significant increases for Great Lakes restoration, the future for partnerships in the region is very bright.

While we continue to experience a period of growth and success in bringing new funds to wildlife conservation, we still continue to fail to fully maximize the potential. Even NFWF (an organization uniquely positioned and experienced at working with agencies) finds it difficult to convince agencies to partner with us in order to leverage existing federal funds with private dollars. Too often, federal agencies opt instead to do their work alone and only with federal funds.

I am not opposed to the Federal Government as the single funder of certain efforts—but as an avid conservationist and businessman, I want to see all potential funds (both public and private) captured and put on the ground during this time of great environmental need.

We believe there are several untapped opportunities to establish new partnerships that will expand the base of funding for conservation. Our own experience this past year working with USDA Natural Resources Conservation Service (NRCS) illustrates some of this potential. Through the Conservation Innovation Grants (CIG) program, NRCS awards approximately $20 million annually to support projects that advance innovative practices and technology to improve stewardship on working

farms and ranches. This program is highly attractive to private funders as it is geared to ensuring that America maximizes food production while enhancing environmental protection goals such as minimizing soil and nutrient runoff, improving wildlife habitat, and reducing water and energy consumption.

NFWF reached out to several corporations and private foundations who share an interest in these issues. Based on our initial inquiries, we were able to identify 6-10 private funders who were excited about the opportunity to work with NRCS and NFWF to leverage funds and expand the pool of financial resources to address the high demand for this program.

We believe there are other existing federal programs that offer similar opportunities to generate partnerships with interested corporations and private foundations. It is critical for the federal government to take full advantage of these partnership opportunities if we want to achieve measurable progress in restoring healthy populations of fish and wildlife and their habitats.

I was very pleased to see in recent days statements from Secretary Salazar regarding his efforts to define a set of conservation priorities under an initiative dubbed "America's Treasures." While this initiative has yet to take shape and definition, I am very hopeful about this opportunity.

As you may be aware, NFWF is scheduled for reauthorization this coming year. I offer the opportunity to use our reauthorization as a mechanism for this Subcommittee to consider changes that will facilitate the kind of effective public private partnerships we have described today.

I believe efforts to clarify, inspire and focus potential private support will be very beneficial.

I appreciate your allowing me this time before the Committee. I am available at the appropriate time to answer any questions you may have.

Thank you again.

Ms. BORDALLO. Thank you, Mr. Trandahl, for the valuable contribution of the National Fish and Wildlife Foundation to conservation, and for all of the work to develop and implement innovative public-private partnerships. And your complete statement will be entered into the record.

To the persons who are standing, you could be seated up here around the table, if you would like.

VOICE. Right here?

Ms. BORDALLO. Right here. Some day you may be able to sit up there.

[Laughter.]

Ms. BORDALLO. I now recognize Dr. Kareiva from the Nature Conservancy to testify for five minutes.

Please proceed.

STATEMENT OF PETER KAREIVA, Ph.D.,
CHIEF SCIENTIST, THE NATURE CONSERVANCY

Mr. KAREIVA. Thank you, Madame Chairwoman, for this opportunity.

The Nature Conservancy, as many of you may know, is the world's largest conservation organization. And just one dimension of that is we own and manage over 1400 private nature sanctuaries. That is a tremendous investment.

And much of my job is geared toward providing scientific tools and decision support for how to protect that investment and other natural assets.

And I just want to draw attention to a couple of examples of these decision-making tools and support. My written testimony goes into much greater detail.

Let us start with the coastline. Seventy percent of the world's population lives along the coast, and an equal percentage of the

world's economic activity is in coastal areas or in delta areas. And these are areas that are at risk from rising sea level, more extreme storms, and are getting heavily battered. They are vulnerable. They also are sites of important habitats and nursing grounds for fisheries.

So, the suite of tools that we develop for these marine coastlines are to identify what is vulnerable, identify what is valuable, and very clearly map some of the options and provide some guidance to the decisions that are before us.

We have two examples of where we have played this out. One is in the Florida panhandle, where we map wildlife, we map offshore habitat that could reduce storm surge. We also actually map vulnerable human communities. And that helps us establish priorities for actions that would protect nature and people.

And we don't do any of this alone. A big partner in this is NOAA and universities.

Another example is the Long Island Sound, where we detail some of the consequences of sea level rise, and look at different adaptation strategies, different ways of responding to that threat, and make clear the choices before us.

So, we don't just do maps of shoreline. The second tool I want to turn your attention to is what is called the Natural Capital Project. And this is a partnership where we rely on cutting-edge science from Stanford University—and I like to think that we do the cutting-edge implementation of that science. And again, it is maps, and again, it is decision support; but it is maps not just of the shoreline, it is maps of land and water use and infrastructure and energy development.

And what we do is we economically value ecosystem services. Things like climate regulation, carbon sequestration, clean water, timber, agriculture, recreation. We map the landscape, we map alternative uses of the landscape, and translate it into cost-benefit analysis. And this has proven to be a very valuable tool to have when you see the consequences of the choices that are between us, and to deal with those trade-offs you mentioned in your opening remarks.

We have applied it in several countries around the world, and are just beginning to apply these tools in the United States.

And let me end by making one sort of general point about these tools. And this is more from my personal experience, working with these mapping techniques, and working in real places.

In these times, with water creeping up, storms being more severe, heat stress, and many of the other stresses we face, you know, it is hard not to feel enormous anxiety, I guess you would say.

But we have options. When you look at these maps, what you see is we do have options. The landscape isn't totally filled. There is more than one thing we could do. And it is my personal experience that often the best option is investing in natural ecosystems. It is the most cost-effective and durable option, in many cases.

Not always. Not always, for sure. For sure, sometimes are engineering solutions and alternative solutions. But using these mapping techniques, looking at what is valuable, what is vulnerable, and what our options are, I think we could have a very affective

investment strategy for our natural resources that benefit both the natural ecosystems and our economies, and people's safety.

Thank you.

[The prepared statement of Mr. Kareiva follows:]

Statement of Dr. Peter Kareiva, Chief Scientist, The Nature Conservancy

I am Peter Kareiva, the Chief Scientist for The Nature Conservancy (TNC). Prior to taking a position at The Conservancy, I served as Director of Conservation Biology Division at the Northwest Fisheries Science lab in Seattle, which is part of NOAA. Prior to working for NOAA, I was a Professor at University of Washington and had pursued a twenty year career of research in conservation, agriculture, and resource management. I have dedicated my scientific career to using rigorous but practical analysis and synthesis of environmental information in order to effectively manage and use our lands and waters. I am here today to talk about the information needs for resource management in an uncertain world facing climate change and potential ecosystem degradation. I also want to describe some new decision-support tools and planning tools that have the potential to guide future human impacts in a way that provides a sustainable future for people and our natural assets.

The Nature Conservancy's on-the-ground conservation work is carried out in all 50 states and in 32 foreign countries and is supported by approximately one million individual members. The Nature Conservancy has protected more than 117 million acres of land and 5,000 miles of river around the world. Our work also includes more than 100 marine conservation projects in 21 countries and in 22 U.S. states. The Conservancy owns and manages approximately 1,400 reserves throughout the United States—the largest private system of nature sanctuaries in the world. We use science to protect our investments, to manage our lands, and to make sure our natural assets will sustainably contribute to both biodiversity protection and to meeting human needs. To achieve our goals we routinely partner with government agencies, with other land trusts, with universities, and with private enterprise. As climate change has begun to show its impacts on lands and waters, and as the human footprint grows, we have found our responsibility increasingly challenging. It is my job as Chief Scientist to provide technical guidance and leadership so that the Conservancy is able to make smart decisions about marine, freshwater, and terrestrial conservation and management. There are two lessons we have learned as we seek to make sure that people and nature emerge as winners in the face of the many different and interacting threats to the environment.

1. First, we need to invest in data collection, information systems and performance measures that allow us to engage in adaptive management, which is a fancy phrase that means "learn by doing in as efficient a way as possible". There is nothing more essential to institutional, national, and environmental survival than learning and improving.
2. Second, we need to create and provide easy access to decision-support tools that can clarify for the public and decision makers the tradeoffs inherent in different options. Honest assessments of tradeoffs will promote informed decisions that in some cases might mean sacrifices to certain stakeholders, but in other cases could actually be win-win's for all involved. Particularly needed are tools that help people to see the economic value of natural assets so that people do not make foolhardy decisions that at first glance seem like a good investment, but upon rigorous analysis turn out to be bad ideas.

I will focus in this testimony on concrete examples of tools and approaches that represent The Conservancy's experience at synthesizing information for adaptive management and developing decision support tools. We initiated development of many of these approaches before the impact of climate change was evident, but now feel a sense of urgency to improve our approaches given the rapid change and the uncertainty that the world faces.

Marine Regional Assessments

Over the last 10 years, the Conservancy has worked with a wide range of stakeholders and partners to complete marine regional assessments in nearly all U.S. waters and many waters internationally. Through these assessments, we have integrated databases and developed maps of the distributions of marine ecosystems, habitats, species, and human uses for most of the United States. This information, when used as part of a stake-holder process, provides a foundation to identify priority areas for conservation, restoration, and management. Examples of how these integrated data sets have been used range from helping to identify marine protected areas and no-trawl areas in California to developing comprehensive fish and wildlife

management plans in Oregon and Florida to partnering with NOAA to assess priority sites for restoration throughout the country. We have also used regional planning information to provide guidance on energy siting decisions. We have shared these data and approaches through workshops, scientific publications, reports, and websites. Over the last several years, we have we have worked with partners to expand our conservation decision-support tools to directly address fishery, coastal hazard, and energy objectives jointly with conservation objectives. Examples of these approaches and current products are available at www.marineebm.org. The key to these mapping tools is identifying a smart mix of fishing, resource extraction, and nature protection.

Developing Multi-Objective Marine Management Approaches: Adapting to Protect Human and Natural Communities

One cannot promote fisheries over all other alternatives, just as one cannot just promote only conservation. The world is not that simple. Instead resource managers must move from single objective plans and management (e.g., just conservation or just fish production) towards approaches that look at the trade-offs among multiple objectives and services. The aim is to identify solutions that minimize conflicts and maximize benefits among these multiple objectives and services. The Conservancy and partners have been developing approaches for combining fisheries, hazard mitigation, energy siting, and conservation objectives together into common frameworks.

One of the areas where there are real opportunities for identifying win-win solutions for human and natural communities is in building approaches that combine hazard mitigation and biodiversity conservation in coastal zones. The goal here is to restore coastal ecosystems to preserve infrastructure and protect human communities. Coastlines have always been dynamic, but are now more so than ever because of changing storm patterns and sea level rise, placing human and natural communities at greater risk. The costs of these hazards to human and natural communities are increasing as coastal development continues and natural buffers, such as coastal wetlands and dunes, are lost.

Despite a growing awareness of the reality of these hazards, communities and local decision makers still have little access to information on likely changes in storm and flooding risk or tools to visualize the potential impacts and identify alternative scenarios. As a consequence, communities are unable to integrate sea level rise and coastal hazard risk into decision-making regarding natural resource protection and land use management. This information is needed to protect human communities from the dramatic changes that are underway. The Conservancy has contributed to the development of two different examples of tools and approaches that can help address these services and objectives jointly in the Florida panhandle (www.marineebm.org/32.htm) and a more advanced and developing decision support tool for the southern shores of Long Island (http://www.coastalresilience.org).

The salt marshes, sea-grass beds and oyster reefs of Florida's Gulf Coast harbor manatees, sea turtles, piping plovers and many other threatened species, as well as serving as nurseries for economically important shrimp, crab and red snapper. These habitats also provide protection from storm surges that accompany hurricanes. Yet strategies to defend and restore coastal ecosystems—which could simultaneously assist people and expand habitats for threatened and economically valuable species—have largely been ignored in favor of engineering projects (diking, building levees, and hardening the coastline) that accelerate erosion and habitat loss. Working with scientists from the National Oceanic and Atmospheric Administration, TNC recently combined maps of critical habitats and threatened species in the Florida Panhandle with maps of anticipated storm surges and of human communities most physically and socio-economically vulnerable to storm damage. By overlaying these data sets, they were able to identify areas in which restoration should simultaneously protect the most vulnerable human populations as well as many of the area's most important species.

On the south shore of Long Island, we have developed an interactive web mapping tool to explore flooding scenarios from sea level rise and storm surge for the south shore of Long Island, New York. The aim of the project is to support evidence-based decision making to better understand the risks to human and natural communities from climate change and to inform management options. The website (http://www.coastalresilience.org) presents IPCC climate scenarios for flooding from sea level rise and storms and identifies some of their ecological, social, and economic impacts using models developed by NOAA and FEMA. We have incorporated management options such as the creation of buffers into the map server and there will be a full policy options report (and web summary) from the Pace University Land Use Law Center forthcoming. This interactive web-tool includes a set of alternative future scenarios that will help decision-makers keep the environment and public safe-

ty in mind as sea levels rise and coastal hazards increase. A wide range of partners across academia, government, and non profits are directly included in this effort. The partners include TNC, NOAA, NASA-Goddard, Association of State Floodplain managers (running FEMA models), University of California Santa Barbara, and University of Southern Mississippi, among others. There is a compelling need to expand this approach to the entire U.S. coastline. This is crucial to environmental protection and environmental justice.

Marine mapping and spatial planning: Key Points & Advice

The Conservancy has worked on marine regional plans for more than 10 years and with partners—including NOAA, EPA, USFWS, and many state agencies (e.g., Washington State Department of Natural Resources, Oregon Department of Fish and Wildlife)—has completed more than 15 regional plans around the U.S. and internationally. You cannot manage marine habitats and ecosystems if you don't know where they are and for most coastal ecosystems, decent maps of even habitat distribution do not exist. In New York, the maps that are currently used for statewide salt marsh management are from 1974. In the Gulf of Mexico, the distribution of oyster reefs was better document in the 1880s than it is today. The technology for mapping habitats nearshore is becoming quick and cheap and a concerted investment in this sort of mapping will have a high payoff. There is not a lot of sense in having comprehensive spatial management tools if the base of information does not exist.

In addition to the need for multi-objective plans described earlier, a second key element for the future of marine spatial management is in interactive decision support. We at TNC think the future is not in the prioritization tools per se but in our ability to examine alternative management scenarios interactively with stakeholders. The interactive decision support shown at www.marinemap and www.coastalresilience.org are two examples of useful approaches for the future. There is no one right answer to how to jointly manage the needs of natural and human communities. Interactive and scenario based tools allow stakeholders to examine alternatives and identify approaches.

There is no common database(s) or clearinghouse for marine information to be used in decision making. There does not need to be just one common framework and database for marine information, but a common framework would serve us all well. For example, we support the efforts to develop a multipurpose marine cadastre.

Methods and tools that help us manage freshwater systems for people and nature

Human alterations to natural stream and river flow patterns take a serious toll on the plants, animals, and freshwater ecosystems that people depend on. Environmental flows are the amount and timing of water flows required to maintain healthy freshwater ecosystems and their benefits to human communities. A well-managed water resource is appropriately allocated to people's immediate needs and to environmental flows. Conservancy scientists have pioneered the field of environmental flows and developed tools that help water managers understand how much water a river needs in each season as well as across years to support important ecological functions and biodiversity. We have developed Indicators of Hydrologic Alteration, a software program that provides useful information for those trying to understand the hydrologic impacts of human activities or trying to develop environmental flow recommendations for water managers. We have also collaborated with the U.S. Army Corps on Engineers on a software program called the Regime Prescription Tool (HEC-RPT) to assist in the development of ecologically sustainable recommendations for dam operations.

We are also developing specific tools that assess the effect of land use changes on freshwater ecosystems. In particular, Water for Tomorrow, a web-based tool being developed in partnership with IBM, will provide a modeling and visualization platform to allow users to assess the water and sediment yields of a landscape from current and projected scenarios of land cover. This project is set to conclude in April of 2010, resulting in a free-standing and broadly accessible product.

From The Conservancy's perspective, society is at a crossroads in water management and freshwater conservation. If society chooses to continue as it has, the health of our freshwater ecosystems will continue to decline at an alarming rate. But we can choose a different path, one which addresses human and ecosystem needs for water, one in which critical water quantity patterns are protected along with water quality. Capitalizing upon this opportunity, The Conservancy is contributing to the development of two certification programs that will promote sustainable water use, dam planning and operations, and catalyze the engagement of corporate

leaders, water utilities and the hydropower industry. Please go to http://allianceforwaterstewardship.org/ for more information about one of these efforts.

Valuing Natural Capital in order to make smart decision about development, infrastructure, and land or water use

Long ago The Conservancy realized that the world is not divided into pro-environment and anti-environment. Rather, everyone seeks a better world and the trick is to have tools that help us see the consequences of our decisions with as complete a cost-benefit analysis as possible. As a partnership with Stanford University and World Wildlife Fund, we have developed spatially explicit mapping and valuation tools, called InVEST (see http://www.naturalcapitalproject.org/InVEST.html). The motivation for this approach is simple: relative to other forms of capital, assets embodied in ecosystems are often poorly understood, scarcely monitored, and undergoing rapid degradation. Often the benefits that natural ecosystems deliver to humans are recognized only upon their loss. For example, Hurricane Katrina brought broader recognition of the importance of coastal ecosystems in dissipating the energy of large waves that occur during storms. Natural capital and the "ecosystem services" that flow from nature are typically undervalued—by governments, businesses, and the public—if indeed they are considered at all.

Two fundamental changes need to occur to replicate, scale up, and sustain the pioneering efforts underway to give ecosystem services weight in decisions. First, the science of "ecosystem services" (the delivery of benefits from natural ecosystems to humans) needs to be advanced rapidly. In promising a return on investments in nature, the scientific community needs to deliver knowledge and tools to quantify and forecast this return. Second, ecosystem services must be explicitly and systematically integrated into decision-making by individuals, corporations and governments. Without these advances, the value of nature will remain little more than an interesting idea captured in small, scattered, and idiosyncratic efforts.

The tool we have been developing (InVEST) is a suite of models that uses land use and land cover patterns to estimate levels and economic values of ecosystem services, biodiversity conservation, and market value of commodities provided by the landscape. Examples of the ecosystem services and commodity production that InVEST can model include water quality, water provision for irrigation and hydropower, storm peak mitigation, soil conservation, carbon sequestration, pollination, cultural and spiritual values, recreation and tourism, timber and non-timber forest products, agricultural products, and residential property value. InVEST can be run at different levels of complexity, making it sensitive to data availability and an understanding of system dynamics. Results can be reported in either biophysical or monetary terms, depending on the needs of decision-makers and availability of data. We have been applying InVEST in Hawaii, California, Washington State, China, and Colombia. This approach has already proven to be influential with decision-makers and has brought a common currency to bear on discussions among private enterprise, government, and environmental groups regarding development projects and land use.

Synthesis and Presentation of Environmental and Resource Information

When you work internationally as I do, you quickly realize we in the USA have the best data and best information on soils, topography, land cover, stream flows, climate data and so forth anywhere in the world. We could also have the best data on ecological processes and biodiversity with modest increases in investment. But we do not get the full benefit of our information advantage. Information on something as critical as climate change, past and future, is not readily accessible to decision makers or land and water-use planners. It is for this reason that TNC scientists have begun to develop a tool called "Climatewizard" (see www.climatewiz.org) that allows one to pick any state in the USA or any country in the world and get records of past temperature and precipitation trends as well as future projections under different scenarios.

There is so much environmental and ecological information out there, that decision-makers and the public get overwhelmed. For that matter, even scientific experts can be overwhelmed. There are two tiers of information and data synthesis needed. One tier concerns the simple tools The Conservancy has been using. Importantly, one must understand the limitations and biases of those tools. For that reason serious scientific research aimed at modeling and synthesis across disparate datasets (such a population distribution, wealth, climate vulnerability, freshwater flows, and biodiversity) are essential. Much of The Conservancy's success at developing practical tools is due to a "hidden" support base of analysis by researchers at universities, and especially the National Center for Ecological Analysis and Synthesis (see http://www.nceas.ucsb.edu/). The nation desperately needs centers such

as NCEAS. NCEAS has supported resource management and conservation around the world through its synthesis of environmental data and development of prototype models that resource management institutions can then tailor to everyday practical decisions.

We live in a time of rapid population growth, dramatic climate disruption, economic stress, and critical resource decisions. In spite of these challenges we still have many options. In the United States we have vast areas of intact ecosystems and some of the world's cleanest rivers. Energy development, coastal development, infrastructure development, agriculture and forestry can be done smartly in a way that gives us a sustainable future. But this will happen only with science-based decision-support tools, easy access to wide-ranging datasets, institutions that support synthesis and analysis, and monitoring of the environment in critically vulnerable regions. By combining climate change models with models of ecosystem services and human vulnerability it is possible to pinpoint sentinel sites for the monitoring of our national well-being. While The Conservancy can help develop practical tools, we cannot collect the early-warning data that the nation needs. We encourage the nation to invest in sentinel sites that track changes in our most vulnerable ecosystems. To do otherwise would be irresponsible. Moreover, as we develop the information systems and decision-support models, we can lead the world "other nations are hungry for the tools that we are developing.

Access to data and easy-to use decision support tools are the keys to smart choices about our future. We know how to do this—we need only to invest in expanding these efforts.

Ms. BORDALLO. Thank you very much, Dr. Kareiva. Your work in developing important applied tools is very encouraging.

And our next witness that will speak to us is Mr. Thompson from Stanford University. Mr. Thompson, the floor is yours. Please begin.

STATEMENT OF BARTON H. THOMPSON, JR., PERRY L. McCARTY DIRECTOR, WOODS INSTITUTE FOR THE ENVIRONMENT, STANFORD UNIVERSITY, AND ROBERT E. PARADISE PROFESSOR OF NATURAL RESOURCES LAW, STANFORD LAW SCHOOL

Mr. THOMPSON. Madame Chair and Members of the Committee, thank you very much for the opportunity to testify here today.

There are multiple challenges that are currently facing our efforts for oceans and wildlife. Climate change, competition from a growing set of land uses, including alternative energy development, reduced funding levels; all of these will require a shift in the character of the agencies that are responsible for the management of our oceans and land, and the laws that are underpinning them.

Today, separate agencies often manage separate sectors, sometimes with minimal coordination. In the oceans area, for example, one agency will manage the marine reserves, another agency will manage oil and gas development. We have something in the nature of 20 different agencies that are responsible for management in the Federal oceans, and additional ones on the state side.

Today, most agencies focus on current needs and demands, and don't necessarily have to plan ahead for future challenges. In administering some laws, such as the Endangered Species Act, Federal agencies are inevitably crisis-driven.

Today, conservation statutes generally do not admit trade-offs among species.

Today, managerial actions are largely static. Today, management decisions tend to focus on relatively small, and sometimes isolated, areas, not on broad ecological regions.

Today, the funding that agencies have to undertake their responsibilities is often inadequate.

The nature of the new challenges that are facing conservation efforts will require change.

In the future, agencies with overlapping geographical jurisdictions will need to coordinate, both to minimize conflicts between competing uses, and also to maximize protection.

In the future, agencies will need to be more proactive in anticipating the impacts of climate change, and also competing uses.

In the future, conservation agencies may need to engage in triage, and recognize that some species inevitably will disappear.

In the future, planning will need to be more comprehensive, and in particular, focused on the creation of an integrated network of reserves.

In the future, agencies will need to make greater use of adaptive management. And unfortunately, in the future, agencies will have to accomplish even more, with actually fewer resources.

These changes may, in some cases, require modification of existing laws, or the adoption of new laws.

In your letter of invitation to me, you asked for my views on the priorities for creating new legal frameworks. Thankfully, current laws provide significant discretion to existing agencies to accomplish many of the things that they need to do in the face of the challenges that you are examining. However, there are probably two priority areas that you may wish to review.

The first is to see whether or not there is currently adequate authorization for the creation of integrated networks of reserves on both land and water, that are climate-aware.

The second area would be to examine current laws to see whether or not there exists an adequate system at the moment for coordinating among the multiple Federal agencies with responsibilities over activities on Federal lands and oceans, and for proactive planning on how to utilize such lands.

There is reason, I think, for optimism. You already have a sizable number of laws that provide a foundation for agencies to do again what they will need to do in the future to address climate change, a growing number of competing uses, and reduced funding. As you will hear from the other witnesses, there are emerging tools to manage these various challenges.

With that, I will submit my written testimony, and look forward to your questions.

Thank you very much.

[The prepared statement of Mr. Thompson follows:]

Statement of Barton H. Thompson, Jr., Perry L. McCarty Director, Woods Institute for the Environment, Robert E. Paradise Professor of Natural Resources Law, Stanford University

Madam Chairwoman and Members of the Committee, thank you for inviting me to testify before you today on this important subject. My name is Barton Thompson. I am one of the two directors of Stanford University's Woods Institute for the Environment, which brings together over 300 faculty members at the university to help develop practical solutions to sustainability challenges. I am also a professor of law at Stanford University and have extensive experience with many of the laws under your jurisdiction. I serve on the board of several land trusts and foundations supporting land and marine conservation. I am testifying today in my individual capacity.

My testimony will focus on the institutional needs for protecting ocean and wildlife resources in the face of climate change and other emerging challenges. In particular, what types of governmental institutions, programs, and processes will be needed for effective protection?

The good news is that current Congressional legislation already provides many of the management tools and much of the authority and discretion that the government will need to address climate change and other emerging challenges in the coming decades. Many key federal agencies, moreover, have already begun to use their authority to develop programs and strategies for addressing the challenges. The United States Geological Survey, for example, has created the National Global Warming and Wildlife Science Center to project climate impacts, help federal agencies develop effective adaptation strategies, and collaborate in developing new tools. The U.S. Fish & Wildlife Service has developed a draft Climate Change Strategic Plan for the 21st Century, in which it commits to developing a National Fish and Wildlife Adaptation Strategy.

To provide effective protection, however, the federal government will need to (1) adopt new management approaches focused on creating effective networks of land and ocean reserves and on adapting over time to climate change; (2) collect, analyze, and use information regarding the state of, and trends in, land and marine species and ecosystems in the face of climate change; and (3) coordinate and collaborate more actively among themselves and with state managers, conservation organizations, private landowners, and other local stakeholders. Resource managers may also need to establish priorities in attempting to conserve species, recognizing that some species will be more difficult than others to protect in the future. These additional steps may require new authorizing and guiding legislation and almost certainly will require new resources. Given the increased conservation effort that is likely to be required in the future, all levels of government will want to look for new ways of reducing the cost of conservation efforts (e.g., by finding ways of conserving species on farms, ranches, and other "working landscapes" that also produce an economic profit) and identify new potential funding sources (e.g., by turning to those who benefit from the ecosystem services often provided by effective conservation).

I. Emerging Challenges

In prior sessions of Congress, the Subcommittee has already heard testimony on the emerging challenges to protection of fish and wildlife resources and ecological services. A quick overview of these challenges is important, however, because they form the basis for determining what institutional changes may be necessary.

The potential pressures from climate change head the list of challenges. No matter what mitigation measures the United States chooses to adopt, the effects of greenhouse gases in the atmosphere have substantial lag time and are predicted to impact fish and wildlife for decades to come through changes in temperature, water availability, wildfires, sea level, ocean acidification, and pests. Scientists predict that, in North America, temperature rise will shift the range of many species northward and to higher altitudes. A growing number of studies indicate that recent temperature rises have already begun to affect the ranges and migration patterns of species in the United States and globally. Scientific studies also suggest that ocean fish populations will be affected both by continuing increases in water temperature and decreases in recovery periods as extreme events occur more frequently.

One of the most troubling aspects of climate change for managers of fish and wildlife is the high level of uncertainty involved. Uncertainty regarding the level of climate change that will occur is compounded by uncertainty regarding the impact of that change on ecosystems and the fish and wildlife that inhabit them. Many scientists believe that the nation is facing a "no analog" future for fish and wildlife: current ecosystems will disassemble as species try to adjust to climate change, and then reform into new assemblies.

Land and ocean ecosystems also face new competing interests. Important efforts at energy development, in particular, may create new pressures on fish and wildlife. Both the new administration and the 111th Congress have announced that alternative energy development will be a priority. Land managers will need to coordinate projects to develop solar, wind, geothermal, and other energy sources with potentially conflicting conservation objectives. Ocean managers will need to coordinate protection of fish and ocean ecosystems with increased interest in liquefied natural gas facilities, renewable energy projects involving wave and tidal energy, and coastal aquaculture, as well as potentially with new oil and gas operations.

Government agencies and private conservation organizations, moreover, will need to protect ocean and wildlife resources in the face of more limited resources. State managers are already facing reduced conservation budgets both because of reduced

tax revenues and a fall-off in new bond measures that have historically supported conservation efforts in many states. Private conservation organizations are affected not only by these same revenue declines, but also by a reduction in private donations.

II. Ensuring that Institutions Are Up to the Challenges

Existing laws and institutions designed to protect fish and wildlife will remain central to addressing the challenges outlined above. One of the most important steps in helping species adapt to climate change, for example, will be to reduce the other stresses that the species face—e.g., habitat loss and fragmentation, over-utilization, pollution, and invasive species. Reducing these other stresses can increase natural resistance and resilience to climate change. A limited number of studies also suggest that climate change can exacerbate other stresses. Changes in water flows, for example, might worsen the impact of water pollution. To the degree that current programs to address non-climate stresses are successful, therefore, the affected species are more likely to survive climate change. And because many of these stresses are local and discrete, they will often be easier to address than climate change.

In looking beyond current programs, however, eight considerations are important in designing new institutions, programs, and tools. It is important to emphasize that, because the need to adapt to climate change is a new challenge, there is little experience upon which to directly draw in divining best practices for ocean and wildlife management. Scientific studies of how species respond to climate impacts and experience with similar challenges, however, can provide useful initial guidance.

1. Proactively Incorporate Climate Considerations into Management Programs and Plans

First, government conservation managers should use the best information available regarding the potential future impacts of climate change on ecosystems and species to proactively seek to protect those ecosystems and species. Many of the nation's current laws are focused on "crisis management," protecting species that are already in trouble from immediate threats, rather than anticipating and avoiding future problems. Where management takes place in a crisis setting, management agencies generally have only limited options, and conflicts with various stakeholders are more likely. To the extent the government can identify at an early stage climate-vulnerable species, the habitat that they may need to survive, and steps that can reduce the impact of climate change on the species, the government is likely to be more effective in protecting the species and to avoid the need either to ultimately list the species under the Endangered Species Act (ESA) or engage in other forms of crisis management.

Once a species is listed under the ESA, the Act appears to give the Fish & Wildlife Service and the National Oceanic and Atmospheric Administration (NOAA) significant authority to proactively address climate-related threats to the species. Section 4(a)(ii), for example, appears to allow these agencies to designate as "critical habitat" areas that will be essential future habitat for the species in light of climate change, even though the areas are not currently occupied by the species. Under the recent decision in NRDC v. Kempthorne, 506 F.Supp.2d 322 (E.D.Cal. 2007), the agencies must also consider the effects of climate change in jeopardy consultations (at least where the effects are "reasonably certain to occur" and "reasonably expected" to jeopardize the relevant species). In evaluating the adequacy of habitat conservation plans (HCPs) under section 10, the agencies would appear to be authorized to require that the HCPs address "reasonably foreseeable" risks from climate change.

The regulatory provisions of the ESA, however, were not designed to address uncertain future threats such as climate change and therefore are not sufficient to provide the type of proactive management that is likely to be needed. First, the ESA covers only species that are already endangered or threatened (i.e., are already at a crisis stage). Second, many provisions of the Act can be used only awkwardly, at best, to provide proactive management. Section 9, for example, applies only to land modifications that pose proximate and foreseeable harm to endangered species, making it very difficult to regulate land uses that pose threats to likely future habitat or to important corridors. Finally, even where the ESA permits some degree of proactive management as described above, the level of uncertainty involved in predicting the future range and needs of listed species may frequently make it impossible to meet the Act's standards.

Although federal laws would appear to provide the Fish & Wildlife Service and NOAA with the authority to proactively manage federal areas under their jurisdiction for the risks of climate change, neither agency has historically engaged in such planning. The National Wildlife Refuge System, for example, lacks a system-level

proactive planning program for climate change. The management of federal marine reserves also does not currently incorporate projected impacts from climate change. Both agencies, however, have begun to consider how to incorporate climate change into their missions.

The federal government might consider several proactive steps in addressing climate change. First, in establishing new land or ocean reserves, the government could consider what areas will be most important in light of likely climate impacts. New refuges might focus on what scientists often refer to as "refugia," which are areas that will probably be less affected by climate change and therefore safe havens for climate-sensitive migrants or sources of "seeds" that can be transplanted elsewhere. For example, marine protected areas might focus on areas where upwelling reduces thermal stress. New refuges might also focus on establishing current or future havens for species that are likely to be most vulnerable in other locations to climate change impacts.

Second, governmental agencies could incorporate climate change projections into their management plans for existing reserves. As mentioned earlier, the Fish & Wildlife Service has already begun to examine this option. Finally, the national government could develop new incentive systems and other programs to encourage the conservation of private lands that are likely to be essential for the future survival of species in the face of climate change, either as refugia or as the destination of migrating species.

2. Consider "Resilience," "Replication," and "Connectivity." in the Creation and Management of Reserves

A related goal in establishing new reserves or conservation programs, and in managing existing ones, should be to maximize the probability that the reserves will protect species over the long run in the face of climate change. In discussing what types of reserve system are likely to do so, scientists often talk in terms of "resilience," "replication," and "connectivity." Resilience refers to the ability of an ecosystem or species to resist shocks or surprises and to revitalize or repair itself if damaged. Scientists believe that ecosystems with high biodiversity will more easily recover from climate impacts. As mentioned earlier, reserves that are not under other stresses are also likely to be more resilient to climate change. Replication emphasizes the importance of creating a reserve system that includes multiple examples of key species or ecosystem so that, if species die out in one area, the species might still survive in another and provide a long-term source for recolonization. Finally, "connectivity" emphasizes the importance of providing connections between reserves both so that species can move from one reserve to another in response to climate change and so that species that survive in one area can naturally recolonize another.

A variety of governmental agencies and private conservation groups around the world are already utilizing these concepts to design reserve systems that are more likely to resist or recover from climate impacts. In the Florida Keys, for example, The Nature Conservancy (TNC) has created a Florida Reef Resilience Program to try to enhance the probability that coral reefs will survive climate change and other impacts. TNC is growing multiple coral genotypes at different locations along the reef and studying their survival. This in-place experiment will provide important knowledge about the genetic and geographic determinants of reef resilience and provide the basis for the selection, creation, and management of more resilient reserves in the face of climate change. The Australian government has adopted a Climate Change Action Plan for the Great Barrier Reef Marine Park that also focuses on protecting those areas with high resilience (as determined by such factors as water quality, coral cover, community composition, larval supply, recruitment success). In their work in the Australian Central Desert, TNC and the Australian Wildlife Conservancy are focused on creating connections between protected lands in order to maximize the probability of successful migration of species when necessary for survival.

These experiences, along with scientific studies, suggest again a number of considerations for improving the effectiveness of conservation laws and practice in the United States. First, focus on the creation of networks of effective protected areas, rather than on the creation of a portfolio of separate sites. The nation's current system of wildlife refuges, for example, largely consists of a number of separate sites that are often small, located in altered landscapes (and thus subject to significant external stresses), and incompletely representing imperiled species. The system would likely be more effective in the face of climate change if it consisted of a network of interrelated, resilient reserves. To the degree possible, the network would replicate critical ecosystems and species and would be connected by corridors permitting species to migrate northward or upward in response to climate change.

Where possible, the network would include reserves along climate gradients, in order to ensure effective migration in response to climate change.

Creation of a network of marine protected areas would also be valuable in protecting the oceans against the impacts of climate change. In an ideal world, the network would protect a full range of habitat and community types, and include areas of apparent resilience (e.g., reefs that still have high coral cover). The network would also ensure that the individual reserves were connected by taking into account currents, larval dispersal, and the movement of adults. Much like a diverse stock portfolio can reduce financial risk in normal economic conditions (albeit not today), such a network would also reduce risk to marine ecosystems and species from climate change.

A number of governments have created or are developing effective systems of marine reserves. The Australian government has created a network of marine reserves as part of its Great Barrier Reef Marine Park. In the United States, California is currently developing a system of marine reserves in an even larger geographic areas, the state's entire coastline, under its Marine Life Protection Act (MLPA).

Current laws in the United States would appear to provide adequate authority for the creation of such reserves. In practice, however, absent legislative directive, most reserves have been established on an individual basis rather than as part of a more comprehensive and strategic network. California's creation of a network of marine reserves has been advanced by (1) explicit legislation calling for the creation of such reserves (the MLPA), (2) the establishment of deadlines for the creation of such reserves, and (3) the creation of an institutional structure, including science advisory teams and regional stakeholder groups, to advice in the design and selection of the reserves.

Second, to the extent possible, reserves should minimize stresses on protected species from outside activities. Where practical, wildlife reserves should be surrounded by buffer zones that minimize stress from adjacent land uses. Wildlife refuges should also have adequate water supplies. Many refuges today have only limited jurisdiction or authority over needed water. For this reason, the Fish & Wildlife Service's draft strategic plan emphasizes the need to work with other governmental agencies and water users to ensure water resources of adequate quantity and quality. Marine reserves also can benefit from buffer areas. Australia's Great Barrier Reef Marine Park provides for buffering, and a new proposal in California would "zone" the coastal waters in part to ensure that uses adjacent to marine protected areas are compatible with the protection.

3. Provide for Flexibility and Adaptation

The uncertainty surrounding the impact of climate change on oceans and wildlife calls for flexibility and adaptive management in response to climate change over time. The Great Barrier Reef Marine Park is effective in part, for example, because the flexibility of its management plans have permitted adjustments in the face of new information. The marine park has established a variety of tools to which it can turn as soon as new information becomes available showing the need for the tools, ensuring that managers can respond rapidly and responsively to ongoing changes.

Many of the existing conservation laws in the United States would seem to allow for, or in some cases explicitly call for, flexibility and adaptive management in the face of climate change. Section 7 of the ESA, for example, provides that agencies must reinitiate consultations if "new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent nor previously considered." The laws governing the National Wildlife Refuge System would appear to give the Fish and Wildlife Service substantial latitude to manage the system adaptively.

In practice, however, adaptive management is only infrequently utilized. In some situations, the law does not provide adequate flexibility. Some wildlife refuges established by presidential proclamation, for example, have very specific purposes that limit flexibility. Section 7 of the ESA provides for reinitiations of consultation only where the affected federal agency has retained discretion over the covered action. In the case of private land trusts, federal tax laws require the creation of perpetual conservation easements that may be difficult to modify in response to climate change. In other cases, both the flexibility and authority needed to engage in adaptive management might exist but there is no requirement that it be utilized. Even where section 7 of the ESA provides for the reinitiation of consultations in the face of relevant new information, for example, there is no affirmative obligation to seek out new information.

A number of practical considerations often discourage the use of adaptive management where it is not required. First, the flexibility of adaptive management can conflict with the degree of certainty that is often demanded both (1) by private land-

owners and other commercial interests whose actions may be affected by management changes, and (2) by conservationists seeking to ensure protection. As a result, property owners and other commercial stakeholders often oppose the use of adaptive management and have no incentive to provide new information that might lead to the adoption of new management measures. As illustrated by the recent decision in NRDC v. Kempthorne, courts may worry that adaptive management measures are too open ended and insufficiently certain to provide effective management. Efforts such as the Fish & Wildlife Service's "no surprises" policy can reduce uncertainty for property owners but, in the view of some environmental organizations, only at the cost of threatening to undermine the agency's use of its adaptive discretion. Second, the legal focus on "final agency action" may also indirectly discourage agencies from engaging in adaptive management. NEPA, the Administrative Procedure Act, and specific conservation laws all emphasize finality, and the process required to develop a final agency action may tend to lock such actions into place.

Limited resources also restrict the use of adaptive management. Most conservation agencies have little funding and other resources available to engage in monitoring and the development of iterative actions. Management agencies also often lack the metrics needed to implement adaptive management.

The effective use of adaptive management to address climate change may therefore require explicit Congressional directive and support. New incentive systems may also need to be created to reduce stakeholder opposition to climate change. Some studies, for example, have urged the creation of economic incentives to encourage permittees under section 10 of the ESA to provide information regarding species on their property that could call for adaptive measures.

4. Develop & Use Adequate Information & Science

In order to implement the above approaches, governmental agencies need significant new science and information, including:

- Models that can predict, at regional and local levels, the likely impacts of climate change on fish and wildlife. Such models are critical to proactive management, the creation of effective reserve networks, and identifying adaptive measures.
- Baseline data on current ranges and distributions of species. This data is again important in all of the approaches described above.
- Monitoring of ecosystems and species over time. Important data can include ranges, distributions, abundance, changes in phenology, arrival and departure times of migrants, flowering dates for plants, and emergence dates for insects. Such monitoring data is critical to effective adaptive management and to determining what management approaches are likely to work in the future. Such data can also be used to help inform the public and relevant stakeholders about the impacts that climate change is having on oceans and wildlife.

Governmental agencies and other conservation groups also can benefit from more robust and comprehensive exchanges of information regarding the effectiveness of various measures to address climate change.

Significant work is still needed on all of these fronts. The National Research Council, for example, has concluded that climate change predictions are still relatively poor at both the regional and local scales. Few conservation agencies have either substantial baseline data or monitoring programs. Studies of HCPs, for example, have concluded that few HCPs have well-developed and statistically-valid monitoring programs. (Due to cost and for the reasons discussed in the last section, moreover, land owners oppose significant monitoring requirements.) Although the National Wildlife Refuge System Administration Act requires the Fish & Wildlife Service to monitor the status and trends of fish, wildlife, and plants in each refuge, the service's budget has not kept up with the needed work. While a large percentage of refuges have presence information regarding relevant bird species, for example, many have no information regarding seasonal presence or abundance.

Effective management in the face of climate change could therefore benefit from support for several new scientific efforts. First is the development of new models of regional and local impacts from climate change that could aid in the development of simulation maps and other tools for predicting ecological changes in response to climate change. Second is an inventory of the existing ranges and abundances of at-risk species in order to establish a baseline against which management actions can be planned and evaluated. Third are nationally coordinated monitoring systems that can be used by management agencies to gauge the success of management measures and decide on needed adaptive measures. The Fish & Wildlife Service in its draft strategic plan calls explicitly for a National Biological Inventory and Monitoring Partnership. The final effort is a national interagency climate-change information

network that can exchange information on successful and unsuccessful management efforts.

Efforts to collect new information can build off of existing efforts, such as NOAA's Coral Reef Ecosystem Integrated Observing System (CREIOS) and the USGS's National Phenology Network. In many cases, efforts to inventory and monitor species may be able to enlist community volunteers. A privately-supported example is the Reef Check program that uses community volunteers to collect coral reef monitoring data to supplement scientific and governmental data.

5. Integrate Across Institutions & Geographic Areas

Climate change and other emerging challenges to the effective management of oceans and wildlife are likely to require greater management integration across geographic areas and management institutions. As discussed earlier, addressing climate change may require large networks of protected areas, including corridors for moving between areas. Existing governmental reserves tend to be relatively small and, on land, embedded in a matrix of private land ownership. Such fragmentation restricts the ability of the government to address changing dynamics. Even if we started from scratch to create reserve networks, moreover, no single agency or private conservation group would be likely by itself to be able to create an optimal network. And today coordination among agencies may be more practical and efficient than significant expansion of individual reserve systems. Other groups also frequently have control over potential external stresses. Water supplies for national wildlife refuges, for example, are often under the control of water agencies such as the Army Corps of Engineers or the Bureau of Reclamation, rather than the Fish & Wildlife Service.

A number of groups, ranging from the Fish & Wildlife Service to the Western Governors' Association, have therefore called for national and regional task forces or partnerships to help bring together national, state, and local agencies, as well as private conservation groups and landowners, to address climate change on a more comprehensive basis. Although agencies and other groups probably have the authority to enter into such partnerships already, Congress might be able to help promote and speed the formation of such partnerships through explicit legislation and funding. Conservation partnerships could have multiple purposes, including coordinating conservation actions, building essential connectivity among reserves, reducing local stresses, and protecting needed water resources. Such partnerships can build on existing partnership or funding programs (such as the Partners for Fish and Wildlife Program or the State Wildlife Grants program), although Congress might wish to rationalize these programs into a more integrated system rather than simply building haphazardly on top of existing programs.

Greater integration among agencies can also help in addressing the increasing conflicts between energy and conservation uses both on land and in the oceans. Different agencies have authority over various commercial uses of land and oceans and over conservation efforts. These differing agencies also tend to have conflicting missions, policies, and programs, and they are used to having sole responsibility over the activities under their jurisdiction. Effective coordination of activities is therefore often exceptionally difficult.

A recent study of conflicts in the use of California's territorial waters examined a variety of options for resolving such conflicts among state agencies and creating an effective system for managing competing ocean activities. (See Deborah A. Sivas & Margaret R. Caldwell, A New Vision for California Ocean Governance: Comprehensive Ecosystem-Based Marine Zoning, 27 Stan. Envtl. L.J. 209 (2008).) The least radical option was to legislatively create a common set of management principles that all agencies would need to consider and follow in carrying out their management responsibilities. At the more radical end of the spectrum, the legislature could create a master management plan to be implemented by a single agency. Intermediate options would allow existing agencies to maintain their current management jurisdictions but subject them to varying levels of oversight and review by a "master agency." The study ultimately concluded that a balance was needed between protection of existing jurisdictions (given the significant expertise that existing agencies have developed over time) and the need for establishing a coordinated management regime among the agencies.

6. Be Willing to Consider the Necessity of Triage

Scientific discussions have begun to suggest that triage might be needed in protecting oceans and wildlife in an age of climate change. Some species may not be able to adjust to climate change. For example, species such as the Devil's Hole pupfish, which lives in a single cave in Ash Meadows National Wildlife Refuge in

Nevada, may not be able to adjust to change. Climate change, moreover, may quickly overburden the abilities of conservation agencies to respond.

Some governmental agencies have already begun to prioritize actions based on the chances of success. In a recent report, for example, the Tahoe National Forest stated that it has decided not to engage in some projects that might not succeed due to climate change—e.g., trying to restore salmon in rivers that are not likely to provide suitable future habitat.

Most conservation laws, however, including the ESA, appear to demand action in the face of jeopardy and do not appear to allow for consideration of feasibility. Agencies, moreover, have little experience with explicit tradeoffs. Congress, therefore, may need to provide guidance to federal agencies on how to deal with species that cannot be effectively protected or protected only with great difficulty in a time of limited resources. Should resources be spent, for example, under the ESA in developing recovery plans for non-recoverable species? One policy option for dealing with this issue would be to focus attention on ecosystem-based management rather than on single species and seek to support long-term species diversity.

7. Seek Methods for Reducing Costs

Given the sizable task of trying to protect oceans and wildlife in the face of climate change, governmental agencies at all level will need to find methods of reducing the costs of conservation measures. Land conservation managers, for example, might where possible consider the feasibility of carrying out management measures (such as the creation of corridors) on farms, ranches, and other working landscapes before seeking to establish non-use reserves. Allowing the use of land while promoting conservation can reduce the costs of the conservation. Conservation agencies might similarly look to relatively liberal easements (with consequently lower price tags) where appropriate before considering fee acquisitions of property. In all of these cases, federal agencies would seem to have the general authority to consider lower cost options, although agency culture or specific Congressional mandates might present an obstacle.

8. Look for New Funding Sources

Finally, governmental agencies at all levels, as well as private conservation organizations, could obviously benefit from new funding sources. As earlier discussion suggests, conservation in the face of climate change is likely to be expensive. One potential source of funding could be ecosystem service markets in which the beneficiaries of ecosystem services help pay for conservation measures that protect those services. Existing ecosystem service markets tend to be relatively small and localized (with the exception of the emerging carbon sequestration market), and the degree to which more significant markets will arise is questionable.

Efforts to quantify and value ecosystem service markets, however, can be helpful here. The Natural Capital Project (a collaboration among Stanford, The Nature Conservancy, and WWF) is one of several groups developing tools that can help in this quantification and valuation. Congress can help facilitate such markets through provisions such as section 2709 of the Food, Conservation, and Energy Act of 2008, which has led to the creation of the government-wide Conservation and Land Management Environmental Services Board. Even where markets for ecosystem services do not arise, the ability to quantify and value the services flowing from conservation may help local and state governments justify continued financial support of critical conservation measures.DISCLOSURE REQUIREMENT

Ms. BORDALLO. Thank you very much, Mr. Thompson. And I now recognize Mr. Baughman to testify.

STATEMENT OF JOHN BAUGHMAN, MEMBER, SPORTING CONSERVATION COUNCIL

Mr. BAUGHMAN. Thank you, Madame Chairwoman, Mr. Hastings, Members of the Subcommittee, for this opportunity to testify today.

I am John Baughman, a biologist by training, former Director of the Wyoming Game and Fish Department, former Executive Director of the Association of Fish and Wildlife Agencies here in Washington. I am currently on the Sporting Conservation Council, which is a FACA committee that advises both the Secretaries of Interior

and Agriculture on sportsmen's issues, including wildlife conservation.

Over the past year I have been involved in three parallel, but independent, efforts to formulate recommendations on fish and wildlife conservation for the new Administration and Congress.

The first is in my role with Sporting Conservation Council, where we developed a series of white papers on eight of the biggest conservation issues of our time. Those are contained in a report entitled, "Strengthening America's Hunting Heritage and Wildlife Conservation in the 21st Century."

The second effort worked with the American Wildlife Conservation Partners—that is a consortium of 42 conservation organizations—to revise their recommendations for the Obama Administration. They are in a report entitled, "Wildlife for the 21st Century, Volume Three."

And the third effort, the Association of Fish and Wildlife Agencies also came up with recommendations for the new Administration and Congress. These represent the collective opinions of those agencies legally charged with the stewardship responsibility for the nation's fish and wildlife resources.

All of those are contained in reports that accompanied my written testimony to the staff.

While these efforts were independent, the recommendations were strikingly similar. And I have characterized the really big issues identified in all three. These are my characterizations.

One is global climate change. Two is maintenance of fish and wildlife habitat. Three, invasive species and diseases. Four, the disconnect between Americans and nature. And the fifth, a lack of reasonable assured funding.

Given the short time for oral testimony, I will highlight just a few of the challenges and opportunities.

Global climate change, certainly other entities will work on the causes and solutions to global climate change. The challenges for fish and wildlife conservation will be maintenance of functional ecosystems, lessening impacts of a warmer world on at-risk species, and developing and implementing wildlife and habitat monitoring systems that are sensitive enough to allow us to identify and react to emerging impacts.

Challenges to maintenance of fish and wildlife habitats include, but certainly aren't limited to, urban sprawl, increasing frequency of catastrophic fire, poorly managed land-use practices such as agriculture and timbering, conversions from native habitat to agriculture, from agriculture to urban and suburban landscapes, impacts of energy development. And all of these are exacerbated by, and in addition to, the impacts of global climate change and invasives.

Invasive species and diseases. The most important challenge is to stop the spread of invasives. But even more challenging will be the methods to control, manage, and/or eradicate invasives once they are introduced.

The disconnect between Americans and nature. We are raising a generation of Americans whose only link to nature comes from a TV screen or computer monitor. It is not surprising that childhood obesity is epidemic. Those who don't comprehend and understand

the link between habitat and animals, man and nature, aren't likely to support the political and on-the-ground processes that ensure perpetuation of these resources.

Lack of reasonable assured funding. The challenges are twofold: less money available, lots more to do. At the turn of the last century, wildlife conservation was setting regulations for law enforcement and stalking fish. And we had adequate resources from the revenues from hunters and anglers, and appropriations from Congress for national programs.

Now we have preserving biodiversity, recovering species at risk. We have conservation education. We have solving human-wildlife conflicts, controlling wildlife/human/livestock diseases, and so forth.

Failure to act on any of these challenges will mean less wildlife, less and more fragmented habitat, more threatened and endangered species, along with regulatory and cost burdens; an unhealthier country, and greater long-term costs.

Our opportunities under global climate change, I would say comprehensive legislation that addresses emissions of greenhouse gases also generates revenues to drive the programs to identifying remedy impacts.

Maintenance of fish and wildlife habitat, opportunity to work on the really big issues, through landscape scale initiatives, such as North American Water Fowl Management Plan, conservation features of the Farm Bill, National Fish Habitat Action Plan, Healthy Lands Initiative.

Invasive species, diseases, we need to secure comprehensive legislation to address importation, possession, and management of invasives. Disconnect between Americans and nature, to support existing and create new programs and partnerships that encourage adults and children to participate in wildlife- and nature-based outdoor recreation.

Lack of reasonable assured funding. We need to improve the sustainability of traditional funding, while working with state, Federal, and private partners to develop new sources of funding.

In conclusion, there are dozens of excellent recommendations in the three reports I mentioned. The new Administration and Congress can make the needle move; that is, make measurable on-the-ground differences in conservation of fish and wildlife resources if we seize a few big opportunities under each of my categories.

But we have to do things a little different than we did in the 20th century. First, we need to address issues on a much larger landscape scale. Second, we need to work together better. Virtually all conservation needs to be delivered via partnerships. Third, we need to spend dollars more efficiently. Virtually all conservation dollars need to be leveraged. And fourth, when contributions from hunters, anglers, and Federal appropriations are no longer adequate as a primary source for funding conservation of all species for all Americans in the 21st century, new streams of adequate assured funding have to be developed.

Thank you, Madame Chairwoman.

[The prepared statement of Mr. Baughman follows:]

Statement of John Baughman, Member of the Sporting Conservation Council

Thank you Madame Chairwoman. I am John Baughman, a member of the Sporting Conservation Council (SCC), which is an officially sanctioned FACA committee that advises both the Secretaries of Interior and Agriculture on issues important to America's sportsmen and women—including those issues related to conservation of our wildlife resources. I am a biologist by training and have spent over 30 years as a wildlife conservation professional including 6 years as Director of the Wyoming Game and Fish Department and 4 years as Executive Director of the Association of Fish and Wildlife Agencies (AFWA) which is an organization of the state and federal agencies charged with management of North America's fish and wildlife resources. At present I work for AFWA, from my home in Cody, Wyoming, as a liaison between state and federal agencies, industry, and non-profit organizations on energy development and wildlife conservation issues.

Our topic today is especially timely given the new Congress, the change in administrations, and the mega-issues of world population growth, global climate change, invasive species and diseases, a faltering economy, changing demographics and social values, and a growing list of tasks and problems to be addressed with a shrinking supply of money and personnel resources.

Over the past year, I have had the opportunity to be involved to some degree in three efforts that have analyzed the wildlife conservation issues of our time and made recommendations for maintaining our fish and wildlife resources in the future. The first effort was the Sporting Conservation Council's role in responding to Executive Order 13443, "Facilitation of Hunting Heritage and Wildlife Conservation." In cooperation with the Council on Environmental Quality, the Department of Agriculture and Interior, the American Wildlife Conservation Partners, other conservation organizations, and state wildlife agencies; the SCC produced a series of white papers and recommendations on eight topics related to wildlife conservation and our nation's hunting heritage. Those white papers are contained in a report entitled "Strengthening America's Hunting Heritage and Wildlife Conservation in the 21st Century: Challenges and Opportunities" which accompanies my written testimony.

The second effort was working with the American Wildlife Conservation Partners (AWCP) to update their recommendations for the incoming administration. The AWCP is a consortium of 42 conservation organizations with a common goal to safeguard America's wildlife resources and the interests of sportsmen and sportswomen. Beginning in 2000, and then preceding each presidential election thereafter, the AWCP has prepared a series of recommendations related to the most important issues facing wildlife conservation and America's sporting traditions. The revised recommendations, "Wildlife for the 21st Century: III" which were presented to President Obama, also accompany this testimony.

Finally, the AFWA also prepared a series of recommendations for the Obama administration. These recommendations represent the collective opinion of those agencies legally charged with the stewardship responsibilities for our nation's fish and wildlife resources. Their recommendations accompany this testimony in a report entitled, "Furthering Conservation in the Public Trust: A National Fish & Wildlife Agenda."

The purpose of all three efforts—to define and analyze today's fish and wildlife conservation issues and produce actionable recommendations to ensure the future health and sustainability of these resources—is squarely on target with the purpose of this hearing. For a more in-depth discussion of the subject we are addressing I highly recommend that members of the committee and their staffs peruse these documents. Even though these three efforts were independent, the similarities between their recommendations are striking. The reports identify literally scores of issues, challenges, and opportunities, but I would categorize the really big issues—common to all three—as follows:

1. Global climate change.
2. Maintenance of fish and wildlife habitat.
3. Invasive species and diseases.
4. Disconnect between Americans and nature.
5. Lack of reasonable, assured funding.

Challenges:

Global Climate Change

While others work on the causes of and solutions for global climate change, the biggest challenges in managing aquatic and terrestrial habitats and wildlife will be in conserving functional ecosystems, lessening impacts of a warmer world on at-risk species, and developing and implementing wildlife and habitat monitoring systems

with sufficient sensitivity to identify the emerging impacts of climate change so adaptive management strategies can be employed. Failure to meet these challenges will mean greater loss of habitat and wildlife populations, more species becoming jeopardized or even extinct, and far more resources spent on recovery of individual species than would have been needed to take early preventative actions.

Maintenance of Fish and Wildlife Habitat

Healthy, sustainable ecosystems and wildlife populations depend on a healthy, somewhat stable, and resilient habitat base. Major challenges to our ability to sustain fish and wildlife habitat include, but certainly aren't limited to, urban sprawl, increasing frequency of catastrophic wildfire, poorly managed agricultural practices, impacts from domestic energy development, conversion of native habitat to agriculture and conversion of agriculture to urban/suburban landscapes, and all of these are compounded by and in addition to changes in habitat due to climate changes and invasive species. Failure to react adequately to these challenges will result in habitat loss and fragmentation, and the net effect will be fewer animals and more species at-risk.

Invasive Species and Diseases

Invasive species and diseases cause challenges on a number of fronts such as maintaining wildlife habitat; protecting human, wildlife, and livestock health; safeguarding the economic viability of agricultural and timber operations, etc. Perhaps the biggest challenges for Congress, the Administration, and all of us will be first and foremost developing and implementing better systems to prevent the spread of invasive species and diseases, and secondly, though even more challenging, developing and implementing programs to manage, control, and eliminate invasive species and diseases once they are introduced.

Disconnect Between Americans and Nature

As American society becomes more urban and opportunities for fish and wildlife-related recreation diminish, our citizens become more and more disenfranchised from nature. People who don't understand the uniqueness and success of the North American Model of Wildlife Conservation have little reason to actively support its continuance. Those who don't comprehend the link between habitat and wildlife aren't likely to participate in and support political and on-the-ground processes that ensure perpetuation of these resources. America is raising an entire generation whose only link to the out-of-doors is through a TV screen or computer monitor, and it is not surprising that child obesity is epidemic. The challenge is to increase our nation's understanding and appreciation of nature and their participation in hunting, fishing, and other wildlife-related recreation. To maintain the public's support and participation, there is also a challenge to ensure access to opportunities for quality recreational experiences.

Lack of Reasonable, Assured Funding

The North American Model of Wildlife Conservation was founded on a user-pays concept where the cost of fish and wildlife conservation was almost exclusively funded by hunters and anglers through their purchase of licenses, permits, and stamps and taxes on their equipment and supplies along with federal appropriations for national programs (e.g. wildlife refuges, interstate law enforcement, national fish hatchery system). This method of funding worked well for much of the 20th Century when wildlife conservation meant establishing regulations, law enforcement, and raising and stocking fish and wildlife to establish and supplement natural populations. The challenges now in providing adequate funding for fish and wildlife conservation are two-fold: 1) less money available, 2) lots more to do. Hunters and anglers who once provided most of the funding for all fish and wildlife conservation are declining as a percentage of the population nation-wide, and with the national economy and federal budget priorities, federal appropriations for fish and wildlife conservation have less flexibility and purchasing power than 30 years ago. Fish and wildlife conservation still includes establishing regulations, law enforcement, and stocking fish and wildlife, but it also includes major additional programs to manage and conserve all wildlife resources for all citizens (e.g. environmental protection, maintaining biodiversity, species at-risk recovery, conservation education, watchable wildlife programs, managing human/wildlife conflicts, wildlife/livestock/human disease control, etc.).

Opportunities:

As mentioned earlier in my testimony, there are literally scores of opportunities identified in the reports from the SCC, the AWCP, and the AFWA. I will highlight

of few of the most important opportunities, i.e. things that can actually make a significant on-the-ground difference under each of my five major categories.

Global Climate Change

1. Enact comprehensive climate change legislation that regulates greenhouse gas emissions.
2. Dedicate a portion of the revenue from carbon credits or other cap-and-trade protocols to state and federal programs that identify and remediate the impacts of global climate change.

Maintenance of Fish and Wildlife Habitat

1. Ensure continuance of meaningful conservation features in future Farm Bills.
2. Support delivery of habitat conservation through landscape-level conservation initiatives based on strong federal, state, corporate, private partnerships and highly leveraged federal dollars (e.g. North American Waterfowl management Plan, National Fish Habitat Action Plan, Health Lands Initiative).
3. Support tax credits and other incentives to encourage private landowners to voluntarily preserve habitat and incorporate conservation practices.
4. Support legislative and administrative changes in federal energy development processes to better balance the needs of domestic energy development with conservation of fish and wildlife resources, and develop the appropriate capacity to run these processes with federal, state, and industry funding from rents, royalties, receipts, and income.
5. Incorporate state and regional wildlife plans (e.g. State Wildlife Action Plans, Sage Grouse Conservation Strategy, Mule Deer Conservation Plan) into federal land use planning processes.
6. Develop and implement landscape-level programs to treat at-risk forest, grassland, and wetland habitats.

Invasive Species and Diseases

- Secure comprehensive legislation to address importation, possession, and management of invasive species (including pathogens and regulation of ballast water).

Disconnect Between Americans and Nature

1. Support existing and create new programs to encourage children and adults to participate in fish, wildlife, and nature-based outdoor recreation.
2. Develop federal training programs designed to give in-coming employees an understanding of wildlife conservation and the North American Model of Wildlife Conservation.
3. Develop and support programs that enhance access to public and private lands for fish, wildlife, and nature-based recreation including incentive-based programs to encourage private landowners to voluntarily provide public access.
4. Include natural resource agencies in any forthcoming "No Child Left Inside" legislation.
5. Improve and revise the Wildlife Restoration Act of 1937 to create a Recreational Boating and Fishing Foundation-like entity to promote hunting, shooting, and wildlife related outdoor recreation.

Lack of Reasonable, Assured Funding

1. Stabilize traditional funding (i.e. hunter and angler user fees and federal appropriations).
2. Encourage comprehensive evaluation of the Wildlife and Sport Fish Trust Funds by state, federal, industry, and sportsmen representatives with a goal to simplify and modernize the processes for collecting revenue and to sustain and expand funding over time.
3. Create additional sources of funding for conservation of all species and their habitats (e.g. carbon credit revenue, OCS revenue, income from new energy development).
4. Provide incentives to encourage states and private entities to develop new sources of funding.

Summary and Conclusions:

Most of the big issues we face in managing our ocean and wildlife resources in this dynamic environment can be included under one or more of my five categories: Global Climate Change, Maintenance of Fish and Wildlife Habitat, Invasive Species and Diseases, the Disconnect between Americans and Nature, the Lack of Reasonable and Assured Funding. If the new Congress and Administration dedicate themselves to seizing a few of the very top priority opportunities for each of these cat-

egories we will have "moved the needle" in making a real difference in conservation of these resources. If we are going to continue to be successful we will have to do a few things differently from the way we operated over the past 100 years: 1) we have to address issues at a much larger landscape-level scale, 2) we (federal and state governments, industry, tribes, NGOs, private individuals) have to work together much better, everything should be done in partnership, 3) all conservation dollars need to be leveraged, and 4) contributions from hunters and anglers and federal appropriations are not adequate, and probably not appropriate, as the primary source to fund wildlife conservation in America for the 21st Century; new streams of adequate assured funding must be developed. Leadership from Congress and the new Administration will be essential.

Ms. BORDALLO. Thank you very much, Mr. Baughman. And I want to commend all of our witnesses; they stayed within the time limit. Congratulations.

Your entire written statement will be included in the record.

I will now recognize the Members of the committee for any questions they may wish to ask the witnesses, alternating between the Majority and the Minority, and allowing five minutes for each Member. However, should the Members need more time, we will have a second round of questions.

I will begin with myself. And I have just one question, three parts of it, to Mr. Trandahl.

You have testified that Congress should provide clear priorities of Federal conservation goals and objectives in order to increase conservation funding from private sources.

Now, how does NFWF establish its own conservation priorities?

Mr. TRANDAHL. Great question. We have within our staff a scientific group. And we have identified what we call keystone objectives. In forming those keystone objectives, we are working alongside with the Federal agencies, as well as the conservation community, to identify through a scientific process where we believe we can move the needle on particular species or particular habitats, based upon the financial contributions we can invest into those areas.

So, it is called the keystone process. And I can submit for the record a very detailed explanation of it.

Ms. BORDALLO. Very good. I would like to have that entered into the record.

Mr. TRANDAHL. OK.

Ms. BORDALLO. And the second part of the question, how can the goal-setting process of NFWF and the Federal government be made mutually reinforcing?

Mr. TRANDAHL. I believe it is a matter of really getting a spirit within the Federal agencies to really pursue partnerships through the Foundation, or with other partners, in order to bring together those private and public dollars. As well as everyone, science and wildlife plans and everything else.

We are not short on planning, and we are not short on science. We are short on coordination, in my opinion.

Ms. BORDALLO. And then the third question along the same lines. How would Federal priorities improve the availability of funding from private sources?

Mr. TRANDAHL. What has happened is many private donors are very interested in partnering with the Federal government. I will use a real-life example here, just the last couple months.

We have been working with the Natural Resources Conservation Service, which is an agency of the USDA, on a program that is called Conservation Innovative Grants, which is a $20 million-a-year grant program.

I have been trying for two years to get them to move it into the Foundation, so one, we could administer the grants much more efficiently; but more importantly, we could then turn and try to leverage it up with the corporate community.

And in just gauging corporate interest in leveraging against that $20 million, we have had seven different companies come forward and say yes, we would want to do that, if you are able to do it.

Now, we are still pursuing, and hopefully we will be able to bring that into the agency.

The thing to realize is the values within an agency aren't necessarily to partner. Partnerships cause complication and more work. And the idea of bringing in more money is not necessarily enough of an incentive for agencies to enter into it.

Ms. BORDALLO. Thank you, thank you very much, Mr. Trandahl.

I have another question, just one more, for Dr. Kareiva. And again, Dr. Kareiva, while the Nature Conservancy has developed some impressive tools for marine mapping and planning, your testimony provided examples of data gaps that limit the ability of decision makers to use adaptive management strategies.

Now, is this patchwork of data the critical limitation on adaptive management? In other words, why isn't adaptive management used more often?

Mr. KAREIVA. I will also speak for NOAA, where I worked for the fisheries and fisheries management, as well, where that was a struggle.

Certainly there are data gaps. In the marine system, part of it is we don't have good maps yet for the whole coastline for the habitats and the resources. So, the data is a limitation.

I would say the other two limitations are strong incentives to the agencies to engage in it. We talk about it a lot, but you really need sort of strong administrative incentives. Performance, have your performance based in your agency job onto the extent to which you do adapted management.

And the third thing is that adaptive management is new, and you need some tools to help people. You need, some of the tools that we develop at the Nature Conservancy are meant to synthesize that information, and present it in a way that doesn't overwhelm you with the complexity of the program.

And if you have those tools, I think people will be much more amenable to doing it. If we make it easy for them. Incentivize and make it easy.

Ms. BORDALLO. Another part of the question. Do tools and technology exist to effectively fill the critical data gaps? And can this be done in a cost-efficient manner?

Mr. KAREIVA. Prototypes of all the tools and data do exist. With, I hesitate to give a timeframe, but in a relatively short timeframe, you know, two to five years, we could fill the data gaps and get the tools up to easy implementation. And really, on your desk, anybody could use them in a very cost-effective manner.

Most of the hard work has been done. Most of the early investment, and a lot of the hard work and research have been done.

Ms. BORDALLO. Thank you very much, Doctor. And now I would like to invite the person standing in the back to please come and be seated around the lower table here.

And now I would like to recognize the Ranking Member, Mr. Hastings, for any questions he may have.

Mr. HASTINGS. Thank you very much, Madame Chairman. I just have a couple of questions here.

Mr. Trandahl, you were—and it is good to see you.

Mr. TRANDAHL. Good to see you.

Mr. HASTINGS. You had mentioned the private and the public partnerships several times in your testimony, and in response to the Chairman's, Chairwoman's remarks.

Give me your assessment of the President's proposed budget that limits tax deductibility of those earning more than $250,000.

Mr. TRANDAHL. Yes, I expect to be going over to the Ways and Means Committee at some point.

Yes, as people are probably familiar, in the President's sort of outline of a request, there is an idea of limiting individuals who earn more than $250,000 a year, limiting their tax deductibility to nonprofits.

And I personally would have great hesitation and disappointment if that were adopted as a concept. And from the Foundation's perspective, it would be disastrous.

We rely on major gifts—obviously corporate as well as Federal dollars. And my average individual contribution is well in excess of $100,000 a year; it is not five dollars a year.

And you know, we are working the very high end of the economy in order to generate tens of millions of dollars back into conservation, that is then, in turn, matched on the ground.

So, it would have a very negative impact. And I have spent my entire weekend actually putting together all the empirical data to kind of show exactly what it would do for us, but as well for others.

Mr. HASTINGS. I thank you for that. We are not the Ways and Means Committee, but I felt it was worth, worth at least asking.

Mr. TRANDAHL. I appreciate it. And I should just mention, as well. This committee, last Congress, expanded our board from 25 to 30, which I have to say had exactly the impact that we were hoping for with the committee, which would be a dramatic increase, again, in the individual giving for the Foundation. Which it did. It has had more than a million-dollar impact.

Mr. HASTINGS. Good, thank you. Mr. Thompson, I want to ask a very broad question, because this is a hearing on climate change, yet we haven't talked about what climate change is, and how one looks ahead of it.

My understanding is that most of the predictions are based on modeling data. And I want to put this—and I want you to respond to that—but I want to put it in real-world terms. Because I was here last Thursday, and I flew back to my home in Washington. And I listened to the weather report for this weekend. And they said it was going to cool down.

There was absolutely no prediction, when I left on Thursday, that you were going to have all of this snow here. And I come back, and I see that low records were set here during the week.

So, my question to you is, based on the data long term, how can we have any confidence, when we can't predict what, just this last week we didn't predict how cold it was going to be this weekend?

Mr. THOMPSON. So, Mr. Hastings, this is a very important question. Because of the difficulties of predicting exactly what the impacts of climate change will be on our oceans and wildlife in the future, our first priority should clearly be to protect the fish and wildlife today.

But we also have to recognize that climate change may very well impact those fish and wildlife in the future. Scientists are already beginning to see what they believe is an impact on the fish and wildlife today.

And so that would suggest two things. First of all, that we be as adaptive as possible, recognizing that we are not that good at the moment at predicting into the future—so that as we begin to see change, we can adjust to those changes.

And then second of all, we do know the general nature of impacts in the future. We know, for example, that species are likely to move, that they are likely, in the United States, to move north to higher altitudes. And therefore, in thinking about the reserves that we are setting aside, and the coordination between Federal actions, state actions, and the actions of organizations like the Nature Conservancy, we need to be providing for that opportunity of movement.

Mr. HASTINGS. Madame Chairman, I see my time is about out. My question was more, how can we have confidence—because we are going to be potentially making huge decisions here that is going to cost individuals and taxpayers millions, if not billions, of dollars. And yet we are doing it, what appears to be on something that is not extremely solid data.

Madame Chairman, I have other questions, and I will wait for the second round. And maybe, Mr. Thompson, I would ask you to rethink that. I understand the impact that probably everybody feels on climate change. After all, history, long before humans were here, climate change had an effect on the species in the world, so I think that is self-evident.

The question is, how do we make these determinations based on good data. And I guess that is what the question is. But thank you very much. And thank you for your indulgence, Madame Chairman.

Ms. BORDALLO. I thank the Ranking Member, Mr. Hastings from the State of Washington.

I would like to just introduce a few new Members that have come in. We have Mr. Sablan from the Northern Marianas, and we have Mr. Pierluisi from Puerto Rico, and Mr. Wittman, State of Virginia.

And now I would like to recognize the gentlewoman from California, Lois Capps.

Ms. CAPPS. Thank you, Madame Chair. And may I say at the outset, congratulations on this hearing. The topics and the esteemed testifiers managing our oceans and wildlife resources, this is very valuable to have as we confront the 111th Congress and our

new Administration. And with the goal of establishing some priorities.

I would like to turn to Dr. Kareiva, if I could, please. And I commend you, as an organization amongst many who have worked very closely to set aside millions of acres of land and water as habitat for plants, birds, fish, other animals.

You have been working in Morro Bay in my Congressional district, dealing with marine protection. And by the way, you have also been working on that endangered group, the fishing community, through sustainable fishing that you partnered with the Environmental Defense, a very novel, and I think very worthwhile, approach, which actually touches on some of the things we are talking about here.

I would like to ask if you could describe for us what a failure to act on climate change—a little different take on it from the previous question—what a failure to act or delay to action would mean for the ability of existing marine protected areas and wildlife preserves, to protect wildlife and sensitive ecosystems.

Mr. KAREIVA. First I would like to say——

Ms. CAPPS. And as you are thinking of your answer, let me, I can maybe focus it a little more specifically.

How would climate change impact the national marine sanctuaries, for example? I have two sanctuaries in my district, the Channel Islands and Monterey Bay, the tip of Monterey Bay Sanctuary.

As you know, national marine sanctuaries are set up to be some of the best examples of ecosystem-based management. They will be affected by climate change. Maybe that is a good way to approach this question.

Mr. KAREIVA. So, first I want to correct sort of a misimpression. We actually have very good data and science about climate change.

We don't about weather. There is a distinction between weather and climate change. Weather is what happened, you know, here in D.C. the last couple days. Climate change is long-term trends and expectations.

So, in any given year, any given day, any given week, you might be surprised. But it is the long-term averages we are doing on climate change.

Ms. CAPPS. Yes.

Mr. KAREIVA. So, turning to the marine protected areas, and just the marine resources in general, it is quickly becoming evident that our marine systems are some of our most vulnerable. And they are vulnerable for a number of reasons.

They are vulnerable in coral reefs because rising sea surface temperatures stresses and kills the coral. They are vulnerable because they change currents and up-welling patterns; and thus, they change the fisheries that we harvest. And they are vulnerable because some species shift their, their distributions. And in fact, it has been noticed along the California coast that species will shift their distributions.

As a result of that, if we have a marine protected area set up in one place for a suite of species we are trying to manage, and as a result of climate change the physical conditions are altered, that place will no longer provide the protection for those species.

So, it is going to be a challenge to management in that we won't just be able to rely on fixed marine protected areas. We are going to need much more sophisticated management, like zoning and some of the innovative techniques we have.

But we already have good data showing shifts in distributions, showing stresses in offshore habitats, that are tightly linked to climate change in the last 30 years.

And there will be surprises, for sure. And we will be surprised. But I think we know generally, strategically how to approach the problem.

Ms. CAPPS. Thank you. Another justification for having these areas, because of the data that you are able to collect in an intensive way.

Mr. KAREIVA. That is right, we do monitor those places.

Ms. CAPPS. I want to talk about sanctuaries. I happen to—this is a little self-serving question for me. I am Co-Chair of our newly formed caucus on National Marine Sanctuaries. The other Co-Chair is Ileana Ros-Lehtinen. I represent a specific district, she represents a district in Florida.

The sanctuaries are applying the principles of ecosystem-based management, I understand, to manage their diverse set of natural resources and ecosystem services. Maybe you would talk about this a little bit, as a follow-up to the previous question.

And more specifically, how are sanctuaries using ecosystem-based management to meet the growing threat of climate change? And what they do then is important for its own sake, but clearly because of their status; but also as an example and a model for other areas.

Mr. KAREIVA. So, ecosystem-based management is jargon for, I guess you would say trying to achieve many purposes with one sanctuary. And balancing those purposes using the best science. And in doing that in a very transparent way, so it is also clear to the stakeholders that are involved.

So, early on in the history of marine protected areas, it might have been thought they were just for biodiversity, or just for one species. No longer is that the case. You look at the entire ecosystem, and the many services they provide.

So, shoreline ecosystems, as an example, they provide fisheries for commercial fisheries; they provide sport fishing; they provide recreation. They can provide habitats that reduce storm surge, and protect human communities.

See, we would look at all those natural assets, and you would look at the economics in the stakeholder zone. That is what ecosystem-based management is, looking at the many different interests in the sanctuaries.

The other thing, for the Federal ones that have been set up, that is especially valuable, is they are well-monitored. We have invested money into collecting information. And I think of them as probably our best sentinels for climate change.

We have too few places in the world where we are collecting comprehensive information, and we will be able to see, before it is too late, what is going on. So, they also serve that purpose, although maybe that isn't what they were originally set up for.

Ms. CAPPS. Thank you very much. I have used my time. But Madame Chair, that, of course, prompts with me a follow-up, an additional question, what kind of resources. Do we have enough resources, if this is indeed that critical, for advice to the new Administration and to our 111th Congress? Do we need additional resources for the kind of information that you are going to be able to supply?

But I will yield back. Thank you.

Ms. BORDALLO. We will have a second round. I thank the gentlelady from California.

I recognize the gentleman from Virginia, Mr. Wittman.

Mr. WITTMAN. Thank you, Madame Chairwoman. I would like to begin by yielding to the Ranking Member, Mr. Hastings.

Mr. HASTINGS. Thank you, Mr. Wittman.

Mr. Baughman, I want to ask you a question real briefly. In your oral testimony you talked about regulating greenhouse emissions. Could you elaborate on what your recommendations would be on that?

Mr. BAUGHMAN. Well, I think if you look at my testimony, part of it is that there are other people working on the emissions of greenhouse gases, other than the wildlife conservation community. I think our bigger task is reacting to those impacts on the communities, and maintaining those functional ecosystems.

I am not an expert on it, but certainly some of these carbon-trading protocols, carbon credits, I think those are the most—I think there is promise in some of those protocols. There is always the devil in the details, things that have to be worked out.

You mentioned the tremendous costs of some of those. We need to look at the tremendous benefits of some of those protocols, too. There is always someone paying things, receiving money. There is a money end of it, but there is also the behaviors-and-outcomes end of that equation, too. And we need to look at the whole picture, to where whatever protocols are adopted, those things balance. And the net is a positive effect for the country.

Mr. HASTINGS. Thank you very much. I yield back to my friend.

Mr. WITTMAN. Thank you. Mr. Baughman, you have had over 30 years of experience in the area of wildlife conservation. Can you tell us what you believe the overall impact of climate change is having on our wildlife?

Mr. BAUGHMAN. Well, I am most directly, of course, familiar with the West, the Rocky Mountain West. And certainly the last 15 years has been warmer and drier than any situation we have witnessed. And in fact, I think the records document, it just has been warmer and drier than any period in the last 500 years.

And we have seen species decrease in abundance. We have seen entire habitats devastated, trying to manage through drought for 15 years. Our systems of timbering, our systems of public land, they just break down. They were never, they were never meant to operate that way, and we have not adopted behaviorally or economically to some of those systems. And some of the net results the whole country is looking at are species like sage grouse becoming listed as threatened and endangered, and the impacts that would have. I think the Northern Spotted Owl would pale in comparison.

Our mule deer are in jeopardy. All of these high grassland step species are at risk.

But in the whole country, there are just species and, and habitats that evolved in much wetter, cooler times. And things are moving, things are changing, like some of the other speakers talked about. Things are disappearing.

Mr. HASTINGS. Now, you spoke earlier about making sure we get our children out from behind televisions and computer screens, and I couldn't agree with you more. I think it is high time that our youth be as acquainted as they can with our outdoor environment.

I wanted to sort of pick your brain about, how do you think we can best achieve that? I think there has to be an understanding from top to bottom about, obviously about the issue of climate change; but also how that affects our natural environments. And we have to have, I think, people plugged in from top to bottom, as far as the spectrum of age.

So, if you could give us your thoughts about how we can make sure we can fully engage folks, and that includes our youth.

Mr. BAUGHMAN. Well, certainly there are some really good programs out there. And there are some really good programs emerging.

Congress, the Administration doesn't have to do everything, but it would be nice for them to be partners in these efforts. And I think the most important needs, and probably the biggest successes, we have is one, developing some national conservation environmental education standards, that there are some concepts and principles that every child, every citizen of America understands. We don't have that.

And the second is concentrating on opportunities as this country becomes more urban, and we get more kids with that computer monitor and TV screen. And access becomes tougher, not only the legal access to public and private lands, but just the difficulties of getting out of the beltway to find a place to recreate.

We have to focus on, again through partnerships, on developing those opportunities that people know about, and they are easy to take advantage of.

Mr. HASTINGS. Thank you, Madame Chairman.

Ms. BORDALLO. Thank you, gentleman. I would now like to recognize the gentlewoman from the Virgin Islands, Mrs. Christensen.

Mrs. CHRISTENSEN. Thank you, Madame Chair. And thank you for holding this hearing, and thank you to our witnesses today.

I would like to begin by welcoming our former Clerk of the House, Jeff Trandahl, who is now representing, is now the Executive Director of the National Wildlife Foundation.

Before I ask a question, and I will ask this inside of a question, I have a concurrent resolution, too. I don't know if you are familiar with it. I know we are talking today about specific legislative changes and administrative changes that are needed. But this would express a sense of Congress that the Fish and Wildlife Service in particular should incorporate consideration of global warming and sea level rise into comprehensive conservation plans for coastal national wildlife refuges, and for other purposes.

And Madame Chair, we are working with your staff to move this through the committee. But is that something that the panelists

would support? At least as a beginning step, getting the Congress to recognize—and we could expand it to include, you know, all planning, if you so recommend.

Mr. Trandahl, you focus a lot on the need for clear and synchronized goals, one reason being that it is a barrier to you felt the kind of public-private partnerships you are charged to create. And Mr. Thompson, I think you also referenced the same concern.

I can understand, within agencies, the need for consistent and clear goals. But across different agencies with somewhat different missions and different oversight, I am not sure if that can be done successfully.

Are there some key overarching areas that you would want to suggest, that the Park Service, BLM, Fish and Wildlife could have clearer goals that are synchronized with each other?

Mr. TRANDAHL. OK. First, Donna, it is always great seeing you. I prefer to see you in the Virgin Islands, though.

[Laughter.]

Mr. TRANDAHL. First, I want to start and say I do think that the need of coordination among the agencies is incredibly important. And it is going to take leadership from one agency in particular, which I think the Department of the Interior is the agency that should lead it.

The good news, to me, and the optimism is, Secretary Salazar spent a lot of time, the last couple weeks in particular, talking about his America's Treasures concept. Of which he is talking about exactly the same thing: creating a priority list of habitats, ecosystems, actions that are potentially, should become Federal priorities, and agencies should look at those priorities to try to do a better job in working with one another.

An example I would give just right off the top is invasive species. A lot of money is spent at USDA, a lot of money is spent at the Department of the Interior to deal with invasive species. But I have yet to see the Department of Transportation do anything.

Yet how do they get there? Well, they normally arrive through a transportation system: a highway, a plane, a boat. And if we were able to coordinate better, and get the agency sort of at the front end of the problem involved, I think we would find ourselves in a much more successful position down the road. And hopefully save money, instead of just trying to manage through a problem.

Mrs. CHRISTENSEN. And I was thinking just under Interior. I wasn't even thinking about the departments outside.

Mr. TRANDAHL. OK.

Mrs. CHRISTENSEN. But we are actually employing the same, trying to get the same kind of coordination on healthcare issues.

Mr. TRANDAHL. Right, right.

Mrs. CHRISTENSEN. Because there are many ways that other agencies, other than the HHS, can collaborate and coordinate, and within the department also, to address those issues.

Dr. Kareiva, as you know, the Nature Conservancy has been doing a lot of work in the Virgin Islands. I wanted to talk a little bit about the multi-objective marine management approaches that you talked about.

Your remarks referenced the utility of such techniques in places such as Long Island and Florida. But what about in a smaller com-

munity like ours, or Culebra, which my colleague, Mr. Pierluisi, represents, and where I understand you may be partnering with an organization shortly, where single objective approaches such as coral farming or small-scale community conservation projects have been quite successful. Are these approaches transferrable to smaller communities like ours, and can they support what are sometimes unique and often cultural concerns?

Mr. KAREIVA. For sure they can. To be honest, probably——

[Electronic interference.]

Mr. KAREIVA.—there is support then for doing the research and development.

But as we get better at the tools, of course, what they really are about is balancing competing needs, and making clear the tradeoffs and the consequences of decisions.

So, instead of making a decision yes/no, the decision is, what is your full suite of options to meet everybody's needs. And those needs for sure include cultural values, impact on family structure. In some of the Pacific Islands we worked on, paying attention to role of women in the community, impact on family structure, and household surveys. What are the consequences for household satisfaction.

And I think you will see these tools in a second generation being widely used across scales, not just for Long Island, and not just for Florida. I think it is a general, it is common sense. It is really a common-sense vision, supported by science and transparent presentation of information.

Mrs. CHRISTENSEN. I think my time is up. Thank you for your responses. Thank you, Madame Chair.

Ms. BORDALLO. I thank the gentlelady from Virgin Islands. Now I would like to recognize the Ranking Member, Mr. Wittman from Virginia.

Mr. WITTMAN. Thank you, Madame Chairwoman. I would like to go back to Mr. Baughman again, and talk a little bit about the President's budget submission. As you know, he has set aside some dollars for wildlife adaptation. And of that, it designates 31 percent of those dollars will go to the states.

In considering that states have primacy over wildlife resources in their state, would it be more judicious if the split were 50/50, rather than 31 percent going to the states, as far as utility in getting dollars down to make meaningful impacts on wildlife adaptation?

Mr. BAUGHMAN. Yes.

[Laughter.]

Mr. BAUGHMAN. You know, I am really not familiar with that, so I wouldn't be, I would be out of my league to comment right now without doing a little homework on that.

But in general, the conservation programs are developed and run more efficiently. And like most forms of government, the more local we get in the delivery. And so I would certainly favor that.

But there are certainly roles for the Federal dollars, private dollars, state dollars. And there are programs where all those entities kind of take a lead, and do it very well. And we just need to segregate and figure out who is best at doing what.

But on all programs, as long as we are working together, maybe the end outcome isn't going to be that different where it goes.

Mr. WITTMAN. Any other panel members have a comment on how funding should take place under wildlife adaptation?

[No response.]

Mr. WITTMAN. Thank you, Madame Chairwoman.

Ms. BORDALLO. I thank the gentleman for his questions.

I have a couple of questions before we go into any further questions from the Members.

For Mr. Thompson, this has to do with climate change and adaptive management. How will incorporating climate change projections into programs and plans enhance our ability to manage ocean and wildlife resources?

Mr. THOMPSON. So, Madame Chair, I think there are two important issues here.

The first one is the importance of immigrating what we already know about the likely impacts of climate change into the current management plans. That would suggest that we need, for example, a network of reserves, on both the marine side and the land side, that permit species to adjust over time.

As Dr. Kareiva mentioned earlier, given the likely impact of climate change, fixed reserves that are relatively isolated will not be as effective as they were in the past. So, we need a broader network of reserves.

In California, for example, under the Marine Life Protection Act, we are currently setting up reserves along the entire California coast which are immigrated, and are likely to be far more effective in addressing climate change.

The second aspect, though, is in addition to taking climate change into account in our current plans, we also have to always be ready in the future to adjust our management efforts to take into account the new information and the surprises that will come along.

Ms. BORDALLO. Mr. Thompson, a second part of the question. What lessons can be learned and applied at a Federal level from California's Marine Life Protection Act?

Mr. THOMPSON. So, there are several lessons that I think can be learned from the Marine Life Protection Act.

The first one is the importance of having a very explicit directive to establish a set of marine reserves. The second is to establish a process for setting up those marine reserves which are effective.

When California first started implementing its Marine Life Protection Act, for example, the agencies did not fully consult with the stakeholders; and as a result, it wasn't that effective of a process.

Today we have a process where, first of all, the state is going region by region, and looking to see what the set of marine reserves should look like in each of those areas. And it has set up a very clear process that involves a scientific advisory committee and a stakeholders group and a blue ribbon task force. So then, each of those regions help to shape what those reserves are going to look like.

And then finally, there are a clear set of deadlines by which action is actually supposed to be taken.

Ms. BORDALLO. Very good. I also have, for Mr. Baughman, you recommend that the Congress take action to screen and prevent the introduction of invasive species.

Now, does the Sporting Conservation Council support my legislation, H.R. 669, which would address that particular gap?

Mr. BAUGHMAN. I have not read the legislation, and I know that counsel has not done a thorough analysis of it. But certainly the concepts we would support.

And as you know, perhaps better than I do, that is a tough, tough challenge to, first, control the spread of those invasives around this planet; and then even tougher, to try to control things once we have them. It is just an overwhelming, overwhelming task with challenges that are just mind-boggling. How to address some of these things once they are introduced.

But yes. Again, the devil is also in the detail. I think there is still some work, as there always is in Congress, to be done before a fine piece of legislation goes out the door.

Ms. BORDALLO. Well, I suggest you read the bill, and give us your comments.

Mr. THOMPSON. So noted.

Ms. BORDALLO. Thank you. The Chair wishes to welcome Mr. Kildee from Michigan, who has entered. And just in time for our second panel.

Are there any other questions of—gentlelady from Virgin Islands, do you have any other questions?

Then I wish to thank the witnesses for being with us this morning, and would like to welcome the second panel of witnesses.

[Pause.]

Ms. BORDALLO. For anyone who is standing in the back of the room, please come forward and be seated here in the lower level here. There are many chairs.

As Chairwoman, I now recognize our second panel of witnesses. Dr. Shirley Pomponi, Executive Director of the Harbor Branch Oceanographic Institute; Dr. William Jackson, Deputy Director General, the International Union of Conservation of Nature; Mr. Franklin Nutter, President of the Reinsurance Association of America; and Dr. Brian Rothschild, Montgomery Charter Professor of Marine Science, Professor, School of Marine Science and Technology at the University of Massachusetts at Dartmouth.

As a reminder to the second panel of witnesses, I would note for all of you that the red timing light on the table will indicate when five minutes have passed, and your time has concluded.

However, a reminder that your full written statement will be submitted for the hearing record.

And now I would like to begin with the first witness of the second panel, Dr. Pomponi. Please begin.

STATEMENT OF SHIRLEY A. POMPONI, Ph.D., EXECUTIVE DIRECTOR, HARBOR BRANCH OCEANOGRAPHIC INSTITUTE, FLORIDA ATLANTIC UNIVERSITY

Ms. POMPONI. Good morning, Chairwoman Bordallo and Members of the Subcommittee. My name is Shirley Pomponi, and I am the Director of Harbor Branch Oceanographic Institute at Florida Atlantic University.

Today I am providing my perspective as a career oceanographer, Chair of the board of trustees of the Consortium for Ocean Leader-

ship, and Chair of the Ocean Studies Board of the National Research Council.

The ocean covers two thirds of our planet. It is the driving force behind the climate and weather. It provides oxygen, food, recreation, and highways for commerce, and significantly contributes to our nation's economic regime.

As we have come to better appreciate the complexity of marine ecosystems, we have developed new approaches to ocean management that seek to balance the human uses of coastal and ocean environments, while maintaining the integrity of marine ecosystems.

I am going to highlight five priority areas for managing our ocean resources.

First, ecosystem-based management, about which we have heard quite a bit this morning already. This recognizes the complex interactions of the entire ecosystem, rather than just a single fishery.

The many aspects of human interactions with the oceans are also taken into consideration in resource management decisions. Although not a new concept, we have not made significant progress toward realizing ecosystem-based management in our current regulatory regimes.

Marine protected areas are an essential component of ecosystem-based management that could provide some insurance against over-harvesting.

In addition to committing to the establishment of marine protected areas, we must also ensure that there is continuing support for science to monitor their effectiveness.

Second, in the ongoing debates about climate change and how to mitigate and adapt to its effects, the role of the ocean and the impact of climate change are often overlooked. One example is sequestration of carbon dioxide. While the processes by which the ocean absorbs CO_2 are well understood, the impact of a more acidic ocean on critical ocean ecosystems like coral reefs is not known.

I want to thank this committee for its leadership in passing the Federal Ocean Acidification Research and Monitoring Act last year.

As the committee considers climate change and energy legislation, I ask you to include provisions for funding to support research and monitoring activities to better understand the effect of climate change on the ocean.

Third, the ocean plays an important role in human health. Harmful algal blooms produce toxins that not only affect fish and marine mammals, but also humans who eat fish or shellfish, or simply visit a beach during a bloom.

A renewed emphasis on research into the mechanisms of transmission of water-borne pathogens and toxins and the effects of climate and weather patterns on ocean and human health would provide public health officials with the tools and information that they need to prevent human exposure to illness, both in coastal communities and hundreds of miles inland.

Fourth. By integrating existing ocean observing and monitoring systems and expanding the system to incorporate new sources of data, we can combine information from regional systems into one national integrated ocean observing system, and provide multiple scales of information to a variety of end users; from ship captains

to coastal resource managers, to recreational fishers and public health officials.

A critical need is to expand and sustain the basic components of the integrated observing system, including a national commitment to a program of satellite observations from space, coupled with an investment in our academic research fleet, to support simultaneous in situ observations. A robust integrated ocean observing system will fundamentally alter our ability to understand, conserve, and manage our ocean resources, and will enable ocean forecasting, ecosystem-based management, and adaptive management during the next decade.

Fifth. I would like to emphasize the need for continued coordination among the 25 Federal agencies that conduct or fund ocean research. A coordinated mechanism for inter-agency OMB budget reviews would ensure that inter-agency priorities are included in budget planning for individual agencies. A comprehensive interagency review as part of the annual budget process would help ensure that the full suite of ocean research priorities is addressed.

In conclusion, we have drawn down our ocean assets. We now need to reinvest in, and recommit to, the health of our ocean planet. The oceans are finite, and cannot indefinitely withstand the stresses of overfishing, climate change, and pollution.

New technologies to map, explore, and observe the ocean will enable us to achieve ecosystem-based and adaptive management, restore the health of the ocean, and indeed, our planet.

Chairwoman Bordallo and Members of the Subcommittee, I thank you for the opportunity to testify before you; and on behalf of the ocean science community, I look forward to working with you to provide the science to conserve our ocean planet for future generations.

[The prepared statement of Ms. Pomponi follows:]

Statement of Shirley A. Pomponi, Ph.D., Executive Director, Harbor Branch Oceanographic Institute, Florida Atlantic University

Good morning Chairwoman Bordallo, Ranking Member Brown, and members of the Subcommittee. It is an honor to be invited to testify before this committee on ocean research priorities for the 111th Congress and the new administration. My name is Shirley Pomponi. I am the Executive Director of Harbor Branch Oceanographic Institute at Florida Atlantic University. Today I am providing my perspective as a career oceanographer, science advisor to the U.S. Commission on Ocean Policy, Chair of the Board of Trustees for the Consortium for Ocean Research, and Chair of the Ocean Studies Board of the National Research Council.

Both the U.S. Commission on Ocean Policy and the Ocean Studies Board have provided recommendations on issues ranging from the management of fisheries and protected marine species, the prevention of oil and other ocean pollutants, the ocean's role in climate change, and preparedness for coastal hazards such as hurricanes and tsunamis. Clearly, there is a need to improve our understanding of the oceans to inform decision making on these and a suite of other issues affecting society and imperiling our oceans.

I appreciate the opportunity to share with you what we have learned about data needs as well as methods and tools to manage living natural resources within an adaptable, ecosystem-based management regime. I will highlight five areas: ecosystem-based management, climate change, oceans and human health, ocean observing, and interagency cooperation. I will underscore some recommendations from recent Ocean Studies Board reports, the U.S. Commission on Ocean Policy Report "An Ocean Blueprint for the 21st Century," and the Ocean Research Priority Plan and Implementation Strategy (ORPPIS) developed by the Joint Subcommittee on Ocean Science and Technology (JSOST), Charting the Course for Ocean Science in the United States: Research Priorities for the Next Decade. The Ocean Studies Board

has prepared a set of booklets, the Ocean Science Series, which present overviews of key findings and recommendations from National Research Council reports on selected topics including: Oceans and Human Health, Coastal Hazards, Pollution in the Ocean, Marine Ecosystems and Fisheries, and Ocean Exploration (forthcoming). The booklets are available at: http://dels.nas.edu/osb/ocean—science—index.shtml.

INTRODUCTION

The ocean covers two-thirds of the planet, holds 97% of the Earth's water, and 97% of the biosphere. The ocean is the driving force behind climate, weather, and planetary chemistry; it generates more than half of the oxygen in the atmosphere; and it absorbs approximately one-third of the carbon dioxide released to the atmosphere from the burning of fossil fuel. The ocean, coasts, and Great Lakes are critical to our survival and the long-term vitality of the United States: they provide food, recreation, and highways for commerce, thereby contributing significantly to our nation's economic engine. As an example, our commercial marine fishing industry contributed $35.1 billion to the 2006 U.S. Gross National Product. More than 40 million people around the world depend on fishing or fish farming for their livelihood—a number that has more than tripled since 1970. The vast majority of these people are working in developing countries, where fishing and aquaculture constitute the economic backbone of most coastal areas. Their efforts now bring in more than 141 million tons of seafood per year, supplying a primary source of protein to more than one billion people.

But the ocean provides more than fish—it contains a dazzling diversity of life and a seemingly endless bounty of marine resources. Coral reefs draw tourists to support growing ecotourism industries. Marine organisms are the source of thousands of unique chemicals with the potential to treat human diseases. Some are already clinically available. Coastal communities have deep cultural ties to the ocean and depend on it for their livelihood.

But consider this sobering fact: despite the vastness of the ocean, it is not limitless. Ocean resources are under intense pressure to satisfy the expanding demand due to population growth and globalization. Globally, 75% of 441 different stocks of fish are fully exploited, overexploited, or depleted; invasive species have disrupted marine food webs; an increasing number of species are in danger of extinction as a result of human activities; and point and non-point pollution and marine debris are polluting our oceans at an alarming rate. Changes such as habitat loss and degradation are significant threats to marine life while climate change has the potential to modify entire marine ecosystems. The ocean's ability to continue to sustain the multibillion dollar industries it supports is increasingly uncertain.

As scientists have come to better appreciate the complexity of marine ecosystems, we have developed new approaches to ocean management that seek to balance the human uses of coastal and ocean environments while maintaining the integrity of the marine ecosystem. Scientific research on how these ecosystems function and react to physical, chemical and biological changes has helped inform policy decisions that promote the sustainable use of marine resources; however, we need sustained investments in research and strategic, long-term planning to ensure that future generations will have an opportunity to experience and enjoy the ocean and its many resources.

ECOSYSTEM-BASED MANAGEMENT

The concept of ecosystem-based management has been around for some time, yet we have not made significant strides toward realizing ecosystem-based management in our current regulatory and management regimes. In this approach, the many aspects of human interactions with the oceans—fishing, shipping, water quality, extraction and transport of oil, gas and renewable energy resources, and invasive species, among others—are taken into consideration as a whole in fishery management decisions. Recognizing that human activities often have rippling effects on marine ecosystems, ecosystem-based management takes a big-picture approach to using and conserving marine resources.

Although fisheries management is not its only application, ecosystem-based management represents a new approach to harvesting marine resources. Rather than focusing on single species, it emphasizes fisheries management practices that take into account food web and multispecies interactions. Ecosystem-based management recognizes the complex interactions among fished species, their predators and prey, and other aspects of the marine environment. Two reports of the National Research Council—*Sustaining Marine Fisheries (1999) and Dynamic Changes in Marine Ecosystems* (2006)—conclude that an ecosystem-based approach would improve the prospects for long-term sustainability of marine fisheries. Integrating information about predator-prey relationships, food webs, habitats, and the effects of climate

variation, ocean circulation patterns, chemistry, seafloor terrain and fish distributions should enhance attempts to improve fisheries management.

The National Research Council report Understanding Marine Biodiversity (1994) recognized that the human interactions can lead to transformations in ecosystem structure and function and that this transformation is manifested in changes to marine biodiversity. This report, which called for a national marine biodiversity research initiative, led to the Census of Marine Life (CoML), a global network of researchers in more than 80 nations engaged in a 10-year scientific initiative to assess and explain the diversity, distribution, and abundance of life in the ocean. From the work of CoML, we have learned that preserving natural marine biodiversity is critical to maintaining marine ecosystem functions and services, including fisheries, water quality, recreation, and shoreline protection. We need management systems that conserve marine biodiversity; doing so will increase the chance that ecosystems can adapt and recover following natural or human-caused disturbances. If we use conservation of marine biodiversity as a primary aim of ecosystem-based management, we will automatically conserve many of the myriad interconnections among species and their environment, we will generate a cost-effective way to coordinate diverse agency goals, manage trade-offs in providing ecosystem services, and ensure maximum ecosystem function and resilience.

Marine protected areas are an essential component of an ecosystem-based approach to management, as indicated by the National Research Council report on Marine Protected Areas (2001). Marine protected areas could provide some insurance against over-harvesting, provide an effective way to assess ecosystem structure and functions, and protect vulnerable habitats, such as coral reefs. In addition to committing to the establishment of marine protected areas, we must also ensure that there is continuing support for science to monitor their effectiveness, which will allow us to refine and improve the process for identifying and conserving important marine habitats.

To effectively use ecosystem-based strategies, we must improve our understanding of the effects of commercial and recreational fishing on marine ecosystems; in particular, we need greater knowledge of trophic effects and species interactions, indicators of ecosystem regime shifts, and baseline abundance data for non-target species and organisms that comprise the lower trophic levels of marine ecosystems. Only then can we develop accurate ecosystem models to propose alternative policy and management scenarios.

CLIMATE CHANGE

In the ongoing debates about climate change and how to mitigate and adapt to its effects, the role of the ocean and the impact of climate change on the ocean are often overlooked. The National Research Council addressed this issue in several reports. Abrupt Climate Change: Inevitable Surprises (2002) highlights how the ocean exerts a profound influence on climate through its ability to transport heat from one location to another and its capacity to store carbon. Because water has enormous heat capacity, the ocean typically stores 10-100 times more heat than equivalent land surfaces. Changes in ocean circulation, and especially the thermohaline circulation in the North Atlantic, have been implicated in abrupt climate change of the past.

Today, a question of great societal relevance is whether the North Atlantic circulation, including the Gulf Stream, will remain stable under the climatic changes and global warming that are expected to continue for the next few centuries. It was predicted that as the Greenland Ice Sheet melted, the influx of fresh, cold water could shutdown the ocean conveyer belt that delivers warm water (and weather) to northern Europe. A shutdown of this circulation would not induce a new ice age, but it was hypothesized that it would cause major changes in climate and in the ocean's circulation, upwelling and sinking regions, distribution of sea ice and sea level. Surprisingly, after seeing a predicted slow-down in this process, last year the conveyer belt strengthened, which suggests that something is happening that we scientists have not predicted.

In areas of the Arctic and Antarctic, the loss of sea ice has broader implications. For example, as air and water temperature rose, sea ice in Alaska has declined; populations of commercially important fish, seabirds, seals, walrus, sea otters, and other species depend on plankton blooms that are regulated by the extent and location of sea ice in the spring. As sea ice retreats, species composition of the blooms changes, reducing the amount of food reaching benthic organisms which in turn feed other portions of the Arctic food web. Our ability to fully understand the ramification of these changes or predict their impact on protected species or commercial fisheries is sorely lacking.

The future amount of greenhouse gases in the atmosphere, such as carbon dioxide (CO_2) and methane, will depend on the ocean's ability to absorb these gases in open-ocean and coastal systems. The ocean absorbs approximately one-third of the CO_2 emitted to the atmosphere from the burning of fossil fuels. However, this valuable service comes at a steep ecological cost—the acidification of the ocean. Charting the Course for Ocean Science in the United States: Research Priorities for the Next Decade, notes that a more acidic ocean will threatening a wide range of marine organisms from plankton and shellfish to massive coral reefs—further altering ecosystems and their processes. While the process by which ocean waters absorb CO_2 are well understood, the level at which the ocean loses this buffering capacity is not well known nor are the implications for ocean food webs and commercial fisheries that depend on shell-forming organisms. I want to thank this committee for its foresight and leadership in passing the Federal Ocean Acidification Research and Monitoring Act last year; this is a good first step. As the committee considers climate change and energy legislation, I urge you to include provisions that will provide the necessary funding to support research and monitoring activities to better understand the effect of climate change on the ocean.

OCEANS AND HUMAN HEALTH

The ocean is a source of health hazards, harboring toxins and disease-causing agents that can present serious threats to human health. For example, the phytoplankton that cause harmful algal blooms produce toxins that not only affect fish and marine mammals, but also humans who eat affected fish or shellfish, or in some cases, simply visit a beach during a bloom. To prevent disease outbreaks and improve public health, we need to develop more effective threat detection and monitoring systems, and conduct basic research to better understand of the causes and epidemiology of ocean-related health threats.

Environmental changes can affect the dynamics of waterborne diseases. When sea-surface temperatures increase, pathogens can become more concentrated in seawater, threatening to contaminate seafood and drinking water supplies in coastal communities. When sea levels rise, low-lying areas can become inundated with contaminated water. Adaptive management practices can recognize these environmental clues, such as higher sea-surface temperature or a rise in sea level, and enable public health officials to take action to help prevent our citizens from being exposed to waterborne diseases.

The ocean is also a key source of plants, animals, and microbes that are beginning to yield new and potent drugs for the treatment of human disease, as well as new products for use in biotechnology. More than 20,000 chemicals with pharmaceutical potential have been isolated from marine organisms since the 1980s, several of these are currently in the drug development pipeline, and a few are already clinically available. One example is Prialt—a drug developed from the venom of a fish-killing cone snail, and which is being used to treat chronic pain associated with diseases like cancer and AIDS. Another example is Yondelis—a cancer drug developed from a chemical discovered in sea squirts that grow on mangrove roots in Florida.

Ocean research will enable us to develop effective ways of protecting communities from harmful toxins, such as those produced by harmful algal blooms, and dangerous pathogens, and to fuel discoveries of marine-derived medicines, biomedical research probes, and other products that improve public health and well-being. Now more than ever we need a renewed emphasis on research into the mechanisms of disease transmission and the effects of climate and weather patterns on ocean and human health. Only then can we equip public health systems with the tools and information they need to prevent human exposure to illness, both in coastal communities and hundreds of miles inland.

OCEAN OBSERVING

The capability to adaptively describe and forecast the state of the ocean is necessary to predict climate change and large scale phenomena such as El Niño and La Niña events, as well as local phenomena, from hurricanes and tsunamis to human health hazards. A report issued by the National Science and Technology Council Subcommittee on Ocean Science and Technology listed the "capability to forecast key ocean-influenced processes and phenomena" and "deploying an ocean-observing system" as two of its three central elements of science and technology that will "provide the U.S. with the knowledge and means to redefine our relationship with the ocean for the better".

By measuring physical, biological and chemical water properties, integrated ocean observing systems provide the scientific data necessary to support ecosystem-based management and develop adaptive strategies to better manage our ocean resources. Models are invaluable tools that combine oceanographic data from observing sys-

tems with scientific theory to recreate past conditions, provide real-time observations and enable predictions of future impacts to the ocean. Output from models are used by harbor pilots to navigate vessels safely into port, to forecast the transport of harmful algal blooms near coastal cities, and to predict how increasing levels of carbon dioxide in our atmosphere will affect the acidity of the ocean.

An Integrated Ocean Observing System (IOOS) is a central recommendation of the U.S. Commission on Ocean Policy and serves as the U.S. contribution to the Global Ocean Observing System (GOOS). The IOOS combines information from many sensor types at multiple scales, from global to national to regional to local. By integrating and enhancing existing ocean observing and monitoring systems already in place, and expanding the system to incorporate new sources of data, we can aggregate information from regional systems into one national IOOS and provide multiple scales of information useful to a variety of end-users. The data need to be managed and relayed through an integrated communications system that allows feedback from end-users to keep the system relevant to their needs. Although IOOS is still in its infancy, it promises to be a powerful tool for end-users. IOOS end-users make decisions affecting or affected by the ocean, from ship captains to coastal resource managers to climate scientists, recreational fishermen, and surfers.

A critical need is to expand and sustain components of the IOOS, in particular, ocean observations from space. NASA's earth observations have improved warning, monitoring, and recovery support from national disasters, such as hurricanes and floods; they provide more timely detection of tropical storms, resulting in much improved evacuation decisions; and they improve wildfire detection and El Niño forecasting. Satellite missions to observe sea surface height and ocean color are experimental, with no path for transition to true operational status. Declarations in the National Research Council's Decadal Survey call for a renewal of the national commitment to a program of Earth observations. One key recommendation of the survey tasked NOAA with restoring measurements of ocean vector winds and sea-surface temperatures to planned Earth observing missions: the National Polar-orbiting Operational Environmental Satellite System (NPOESS) and the Geostationary Operational Environmental Satellite-R Series (GOES-R). Sustained measurements from Earth observing systems such as these provide the long-term record necessary to make sound policy decisions regarding our oceans.

While ocean data from space are important, satellite remote sensing can only provide information a few meters deep into the ocean. It is, therefore, critical that we continue to invest in our academic research fleet, buoys, floats, underwater vehicles, and sensors to expand our ability to measure biological, chemical and physical properties, and to integrate remote sensing from space with in situ measurements in the ocean. A robust, integrated ocean observing system should be able to describe the actual state of the ocean as well as provide data to predict changes in ocean ecosystems. This information will fundamentally alter our ability to understand, conserve, and manage our ocean resources.

Full development and sustained funding to support the operational costs of this ocean observing system are important: they will enable the promise of ocean forecasting, ecosystem-based management, and adaptive management during the next decade.

INTERAGENCY COORDINATION AND ACCOUNTABILITY

In 2007, the JSOST released the Ocean Research Priorities Plan and Implementation Strategy: Charting the Course for Ocean Science in the United States: Research Priorities for the Next Decade. The plan represents the first coordinated national research planning effort involving all federal agencies that support ocean science. I would like to emphasize one of the overarching recommendations from this report: the need for continued coordination among the federal ocean agencies. Ocean research activities are spread across the 25 federal agencies that comprise the JSOST. This poses a serious challenge for coordination, collaboration and integration of projects for implementing ocean research priorities. A central program office, similar to that of the National Oceanographic Partnership Program (NOPP), should be established to coordinate and manage projects to serve the broader ocean sciences community. NOPP has been effective in facilitating interagency collaboration on a wide variety of topics, including ocean observing system development, and biological and chemical sensor development and commercialization. Under the Ocean Action Plan (OAP), the NOPP program office has been instrumental in ensuring the effective coordination, collaboration, and integration of the Inter-agency Working Group on Ocean Partnerships, the Inter-agency Working Group on Facilities, and the Ocean Research and Resources Advisory Panel as a subset of the various interagency working groups established under the OAP.

Transparency in agency budget requests to specify how funds will be used to support the interagency research priorities would ensure accountability and encourage participation among all federal ocean agencies. However, OMB budget reviews are performed largely per agency, presenting an administrative barrier to assessment of progress that can be more effectively accomplished through interagency coordination, such as those envisioned in the ORPPIS. A more coordinated mechanism will be required to ensure that the interagency priorities are included in budget planning for individual agencies. A comprehensive interagency review, as part of the annual budget process, would help ensure that the full suite of research priorities is addressed. Agency budget reviews should be coordinated to ensure that interagency priorities are included in the plans of each individual agency within the JSOST.

CONCLUSION

The ocean is the reason that Earth is inhabitable: it sustains all life. Yet, we have taken the ocean for granted, often looking to outer space and distant planets rather than inner space, the ocean's depths and the vast species diversity—diversity that feeds a planet and holds the cures to diseases that have plagued humankind. We must recognize that the oceans are finite and cannot indefinitely withstand stresses of overfishing, climate change, and pollution.

We have drawn down the assets of the ocean, but now more than ever we need to re-invest in and recommit to the health of our ocean planet. We have explored only five percent of the ocean and we protect only eight-tenths of one percent of it. We need to understand society's impact on the ocean and the ocean's impact on society to ensure a clean, healthy ocean. We need new technologies to map, explore, and observe the ocean—technologies that will enable us to achieve ecosystem-based and adaptive management, restore the health of the ocean and unlock its secrets. Chairwoman Bordallo, Ranking Member Brown, and members of the Subcommittee, I thank you for the opportunity to testify before you, and on behalf of the ocean science community, I look forward to working with you to provide the science to conserve our ocean planet for future generations.

Ms. BORDALLO. Thank you, thank you very much, Dr. Pomponi, for your testimony. And also thank you for the many dedicated years working to advance marine science.

And I now recognize Dr. Jackson from the International Union for the Conservation of Nature to testify for five minutes. Please proceed.

STATEMENT OF WILLIAM JACKSON, Ph.D., DEPUTY DIRECTOR GENERAL, IUCN-USA MULTILATERAL OFFICE

Mr. JACKSON. Thank you, Madame Chairwoman and Members of the Subcommittee.

Madame Chairwoman, you began your opening statement by talking about the financial crisis. I think this crisis has provided us with a very stark reminder of how the loss of assets can affect our livelihoods, but also undermine our capacity to make choices.

It is shown that early warning signals often go unheeded until a crisis is upon us; and that when we do have a collapse, it can be very rapid and very far-reaching.

I think if we compare the financial crisis with the state of our natural resources, we see some alarming similarities. For many years we have been told that our forests, our rivers, and our oceans are stressed, and unfortunately we tend to ignore these early warning signals. Just look at how 70 percent of the world's fisheries are depleted or over-exploited. Yet in some areas, fishing industry continues to intensify their efforts, opening up new species and new areas.

The IUCN red list of threatened species tells us that nearly 40 percent of the animals and plants that we have assessed globally are threatened with extinction. And we know that since 1900, the

world has lost about half of its wetlands, and about 60 percent of coral reefs could be lost by 2030.

Having the right information is the key to the Subcommittee; acting on that information, even more important.

The consequences of ecosystem degradation have far-reaching impacts on human well-being. Climate change, for example, has global reach; but poor countries are more, or are least able to cope with this. This, in turn, will have a major impact on human security issues through food and water scarcity, and through ensuring migration.

When fisherpeople stop fishing because there is no fish left, and they start using their boats to ferry refugees, you know we have reached another tipping point.

Technology is critical in reversing climate change, but we must be careful not to put all of our eggs in the technology basket. Some technologies will definitely work, others won't. Some will be economic, others won't.

But whether we talk about climate change mitigation or adaptation, conserving natural resources is a safety net that we should never lose. While climate change rightly dominates the headlines today, ecosystem degradation will do so tomorrow if we don't act now. Economies can recover, whilst biodiversity is irreversible.

Biodiversity can do for the planet what a healthy immune system can do for us as individuals. It helps us to adapt to change, but if it doesn't function properly, it makes us more vulnerable.

We have many years, and thousands of years indeed, of experience in using nature to help us to grow our food, to provide us with clean water and medicines, and to protect us from natural hazard. We know that investing in ecosystems can yield multiple benefits at the same time.

For example, in a fight against climate change, restoring forest ecosystems, not only stores large amounts of carbon, but can directly improve the resilience of poor people's livelihoods, and therefore reduce impacts.

We know enough about marine ecosystems to create far more effective national and international management mechanisms to halt the decline and maintain resilience, so that they can have a better chance of coping with climate change.

The bottom line, we need to act urgently on the existing knowledge we have, while increasing, at the same time, understanding of natural processes.

What is it that you can do as lawmakers? The first answer, to me, is fairly obvious, and the one that fits within your Administration's stated intentions. You can invest in knowledge, you can support research.

This committee has a special interest in oceans. Your support for time-series data on fisheries, pollution, and climate variability to allow us to better understand the impacts of climate change on marine ecosystems is essential. We need to understand processes, such as acidification and interaction between oceans and the climate system. Research itself is not enough.

The U.S. has traditionally shown leadership in ocean resource management, and I encourage you to renew that leadership role. This is particularly important for the Arctic.

The U.S. also needs to send strong messages into the international multi-lateral system, and particularly the U.N. Convention on the law of the sea and the upcoming climate negotiations.

Most importantly, you can perhaps do a lot by integrating, in the committee's own thinking, the idea of investing in nature as infrastructure. Perhaps that is part of your new paradigm.

In short, we have to make biodiversity integral to every project in every piece of legislation you work on. The U.S. can lead by example in making these necessary interventions. The International Union of the Conservation of Nature stands ready to help you.

[The prepared statement of Mr. Jackson follows:]

Statement of Dr. William J. Jackson, Deputy Director General, International Union for Conservation of Nature—IUCN

The challenge

Conserving Nature—our life support system

While the global economic crisis certainly warrants the political attention it is receiving, another crisis is escalating, the effects of which could far outstrip the current financial losses: the global decline of the earth's natural capital.

Healthy biodiversity and ecosystems are the true foundation of all economies, yet they are under attack by the same economic forces that ultimately depend on them. Economies can eventually recover, but the loss of biodiversity is irreversible and the impacts of ecosystem degradation are likely to undermine economic recovery.

Biodiversity affects nearly every aspect of human well-being and development. Ecosystems such as forests, wetlands and river basins, if allowed to function naturally, provide streams of benefits to people. These "ecosystem services" include food, timber and medicines, regular supplies of fresh water, maintaining a healthy climate, pollinating crops, preventing soil erosion and controlling diseases. Healthy ecosystems minimize the impacts of extreme natural events and allow affected communities to recover more quickly. The Economics of Ecosystems and Biodiversity study put an average price tag of US$ 33 trillion a year on these fundamental services which are largely taken for granted because they are free. That is nearly twice the value of the global GNP of US$18 trillion. Society as a whole—individual, households, businesses, and governments—depends on ecosystem services but has become so far removed from nature that most people, including policy makers, are unaware of this dependence.

Biodiversity supports much of the energy systems, especially in developing countries where firewood and charcoal are by far the most important sources of energy used for cooking and heating. Biofuels are becoming increasingly important in providing energy security, potentially helping to address the problems of climate change, and providing new sources of income to poor farmers. Biodiversity also provides an effective way to store the carbon produced by burning fossil fuels. Millions of tons of carbon are absorbed every year by plankton, soils and forests.

Human health depends on healthy biodiversity. More than half of our modern pharmaceuticals originated from wild plants or animals while medicinal plants continue to provide the main source of health care in many developing countries. In the U.S. alone, the turnover for drugs derived from genetic resources was between US$ 75 billion and US$ 150 billion in 1997. According to the World Health Organization (WHO), the demand for medicinal plants is likely to increase from the current US$14 billion a year to US$5 trillion in 2050.

Some 40% of world trade is based on biological products or processes including fisheries, timber and food products. The increasing dependence of many countries on imports of food and other biological resources underlines the important contribution biodiversity makes to economies.

Biodiversity is linked to national security. Conflicts over water, fisheries and other shared resources are increasing in many parts of the world and natural resources help feed some conflicts. Civil conflicts are being fought in tropical forests and illegal harvesting of timber and other natural resources provides income that enables insurgent groups to purchase arms or corrupt governments to finance repression. Better resource management can contribute to peaceful relationships among nations. The massive movement of people competing for shrinking natural resources in the face of climate change will further destabilize fragile States.

How many warnings are needed?

Despite the growing knowledge of how nature provides societies' life support systems, environmental degradation is rampant. The world is not reacting to the alarm bells that have been ringing with ever greater urgency for many years.

Almost 40% of the world's species assessed through the IUCN Red List are threatened with extinction; 70% of the world's fisheries are depleted or over-exploited and still, fishing industries intensify their efforts, plundering new species and new areas. The collapse of the cod fishery in Canada is a stark reminder of the impacts of unsustainable harvest on people and economies. The first sale value of marine fisheries was globally valued at US$ 70 billion in 2002, while local scale fishing provides a critical source of protein for the poor.

Nearly every aspect of human development is unsustainable. Demand for fresh water exceeds supply in more and more countries, leading in some cases to conflict over dwindling resources. Through burgeoning levels of waste and industrial pollution, air and water quality continues to decrease, even if the problem may seem far away from Washington, as the "workshop of the world" has moved to East Asia. Consumption increases but the world seems unwilling to recognize, let alone to invest, in maintaining natural capital.

Climate change is altering weather patterns and contributing to the increasing frequency and strength of extreme weather events. What was the impact of hurricane Katrina on the U.S. economy? What was the cost of reconstruction associated with the massive fires in California last summer? What will be the cost of losing cultural heritage from inundation of Pacific islands? What will be the cost of technology to try to maintain liveable conditions as temperate areas become hotter?

In their bid to stimulate economic recovery and create new employment, governments around the world are using public financial resources to invest in infrastructure such as roads and airports. In many cases, these investments could further damage the environment. Infrastructure spending should address issues of waste and energy efficiency and the potential impacts on ecosystems.

Nature can be viewed as a 'trust fund'. There is a choice to spend it all now, use the current stock sustainably (at its current rate of return) or increase future opportunities through investment. There is no "natural reserve bank" or "natural treasury" which will bail the world out of the environmental debt crisis. The necessary actions will not be easy or quick, but the longer we wait, the harder it will be to climb out. As Sir Nicholas Stern has shown with respect to climate change, every year that serious action is postponed results in more unavoidable damage and increased costs of adaptation.

The opportunity

The current economic meltdown can become a catalyst for a new and very real, green economy. It offers an unprecedented opportunity to rethink the global economic model. The U.S., with a renewed commitment and energy to make its contribution once again towards a better world, is ideally placed to lead by example, in putting environmental restoration at the heart of economic recovery and biodiversity conservation at the forefront of efforts to halt climate change.

Many governments still worry that if they set tough standards to control carbon emissions, their industry and agriculture will become uncompetitive, a fear that leads to a foot-dragging "you go first" attitude that is blocking progress. A positive intervention by the U.S. could provide the vital impetus that moves the current climate negotiations beyond the national interests which lie at the heart of the current impasse. The logjam should not be difficult to break if the U.S. helps industrialized countries agree on the principle of equitable entitlement to the planet's common resources. Caps on emissions and sharing of energy-efficient technologies are in everyone's interests, rich and poor.

U.S. corporations have invented remarkable products that have been the source of material well-being for hundreds of millions around the world, but for too long have used unsustainable production systems. Methods of production and consumption must change, but that does not mean going back to the Stone Age. An average citizen of Switzerland, whose per capita GDP is higher than that of the U.S., emits one third of the CO_2 of an American. And in other societies and cultures, a full and happy life can be had for one third of what the Swiss consume.

Climate change, which is triggering environmental, social and economic disruptions, should be elevated as a top priority. But conservation of biodiversity needs just as much attention, and just as urgently. The U.S. interests in conserving its natural resources and achieving energy independence, clearly align with the global common good in every sphere: in the oceans, by halting the rapid decline of fish stocks and increasing acidification; on land, by regenerating the health of our soils,

forests and rivers; and in the atmosphere by reducing the massive emission of pollutants from our wasteful industries, construction, agriculture and transport.

Conservation of nature and natural resources is often perceived as an obstacle to development when in reality, conserving forests, watersheds and coastlines can bring enormous savings to national governments. Investing in green infrastructure secures the continuous flow of ecosystem services and is far cheaper than traditional "built infrastructure" such as flood barriers and water filtration plants.

Green infrastructure = green jobs

The concept of green infrastructure, which originated in the U.S., highlights the importance of the natural environment in decisions about land use and emphasizes the "life support" functions provided by the natural environment. Examples include clean water and healthy soils, functions such as recreation and providing shade and shelter in and around urban areas. The U.S. Environmental Protection Agency (EPA) has extended the concept to the management of storm water runoff at the local level through the use of natural systems or engineered systems that mimic natural systems. At a larger scale, the preservation and restoration of ecosystems such as forests, floodplains and wetlands are critical components of green storm water infrastructure.

Millions of new jobs could be created by "greening" development. Last week, the German government announced that strong growth in Germany's renewable energy sector along with increased state spending for environment protection could help shorten the country's worst post-war recession. The number of jobs in renewable energies will triple by 2020 and hit 900,000 by 2030.

Putting nature at the centre of the fight against climate change

For several years, the world has been investing in technology and engineering to fight climate change. Technology is a vitally important part of efforts to tackle climate change, but we must be careful not to put all of our eggs in a "techno-fix" basket. Some technologies will work; others won't; others will be economically unviable. And yet, whether for mitigation or adaptation measures to climate change, conserving nature is the safety net we should never lose.

A well managed reef in the Indian Ocean or the Caribbean will be more resistant to rising temperatures and will help to keep fisheries healthy. The key role played by forests and other ecosystems like peatlands in absorbing CO_2 and therefore, in reducing emissions is well known. Greater support should therefore be given to the REDD protocol (Reducing Emissions from Deforestation and Degradation) being put in place through the United Nations Framework Convention on Climate Change (UNFCCC) and a financial mechanism in which conserving biodiversity allows countries to reduce their emissions. Properly applied, initiatives like REDD can produce better managed forests that deliver goods for people. A well-managed forest in Ghana brings benefits to the people living in the area, but it also helps to regulate the climate for the rest of the planet. This type of approach makes sense from both a development perspective and an environmental one.

The U.S. has a clear role to play in promoting international cooperation to achieve conservation goals. It is one of only five countries that has not ratified the Convention on Biological Diversity (CBD). IUCN recommends that the U.S. ratifies the CBD, possibly as part of a package of widely-accepted treaties such as the United Nations Convention on the Law of the Sea and the Convention on Migratory Species.

IUCN also wishes to see an increased U.S. Federal role in conserving biodiversity and maintaining or increasing the ability of ecosystems to mitigate and adapt to climate change. IUCN urges the U.S. to strengthen its environmental policies and practices by fully implementing and enforcing existing laws such as the National Environmental Policy Act, the National Forest Management Act and the Endangered Species Act.

The way forward

The knowledge and the tools are at our disposal to restore the global environment and create a world that uses its natural resources sustainably. There are still some gaps in knowledge that must be filled but the problems are identified and so are the solutions.

The first step is to acknowledge the magnitude of our ecological debts. Clear standards and accounting rules are needed for measuring and reporting the depreciation of natural capital, at all levels from individual businesses to entire countries. Recent advances in technology, including remote sensing and internet connectivity, make this kind of measurement and reporting easier than ever before.

The next steps will be harder. In short, there is a need to rebuild our natural capital stocks. This will require wide-ranging reform of public policy, starting with re-

ductions in "perverse" subsidies, such as the US$ 300 billion per year that the world's governments hand out to the petroleum industry. Subsidies to agriculture, forestry, mining, road-building also need to be reformed to create clear economic mechanisms that reward nature conservation and penalize environmental destruction.

Conserving biodiversity and ecosystems must be done by addressing the underlying forces that are eroding them, particularly development and consumption. For conservation to be successful, a flexible approach is needed, diagnosing first and adapting specific solutions in changing contexts. Policy makers at all levels must better integrate sound science and demonstrated practice into their decisions.

Years of experience "on the ground" have shown us the need to root conservation at the local level. It is only by working with communities, by giving them the knowledge and empowering them to use the tools available to them, that any conservation work will be possible. Influencing governance arrangements simultaneously from the local to global level is key to effecting wider change and building public support for environmental protection.

Harnessing the power of the private sector

Businesses and consumers must start to pay the real economic value for ecosystem goods and services. Following the UK-led Review of the Economics of Climate Change, IUCN is working with its partners on The Economics of Ecosystems and Biodiversity study which will provide tools for the true value of nature's services to be accounted for in decision making and integrated into national economic measures.

The priority should be to engage the business sectors in which change is most important and urgent, due to the scale of their negative impacts on the environment and social equity. These include "large footprint" industries such as mining, oil and gas, construction, automobile and energy which have a large impact on biodiversity through their operations. On the other hand, biodiversity-dependent industries such as agriculture, fisheries, forestry, food retailing and aquaculture must all be encouraged to reduce their negative impacts.

Given the vast amounts of capital that financial services, banks, and insurance companies control, the leveraging potential for projects that conserve rather than damage biodiversity is enormous. The development of green enterprises whose activities generate conservation benefits should be encouraged. These include renewable energy, sustainable and organic agriculture, nature-based tourism and ethical trade.

The business case for conserving nature is strong and getting stronger. A recent report published by IUCN and Shell International Limited calls for policy reforms to increase the commercial rewards for conserving biodiversity, increased penalties for biodiversity loss and better information on the biodiversity performance of business. A key challenge facing all businesses wanting to become more sustainable in their practices is the lack of accepted indicators to measure positive and negative contributions to biodiversity conservation. Markets for organic agriculture and sustainably-harvested timber are growing at double-digit rates. Another major area of growth is the demand for climate mitigation services such as the protection of forests and wetlands to absorb carbon dioxide. Bioprospecting—the search for new compounds, genes and organisms in the wild—is also a biodiversity business on the rise.

Paying a true price

Payments for Ecosystem Services schemes reward those whose land provides these services with subsidies or market payments from those who benefit from them. It is an innovative approach to sustainable financing for conservation and highlights the critical importance of natural capital to the global economy.

In the U.S., companies or individuals can buy environmental credits from Wetland Mitigation Banks to pay for degradation of wetland ecosystems due to agriculture or development activities. More than 400 banks had been approved by September 2005, almost three quarters of them sponsored by private entities, while in 2006 the trade of wetland bank credits reached US$ 350 million.

In France, the Vittel mineral water company (Nestlé Waters) was concerned about nitrate contamination caused by agricultural intensification so it began to pay farmers within its catchment to make their practices more sustainable. A key element of success was that Vittel gained the farmers' trust and maintained their income levels by providing them with sufficiently large payments. It also financed any required technological changes, meaning that farmers were not out of pocket. The company worked with farmers to identify suitable alternative practices and mutually-acceptable incentives.

The tools for environmental management are increasingly sophisticated and do not require massive increases in public spending. Market-based approaches such as tradable permits for sulphur dioxide, wetland mitigation banking, feed-in tariffs for renewable energy, waste deposit schemes and resource user fees, have shown that businesses will reduce their ecological footprint and invest in environmental protection, if the right incentives are put in place.

Leading the way in restoring our oceans

The oceans drive weather patterns, generate 70% of atmospheric oxygen, absorb most of the planet's carbon dioxide, are the ultimate reservoir for replenishment of fresh water to land and contain a wealth of biodiversity that keeps the earth's ecosystem services functioning. Marine ecosystems such as wetlands, coral reefs, mangroves and sea grass beds provide food and livelihood for millions of people and can protect communities from extreme weather events.

However as with the terrestrial environment, our oceans face a barrage of threats, one of the biggest being over-exploitation of marine resources. Oil spills, agricultural run-off, harmful chemical and medical substances and plastic debris are just part of a long list of pollutants generated by modern society that end up in the sea.

The U.S. has the largest ocean area under its jurisdiction of any country and has traditionally been a leader in global ocean diplomacy. It now has the opportunity to renew its stewardship of ocean resources and resume its leadership in international marine affairs.

Marine ecosystems often extend across political or jurisdictional boundaries. It therefore follows that they must be managed using a broader framework. For larger systems, for example at the level of a sea or significant portion of it, such agreements might take the form of "regional ocean management agreements." Smaller spaces might require agreement among States or provinces, such as the case of Chesapeake Bay.

The goal of applying the ecosystem approach to marine management by 2010 is incorporated in the Johannesburg Plan of Implementation of the World Summit on Sustainable Development, adopted in 2002. Establishing this goal represented a culmination of global thinking developed in various international processes including the UN Food and Agricultural Guidelines on Marine Ecosystems and extensive work by the Conference of Parties to the Convention on Biological Diversity. Governments have collectively recognized the need to consider the full range of activities and processes affecting marine ecosystems in making decisions about the nature and extent of human activities.

Achievement of this goal is not an easy task. Progress, however, has been steady and widespread. Asia-Pacific Economic Cooperation (APEC) members and the Arctic Council have taken important collective steps. The Global Environment Facility, the World Bank, participating countries and other donors are funding 16 large marine ecosystem projects in Africa, Asia, Latin America and Eastern Europe at a multi-year level of US$1.8 billion. In the U.S., the National Oceanic and Atmospheric Administration has adopted ecosystem-based management as one of its principal strategic goals.

Marine Protected Areas (MPAs) are an important tool in implementing the ecosystem approach. When effectively designed and managed these areas can deliver many ecological and socio-economic benefits as well as build the resilience of marine ecosystems in the face of increasing global pressures such as climate change.

Improved coordination and implementation of land-based pollution programs, in alignment with other sectoral policies, and oil spill prevention measures are required to avoid nutrient overload and hazardous impacts. We need to improve fisheries management if we are to sustain healthy fish stocks and economically-viable fishing industries. Destructive fishing practices must be eliminated and bycatch drastically reduced. The development, strengthening and implementation of international and national policies are also needed to address declines in vulnerable and declining marine species.

Despite the role of the oceans and coasts play in supporting our economic well-being, they remain poorly understood. Core funding for ocean science and research is necessary to expand our knowledge and allow us to continually adapt our management strategies for maximum effectiveness. Traditional approaches to coastal and marine management should be re-assessed and vulnerability studies need to consider new demands on marine ecosystems and their productivity.

In the last few years, the importance of marine biological resources that exist beyond the limits of national jurisdiction—the high seas—as well as on the threats to these important resources have increasingly been highlighted. There is a need to capitalize on this growing awareness and find ways to reduce the multiple threats to marine biodiversity in these areas in ways that are consistent with international

law. Broadest possible participation in the United Nations Convention on the Law of the Sea would ease this process.

Working together

There are many other important steps needed to boost biodiversity conservation at the international level. There is a need to make all data on biodiversity and ecosystems easily accessible to all who need it, including industry. This means solving data proprietary issues. All relevant institutions need to be encouraged to share their data, even though they may have invested significant resources in compiling the information. A sustainable, self-financing, business model for open access needs to be developed and implemented. Financial support must be provided to developing countries, which arguably have the greatest need for access to biodiversity data.

The world is looking to the U.S. with great expectations in relation to the environment. Of course, one nation alone cannot change the world but it can have an enormous influence. Much is possible, but only by mustering the political will at all levels to face and confront environmental challenges. The environmental community is heartened by the positive steps taken in the early days of the new U.S. Administration, particularly towards putting science at the foundation of policy development and natural resource management. IUCN, like other science-based conservation organizations, stands ready to help the U.S. and other nations achieve the ambitious but achievable goal of global sustainability.

IUCN—International Union for Conservation of Nature
1,000 organizations and 10,000 experts solving our planet's greatest challenges

In addition to the U.S. State Department, IUCN has six U.S. government agency members including the Environmental Protection Agency, the Fish and Wildlife Service and the National Oceanic and Atmospheric Administration. Working on behalf of more than 1,000 member organizations, both government and non governmental, IUCN is a unique environmental democracy operating at all levels from the villages of Central Africa to the United Nations' General Assembly. By mobilizing knowledge and expertise from all regions of the world, IUCN's powerful machinery is best able to convert policy into practice, allowing key decisions at higher levels to be informed by field information and expertise, and in turn, applying policy lessons at the ground level.

Ms. BORDALLO. Thank you, Dr. Jackson. And I am very encouraged by your testimony, and congratulate your organization for developing important products that deliver critical data to decision makers on the ground.

And now I would like to recognize Mr. Nutter. It is a pleasure to welcome you this morning, and you can proceed.

STATEMENT OF FRANKLIN W. NUTTER, PRESIDENT, REINSURANCE ASSOCIATION OF AMERICA

Mr. NUTTER. Thank you very much, Madame Chair. It is a pleasure to be here before the committee today and offer our perspective on managing risk by promoting the conservation of our natural resources, and through risk mitigation efforts along our densely populated coastlines.

In simple terms, reinsurance is the insurance of insurance companies. One of its primary functions is to provide transfer for insurers for major natural catastrophe risk.

For example, in 2005, with Hurricanes Katrina, Rita, and Wilma, nearly 61 percent of all the insured losses paid by the insurance industry were transferred to the reinsurance market.

The insurance industry's financial interest is interdependent with climate and weather. It is the risk of natural events that drives the demand for insurance coverages; yet, if not properly managed, can threaten the financial health of an insurer if it is over-exposed in high-risk areas.

As has been mentioned by several witnesses, the insured property along our coastlines has risen dramatically. One study estimated that it has nearly doubled every decade. And at the end of 2007, our estimates are that the privately insured property values along the Gulf and Atlantic coasts totaled nearly $9 trillion. And of course, economic losses associated with natural catastrophes has risen dramatically.

With 30 percent of the U.S. population living in coastal counties that are exposed to extreme events, global climate change will only increase this exposure and potential losses.

Congress should help people living in hurricane-prone coastal areas to take proactive mitigation steps to protect their property, rather than encourage further development in these high-risk environmentally sensitive locales, by creating taxpayer-funded programs to subsidize insurance.

Our organization has partnered with other diverse interest groups to create the Americans for Smart Natural Catastrophe Policy to promote environmentally responsible, fiscally sound approaches to natural catastrophe policy, in the interest of public safety. I have listed a number of our partners in this, including the National Wildlife Federation, American Rivers, Defenders of Wildlife, Friends of the Earth, Republicans for Environmental Protection, the Sierra Club, and, most recently, the Nature Conservancy as part of that coalition.

And it stands for the following principles: that we should build smart, according to the most modern building standards and codes reflecting exposure to natural catastrophe disasters and cost-effective loss-reduction measures; promote risk avoidance and proactive mitigation measures; protect both the public and ecosystems that provide natural buffers to storms, renewed efforts should be made to preserve coastal areas consistent with effective state and Federal laws; and also to provide, to ensure, based upon risk, private and public property, insurance should be established based upon risk exposure.

While our coalition members have different priorities, we all agree that certain actions being considered by Congress may have a detrimental impact on oceans, coastal systems, and wildlife. Our coalition opposed proposals to expand the National Flood Insurance Program to include wind-power coverage, largely because it would overwhelm a program that is already $18 billion in debt, and encourage further development in unsafe or environmentally sensitive areas.

There are many steps that we can take to mitigate losses and protect our oceans, coastal and wildlife resources. Among them include incorporating climate change and risk assessment and risk mitigation that is translated to local levels, particularly for the mapping of flood, shoreline, and inundation areas.

We should require risk-based land-use planning and the integration of natural hazards into land-use planning. We should design infrastructure to consider natural hazards and climate change.

Our organization is also part of a building code coalition whose goal is to enact legislation to amend the Stafford Act, by encouraging states to adopt nationally recognized model building codes for residential and commercial structures.

During this year's consideration of the economic stimulus package, our coalition supported an increase in funding to FEMA's pre-disaster-mitigation program to provide funds to states for community-based hazard-mitigation activities. We also advocated for efforts to ensure that infrastructure projects funded through Federal appropriations consider and incorporate measures to reduce the risk of potential impacts of natural disasters.

Our coalition supports the Coastal Barrier Resources System, which prevents structures proposed for construction in undeveloped environmentally pristine areas from purchasing Federal flood insurance. The Coastal Zone Management Act could provide a tool, essentially a climate adaptation tool, to ensure states are planning for potential risks posed by the impacts of climate change.

If blended with state mitigation plans already required by the Stafford Act and approved by FEMA, the combination provides states with the planning tools they need to develop and implement a climate adaptation policy.

Last, I would like to commend the committee for recognizing the importance of risk mitigation to conservation of our ocean, coastal ecosystems, and wildlife resources in an increasingly dynamic and unpredictable environment. Clearly, all stakeholders must work together to make sure that we have environmentally sound and fiscally responsible policy that will ultimately reduce costs borne by the Federal and state governments, insurers, and American taxpayers.

Thank you.

[The prepared statement of Mr. Nutter follows:]

Statement of Franklin W. Nutter, President, Reinsurance Association of America

My name is Frank Nutter and I am President of the Reinsurance Association of America (RAA). The RAA is a national trade association of property and casualty reinsurers doing business in the U.S. Its membership is diverse, and includes reinsurance underwriters and intermediaries licensed in the U.S. and those that conduct business on a cross-border basis. It is a pleasure to appear before you today at this hearing on "Managing Ocean and Wildlife Resources in a Dynamic Environment." In particular, I will address the reinsurance perspective on managing risk by promoting the conservation of our natural resources and through risk mitigation efforts along our densely populated coastlines.

U.S. Reinsurance Market's Interest in Oceans and Wildlife Resources

First, let me provide a brief background on reinsurance. In simple terms, reinsurance is insurance for insurance companies. Reinsurance is critical to the insurance marketplace because it reduces the volatility experienced by insurers and improves insurers' financial performance and security. It is widely recognized that reinsurance performs at least four primary functions in the marketplace: to limit liability on specific risks; to stabilize loss experience; to provide transfer for insurers of major natural and man-made catastrophe risk; and to increase insurance capacity. I cannot emphasize enough the important role that reinsurance plays in the insurance marketplace. Reinsurers have assisted in the recovery from every major U.S. catastrophe over the past century. By way of example, 60% of the losses related to the events of September 11 were absorbed by the global reinsurance industry and 61% of Hurricanes Katrina, Rita and Wilma in 2005 were ultimately borne by reinsurers.

Reinsurers have a keen interest in managing risk as a means to reduce economic loss. The insurance industry's financial interest is inter-dependent with climate and weather. It is the risk of natural events that drives the demand for insurance coverage, yet if not properly managed, can threaten the financial health of an insurer if it is over-exposed in high risk areas. An insurance company's financial viability rests on its ability to estimate the economic consequences of future events.

Increasing Exposure to our Nation's Coastlines and Wildlife Resources

According to AIR Worldwide, a catastrophe modeling firm, insured property values along the Gulf and Atlantic coasts have doubled every decade. At year-end 2007, Gulf and Atlantic coast insured property values equaled $9 trillion. Globally, the economic losses due to extreme weather have also risen dramatically over time: 1950-59—$53B; 1906-69—$93B; 1970-79—$162B; 1980-89—$263B; 1990-99—$778B; 2000-2008—$620B.[1] Interestingly, between 1970 and 2004, storms and floods accounted for 90% of those losses. In 2005, Hurricanes Katrina, Rita, and Wilma resulted in $87B in insured losses and an additional $20B of losses due to flood that were ultimately covered by the National Flood Insurance Program. Since 2001, nine out of the top 20 costliest natural disasters have occurred in the U.S.

There are two principal socio-economic factors driving these increased losses—the degree of urbanization and value at risk (i.e., higher property values in higher risk areas).[2] With 30% of the U.S. population living in coastal counties that are exposed to extreme events—such as hurricanes and storm surge—global climate change will only increase this exposure and potential losses because of its affects on the intensity and frequency of extreme atmospheric events and storm surge. According to Dr. Dennis Miletti, author of "Disasters by Design," "we are putting more property of greater value in harms way."

Mitigation Works to Save our Coastlines and Wildlife

Congress should help people living in hurricane-prone coastal areas take proactive mitigation steps to protect their property, rather than encourage further development in these high-risk, environmentally-sensitive locales by creating taxpayer-funded programs to subsidize homeowners' insurance. The RAA has partnered with other diverse interest groups to create the Americans for Smart Natural Catastrophe Policy Coalition to promote environmentally-responsible, fiscally-sound approaches to natural catastrophe policy in the interest of public safety. Our environmental allies and coalition partners are particularly interested in protecting our oceans, coastal ecosystems, and wildlife. They include American Rivers, Defenders of Wildlife, Environmental Defense Fund, Friends of the Earth, National Wildlife Federation, Republicans for Environmental Protection, Association of Bermuda Insurers and Reinsurers, American Consumer Institute, Americans for Prosperity, Competitive Enterprise Institute, Council for Citizens Against Government Waste, and the National Association of Professional Insurance Agents. The Coalition's guiding principles are as follows:

Principles for Natural Disaster Mitigation and Assistance

- Build Smart: Properties in coastal areas and other high-hazard areas should be built, replaced or repaired according to the most modern building standards and codes reflecting exposure to natural disasters and effective loss-reduction measures. Based on the continuing scientific assessment of the effects and consequences of a changing climate, property and infrastructure development in coastal and other high-hazard areas have placed people in harm's way and property at significant risk of loss from natural catastrophic events.
- Encourage Safety: Government incentives should promote risk-avoidance and proactive mitigation measures to protect the public from a broad range of natural disasters, including wind, flood, wildfires and earthquakes.
- Use Nature: To protect both the public and ecosystems that provide natural "buffers" to storms, renewed efforts should be made to preserve coastal areas consistent with effective state and federal laws, using uniform, objective standards.
- Insure Based On Risk: Private and public property insurance premiums should be established on the basis of risk exposure, including catastrophic risk, subject to state law that risk premiums should be neither excessive nor inadequate.
- Assume Responsibility: Responsibility for state insurance and reinsurance programs that pool natural disaster risks should remain with those states which have established such programs, rather than shifting the financing to the federal government through such means as federal loans or reinsurance.
- Target Government Assistance: Programs should focus on people and not on insurance companies:
  - Extend tax credits, loans and grants for measures designed to protect the property from natural disasters—rather than for programs designed to support artificially low insurance rates.

[1] Data from Munich Reinsurance Company
[2] 2 The Wharton School

- Provide means-based assistance, focused on low and fixed income residents—rather than wealthy individuals with expensive beach front or vacation homes.
- Discourage development in coastal areas and other high-risk areas—federal assistance should not subsidize new property development in coastal areas vulnerable to catastrophic storms, or other high-risk areas.

While Coalition members have differing priorities, we all agree that certain actions being considered by Congress will have a detrimental impact on oceans, coastal ecosystems, and wildlife. During the last Congress, proposals to expand the National Flood Insurance Program (NFIP) to include wind damage were considered in both the House and Senate. We believe adding wind as a covered peril would:

1. Overwhelm the NFIP. The program already has an $18 billion deficit and is struggling to resolve flood claims, manage fraud arising from Hurricane Katrina payouts, and prevent insolvency. Adding wind insurance will distract from the program's mission and substantially undermine efforts to stabilize the program.
2. Encourage further development in unsafe or environmentally sensitive areas. Supporting wind insurance that encourages unwise construction in high risk areas sends the wrong message to communities regarding the environmental impact and danger of living in hazard-prone coastal areas and floodplains—areas that may be increasingly vulnerable given the potential impacts of climate change.
3. Cost taxpayers billions. Experience with the NFIP shows, and the American Academy of Actuaries confirms, that adding federally-backed wind insurance will not be actuarially sound despite language the contrary. Taxpayers nationwide will be left to pay the cost of wind damage, which would more than triple the government's exposure under NFIP.
4. Discourage the provision of wind insurance by the private market.

Similar problems apply to the creation of new federal natural catastrophe programs that would require the federal government to provide loans intended to bail out state natural disaster catastrophe funds or require the federal government to provide government reinsurance for a state's property and casualty insurance program.

Positive Steps to Protect Our Coastlines and Wildlife

There are many steps we can take to mitigate losses and protect our ocean, coastal and wildlife resources. Among them:

1. Incorporating climate change in risk assessments and risk mitigation. The scientific community should be encouraged to translate the localized impacts of climate change for planning purposes—flood, shoreline and inundation maps should reflect local climate change impact assessment, including scenario assessments.
2. Requiring risk-based land use planning. This would include the integration of natural hazards into land use planning with goal of protecting development and wildlife from extreme weather and erosion.
3. Designing infrastructure to consider natural hazards and climate change.
4. Strengthening ecosystems as part of risk mitigation strategies. Coastal wetlands, barrier islands and natural coastal vegetation serve as buffers from ocean-driven extreme events. Make them part of an adaptation strategy.
5. Insisting that insurance for properties in coastal zones be risk-based as a means to set more appropriate risk-based costs for building in environmentally sensitive or high risk areas, such as along our nation's coastlines.

Additional Considerations

The RAA is also part of the Building Code Coalition whose goal is to enact legislation to amend the Stafford Act. This legislation would enhance existing mitigation programs by encouraging states to adopt nationally-recognized model building codes for residential and commercial structures. With billions of dollars paid by the federal government and the private sector for disaster relief and rebuilding of communities, legislation that would enhance FEMA's ability to "prepare for, prevent, respond to and recover from disasters" is critically important.

There are several other statutes that are not traditional areas of expertise of the insurance industry where there may be opportunities to adopt legislative changes and move them closer to implementation. For example, during this year's consideration of the economic stimulus package, many members of our Coalition supported an increase in funding to FEMA's Pre-Disaster Mitigation (PDM) program. This program provides funds to states for community-based hazard mitigation activities identified in a State Mitigation Plan such as increasing building elevations, flood-

proofing, improving the survivability of existing and new buildings, and relocating willing sellers from natural disaster prone areas. In addition, we advocated for an effort to ensure that infrastructure projects funded through federal appropriations consider, and incorporate measures to reduce, the risks of the potential impacts of natural disasters, such as windstorms and floods, particularly in light of the anticipated effects of global climate change. Our Coalition also supported a tax credit proposal that would have provided homeowners with a credit of up to $1500 for actions taken to make their homes more structurally sound to protect them against risks posed by natural disasters.

Hazard mitigation programs are well-established as a cost-effective means to reduce the impact of natural disasters. For example, in 2007, the Congressional Budget Office found that projects funded through the Pre-Disaster Mitigation program between 2004 and June 2007 resulted in a reduction of future disaster spending of approximately three dollars for every dollar spent on these projects. Similarly, in 2005, a Congressionally-mandated study by the Multihazard Mitigation Council (an advisory body of the National Institute of Building Sciences) concluded that cost-effective mitigation saves an average of four dollars for every dollar spent.

Land-use planning, largely the purview of local governments, is also key to reducing development in environmentally-sensitive, high-risk coastal areas. Our Coalition supports the Coastal Barrier Resources System which prevents structures proposed for construction in undeveloped, environmentally-pristine areas from purchasing federal flood insurance. The Coastal Zone Management Act could provide a tool—essentially a climate adaptation tool—to ensure states are planning for the potential risks posed by the impacts of climate change. If blended with the State Hazard Mitigation Plans already required by the Stafford Act and approved by FEMA, the combination provides states with the planning tools they need to develop and implement a climate adaptation plan.

Conclusion

I would like to commend the Committee for recognizing the importance of risk management to the conservation of our ocean, coastal ecosystems, and wildlife resources in an increasingly dynamic and unpredictable environment. Clearly all stakeholders must work together to ensure environmentally-sound and fiscally responsible policy that will ultimately reduce the costs borne by federal and state governments, insurers/reinsurers, and the American taxpayers, as well as save lives, protect habitats, and ensure our coastal areas thrive for generations to come.

Thank you.

Ms. BORDALLO. Thank you very much, Mr. Nutter. I will now recognize Dr. Rothschild to testify. Please begin.

STATEMENT OF BRIAN ROTHSCHILD, Ph.D., MONTGOMERY CHARTER PROFESSOR OF MARINE SCIENCE, SCHOOL FOR MARINE SCIENCE AND TECHNOLOGY, UNIVERSITY OF MASSACHUSETTS

Mr. ROTHSCHILD. Thank you, Madame Chairman, committee. I have been asked to address information products, services, and tools to address conservation, and to protect and conserve the ocean.

In the early 1900s, conservation was a concept. At the time many people thought our natural resources were unlimited. This suppressed actions that would have prevented irreversible effects of human activity that we see today.

Clearly, the global human population explosion, consequent saturation of the atmosphere and ocean with pollutants, and mismanagement of resources, places conservation beyond a mere concept. Conservation is now an imperative.

The conservation imperative requires action. This is easy to say, but difficult to implement.

The difficulty arises from the fact that we do not have the budget resources to address the total array of conservation problems. As

a result, we have to focus on the problems that are most critical. We have to ask the right questions. It is not so easy to conduct the concrete analysis required to identify the most critical questions.

We have to produce the concrete quantitative analysis necessary to ensure that we are making the best program investments.

Let us take an example from fisheries. The Magnuson-Stevens Act has a number of goals. One is to eliminate overfishing; two is to fully utilize optimal yield; and three is to take account of economic and social fabric of fishing communities.

To take these goals seriously and efficiently balance them, we need to fill in serious and material shortfalls in our information base. For example, standard fishing conservation management practices only account for being able to manage one species at a time. We don't have the techniques to manage the interaction between two species, let alone a whole ecosystem.

The techniques do not account for changes in physical environment. Something as simple as water temperature is not accommodated in fishery management.

Fishery management techniques do not presently account for ecosystems, and, as a consequence, can't really deal with issues of climate change. The fishery management techniques that are used don't take into account economics even, and sociology, even though these are well-known components of fishing.

And finally, there is not an end-to-end systems engineering approach to ensuring coordinated and coherent cost-effective management of the entire process.

In my view, we need a three-year effort to retool fishery management. The effort would be initiated with the creation of three centers that focus on our greatest shortfalls in science, engineering, and technology.

The first center would be a national center for ocean ecosystem research, which would focus, organize, and program an in-depth understanding of ocean ecosystems, particularly as they relate to fisheries and the waste-sink capacity of the ocean in an environment that is changing because of the climate.

The second national center for fishery management systems would develop a systems engineering approach to fishery management, including the end-to-end balancing of data acquisition, control rules for management, and dissemination of information to managers, legislators, and the fishermen.

And finally, a national center for fishing engineering would focus on the green issues of improving the efficiency of fishing gear, separating good fish from bad fish, big fish from little fish, reducing bycatch, and improving fuel utilization, and less influence of bottom-tending gear on the bottom organisms.

I see the creation of these centers by using existing resources and personnel. The answers to the questions that are posed essentially relate to creating a capability. That is what these three centers are intended to do, is to create a capability which does not presently exist to address the most critical conservation issues, using our fishery resources as a model.

Thank you very much.

[The prepared statement of Mr. Rothschild follows:]

Statement of Brian J. Rothschild, Montgomery Charter Professor of Marine Science, University of Massachusetts Dartmouth

The Subcommittee recognizing "that the conservation of our ocean and wildlife resources will be '...impacted by a host of challenges, including climate change, energy development, the economic downturn, and federal budget deficits'," has asked my views "regarding: 1) the information, product, and service needs necessary to address conservation in a dynamic era; and 2) new tools, which Congress may consider...to protect and conserve...ecologically healthy oceans."

In the global and national context, the substantial environmental challenges that we face are intertwined with the ever-increasing human population and consequent food and water shortages; growing limitations in waste-management options; and declining societal welfare. The concentration of population into cities located on coasts or large waterways continues unabated. The differences in priorities between the rich and the poor are significant challenges to any comprehensive approach to coastal and ocean conservation.

In addressing these issues, we have sometimes arrived at simplistic definitions and approaches that are potentially ineffective in solving the problem. These simplistic approaches are evident in terms of both what we know and what we do not know and in terms of the conceptual underpinnings for policy.

For example, while everyone knows that climate change is affecting the ocean, many think that the effect is limited to sea-level rise and increased ocean temperatures. However, the increased heat has significant influence on ocean stability and hence on nutrient cycling and ocean productivity, affecting at the fundamental productivity and organization of the ocean ecosystem.

With regard to conceptual underpinnings, when we think of the challenges facing our ocean resources, we naturally think of "conservation." In the early 1900s, society became aware of the need to conserve our natural resources. At that time, "conservation" was an important concept. While, at that time, some had the prescience to understand its importance, others perceived resources to be virtually limitless and suppressed actions that would have prevented the irreversible effects of human activity that we observe today.

But, conservation is no longer a concept, it is an imperative. Taking into account the involvement of a burgeoning global population, a growing scarcity of many resources, and the complex character of global environmental change requires establishing the conservation imperative. An imperative requires action! And it is obvious that plans for action need to be constructed in the context of shrinking budgets and the need to preserve and even create employment.

How do we address the conservation imperative in time of scarce possibly shrinking budget resources?

In a time of shrinking budgets, we have to ask the right questions to ensure that we focus our resources on the most important problems. As an approach, we might start by listing all of the perceived conservation issues that concern us. We would find some issues would be relatively easy to identify. Other issues would be extremely complicated. Some of the complicated issues would be oversimplified to the extent that their supposed solutions would not result in the intended effect and, in fact, some of the unintended consequences might be negative.

In addition, we would almost certainly find that the magnitude of the total perceived required effort would far exceed resources needed to address the issues. (Let us not forget that some environmental issues are global in scope.)

The actions implied by the conservation imperative require us to select the most important conservation programs given a fixed budget. What are the smart choices? Are some remedies simplistic? Can we make everything pristine? How do we factor in sustainability and balance the political realities of resource use?

At the end of the day, we need a concrete quantitative analysis to assure us that we are asking the right questions. Without such analysis, how can we be sure that the budget and personnel are appropriately allocated? As important, are we organized to maximize our capability to address the right questions in a cost effective way?

Let's examine the specific case of the conservation and management of fish stocks. The conservation of fish stocks is governed by the Magnuson-Stevens Act. This legislation requires that management strike a balance among competing goals: 1) eliminating overfishing, 2) fully utilizing optimum yield, 3) taking into account the economic and social fabric of fishing communities, and 4) utilizing the best available science in the process.

In the context of the conservation imperative in this particular application, we do not have the tools to address the balance among controlling fishing, obtaining the optimum or maximum yield, and balancing the needs of society.

The core science equations used in fishery management are not realistic. The ocean environment drives variations in fish stock abundance, yet it is not included in the core science equations. Many fisheries catch many species at the same time, yet the core equations are only capable of dealing with a single species at a time (not two species and certainly not entire ecosystems). The population dynamics of fish populations are dependent upon the ecosystem within which they live, yet ecosystems are poorly understood. In particular, the component of the ecosystem that drives fish recruitment—the dynamics of the plankton and their interaction with physical forcing—is in particular even less understood. Despite the fact that there is considerable information on fishery economics, that information and associated body of theory is almost never used in fishery management.

Existing data on fisheries is dependent to a significant degree on results from research survey vessels. Because these vessels are very expensive to operate, it is difficult to assemble frequent relatively real time data. The reliance on survey vessels meets some needs but suppresses obtaining data from fishing vessels. Data from fishing vessels satisfies the need to know how effective each fishing vessel is, a critical need in management, and provides basic data.

The nature of the core science equations, the data necessary to fuel the core equations, and the flow of information comprise a system. This system has neither been specified nor analyzed in the context of a systems engineering problem. Experience shows that managing without using a systems context is very expensive. Adopting a systems approach would improve the quality of management without increasing costs.

At stake is the fact that the legal requirement of the MSA, to balance the competing goals of suppressing overfishing, attaining optimum yield, and taking into account the economic and social needs of fishing communities are poorly addressed.

So, how do we develop the capability to address the conservation imperative in fisheries? We need to develop a critical-mass effort in three essential areas. To do this we need to develop a sending-a-man-to-the-moon approach. We need to focus many existing efforts in three national research centers.

There needs to be a National Center for Ocean Ecosystems Research (NCOER). Virtually every fundamental problem that relates to our resources—fisheries and the waste-sink capacity of the ocean—can be found in the structure and functioning of the ocean ecosystem. The NCOER would focus on critical problems in our understanding of ecosystems, particularly the role of the plankton as it affects fish population dynamics. It is important to recognize that understanding ecosystems is also critically important to understanding the very important role plankton play in driving the ocean and atmospheric component of global change. A particular issue of concern is the interaction among species of fish, recruitment dynamics, and scenarios that result from a changing climate—the linkages we need to forecast our nation's fisheries resources, and other species of concern. This would address critical components of the identification of conservation imperatives.

There needs to be a National Center for Fishery Management Systems (NCFMS) applying a systems engineering approach to the technical requirements of fishery management. This center needs to focus on the requirements for fishery management and the alternative approaches to meet these requirements. NCFMS would develop the procedures for development of end-to-end fishery management systems facilitating sampling theoretic data collection; efficient and focused use of simple fishery control rules; and rapid information reports to managers and various user groups. The focus would be on developing simpler, more cost-effective techniques that effectively sample the catch and provide advice on optimum yield—a critical aspect of the conservation imperative.

There needs to be a National Center for Fisheries Engineering (NCFE). NCFE would focus on the improvement of fishing gear and fishing strategies to reduce bycatch and fuel consumption. New net systems and ways of sensing fish from fishing boats would be a priority with the thought-in-mind that these would do a better job in saving fuel and separating wanted fish from unwanted fish—both conservation imperatives. Much of the work in this Center would be undertaken in collaborative programs with the fishing industry—a possible target for stimulus funding.

To respond to the second question posed by the subcommittee concerning new conservation tools, I think that the most productive effort is to take an end-to-end systems approach to fisheries management. This has essentially not been done, and because of this, we are not sure whether we are asking the right questions or being cost-effective in our approach to management.

A priority focus establishing the three Centers would involve a refocusing and retargeting of existing personnel and budget resources. In the short term, we could continue to manage fish under the existing system. I envision after a three-year carefully phased effort, the three Centers would arrive at an innovative approach

to fishery management, effectively providing new and more cost-effective conservation tools. This approach would not only enable a much clearer public perception of our nation's fishery resource management process, but also achieve solid definable results in balancing overfishing, optimum yield, and the economic needs of communities.

Ms. BORDALLO. Thank you, Dr. Rothschild. And I will now recognize Members for any questions that they may wish to ask. And this will alternate between the Majority and the Minority Members.

I will begin with a few questions for Dr. Pomponi.

Your testimony outlined several areas of research that need further study to make adaptive management more effective, and enhance our ability to predict impacts of climate change.

Can you prioritize these research needs?

Ms. POMPONI. Probably the greatest need—well, in fact the greatest need would be to get a better understanding of kind of the baseline data.

But I think the greatest, to enable us to do that, I think we are going to have to develop the infrastructure, put the infrastructure in place. We have already got part of that in place, in terms of our observing systems; but I think being able to establish a regional approach that is integrated across many regions, to be able to provide the data so that we can effectively communicate among regions and convert those data into information that can be used by resource managers, I think is going to be probably the greatest priority.

Ms. BORDALLO. So, improving the infrastructure on the current infrastructure?

Ms. POMPONI. Yes.

Ms. BORDALLO. All right. Now, how will these critical research programs facilitate better decision making with regard to the threats of sea-level rise and ocean acidification?

Ms. POMPONI. I think if we are going to adapt, we need to know what we are adapting to. And as I mentioned, that requires data and models and predictions.

If what we expect is going to happen in terms of sea-level rise occurs, there will be habitat loss; there will be shifting ecosystems. That is going to affect not only our natural resources; it is going to affect our infrastructure, our coastal infrastructure, public health, national security.

We need to reduce those uncertainties in our predictions in terms of sea-level rise. We need to reduce the uncertainties into what marine life is going to survive in a warmer and more acidic ocean environment.

So, that is the type of information that we need to provide to better formulate our predictive models, and be able to provide more information, so that we can manage to these, adaptively manage to these changes in the environment.

Ms. BORDALLO. And Doctor, what new technologies are on the horizon that will enable better ocean management?

Ms. POMPONI. I think there are some exciting new biological and genomic sensors that are going to help us, tags that we can put on, on larger animals. More sophisticated molecular tools that help us to understand what is actually living in the ocean environment.

From an engineering standpoint, gliders that enable us to assess the environment on a more comprehensive scale, on a broader scale.

I think that it is important for us to maintain the continuity of our remote sensing data. So, satellite observations from space are going to be extremely important to continue that, to make a commitment to continue that.

And I think probably even most important out of this is that we need to make sure we can get the agencies to coordinate acquisition of data, the management of data, and the dissemination of those data to our end users. I think more than anything else, I mean, we have information, we have data. We need to be able to coordinate that.

Ms. BORDALLO. We have to share it.

Ms. POMPONI. Yes, and share it. Get it back in a usable format to the users.

Ms. BORDALLO. What are your immediate and long-term infrastructure needs, and how can we reduce the costs?

Ms. POMPONI. Probably the more immediate ones are getting the ocean-observing system in place, and making sure that we have an integrated system across the United States. It is going to be costly, it really is.

And so the key here is going to be, I think, to engage private partnerships, to get private partnerships involved; and to make sure that we are making best advantage, making optimal use of the existing facilities, so that we truly are integrating them.

But I would be remiss if I didn't say that I think we need to make a commitment to our academic research fleet. That is, we really do need to improve our research vessels that are going to be able to go out and service ocean observatories, take other additional measurements, and be able to integrate what we are finding, what we are learning from our satellite observations with what we are learning in situ in the ocean.

Ms. BORDALLO. Thank you very much, Doctor. And now I would like to recognize our Ranking Member here, Mr. Wittman from the State of Virginia.

Mr. WITTMAN. Thank you, Madame Chairwoman.

Dr. Jackson and Dr. Pomponi, I just wanted to point out I appreciate your advocacy of the ecosystem approach in marine management. I think that sort of holistic approach is extraordinarily valuable.

It has been, though, it seems somewhat difficult to the U.S., because of things like the Endangered Species Act and Marine Mammal Protection Act, that elevate protection of certain species at higher levels than others.

And with that in mind, can you comment about how you see the U.S. approach to an ecosystem paradigm or framework in managing our marine resources? How can we do that, based on these existing Acts that sort of create a tiered approach to this ecosystems management?

Ms. POMPONI. If I may go first? I think the key to that is going to be to get the agencies that are responsible for these, these regulatory policies to work together. I mean, we are dealing with a situation right now where we are trying to come up with a plan for

environmental management prior to putting in some offshore renewable energy prototypes.

And it really does involve working with a variety of agencies to make sure that we are taking care of, you know, we are addressing each of these regulatory policies. I think that is probably, it might be a Pollyanna approach, but it is the simplest approach. And it is one actually that is working right now, I think.

Mr. JACKSON. Yes, I think I will just add very simply to that. I think that the ecosystem approach could provide you a tool to focus the efforts of multiple government agencies and non-governmental organizations on a single, a single objective, if you like, for a subregion.

It also enables trade-offs to be made. And we have heard that this morning in the Subcommittee. First to identify what those trade-offs could be, and for decision makers and yourselves to understand what is the consequence of those trade-offs, including with predicted species, and make better informed decisions.

So, this may not necessarily require a substantially increased investment; it is just refocusing where the investment goes.

Mr. WITTMAN. Thank you. Mr. Nutter, you say that programs should focus on people, and not insurance companies; and that measures should be designed to protect the property, not support artificially low insurance rates.

Can you tell me, does this type of program exist today? And if so, where? And can you tell us where it has been successful, and maybe give us some examples of its application?

Mr. NUTTER. Certainly. Let me start with where it exists today, and that is inappropriate, it would seem to us. The National Flood Insurance Program, which is a FEMA-run program, has somewhere between 25 percent and 30 percent of its insured policies are subsidized. In other words, they are not based upon true actuarial risk. It is an example of really encouraging and facilitating development in coastal areas.

Insurance is regulated at the state level, so I think the answer to your question is that some states have done a good job in finding that balance between consumer protection of insurance rates, and finding a risk-based rate.

The state that has the most difficult time with this is really Florida, largely because it is so exposed to extreme natural events. It is very heavily populated, mostly, say that 80 percent of the people who live in Florida are exposed to hurricanes. And they have struggled with finding the balance between actuarially sound insurance rates that send a clear message about what the risk is, and making certain that insurance is available to people.

Mr. WITTMAN. Mr. Rothschild, one last question. In your testimony you refer to simplistic definitions and approaches that have been potentially ineffective in solving the problems that we face in our marine environments.

Can you give some examples of what definitions and approaches you mean? And maybe some effective ways with which to deal with these concepts.

Mr. ROTHSCHILD. Well, one simplistic approach is the concept that we can rebuild fishery stocks in a 10-year time period. And

empirical observations show that sometimes fishery stocks take many more years than that 10 years, or a shorter period of time.

And the approach to dealing with this really relates to having a better understanding of the dynamics of ecosystems. And I propose that we have a national center to study those components of ecosystems.

It is very difficult to have an ecosystem approach to management in fisheries when the most sensitive aspect of fish population dynamics is recruitment. And that is a problem—in other words, the number of young fish that are born each year. And that is a problem that is unsolved.

Mr. WITTMAN. Dr. Rothschild, thank you. I think that is very insightful. I think sometimes there is a tendency to oversimplify issues that we all know are extraordinarily complex, and all interrelated as to the ecosystem and other aspects of what we deal with.

So, I think that holistic approach in trying to go away from some of the more simplistic ways to say well, it is as simple as A produces B, is where we need to go. And I appreciate your insights there.

Thank you, Madame Chairman.

Ms. BORDALLO. I thank the Ranking Member, Mr. Wittman. And now I would like to recognize the gentleman from Michigan, Mr. Kildee.

Mr. KILDEE. Thank you, Madame Chair.

Dr. Jackson, how does IUCN envision the Federal government fully implementing and enforcing existing laws, such as the National Environmental Policy Act, the National Forest Management Act, and the Endangered Species Act?

Mr. JACKSON. Yes, thank you. I will just say that I am not expert on the U.S.; my expertise is in international work.

But I think coming from that perspective, there are many eyes on the U.S., particularly on the excellent legislation that has been put in place over many years. And it is, I think I mentioned in my testimony about leadership of the U.S.

And I think a key thing here is the implementation that was in my statement, the implementation of that legislation, if fully followed, will solve many of the environmental problems we have had, particularly on an ecosystem-based level.

But more than that, it shows international leadership that these things can be done, they should be done, and they can be done economically by investing in good legislation and in good implementation of that.

This morning we heard also about the need for more integration across those various pieces of legislation, across the various agencies. So, I think the comment in my statement was more keep up the good work, and take it forward; rather than shy away from the economic crisis, and go backwards.

Mr. KILDEE. Let me ask you this. This is kind of a general problem we find in government.

We have good laws, like NEPA and the National Forest Management Act and the Endangered Species Act. Those are authorization bills, and authorization bills are somewhat like a get-well card. You know, if I have a friend who is ill, I will send my friend a get-well

card that expresses how I value my friend, how I feel about my friend.

What my friend really needs is the healthcare card. That is the appropriation.

Is there a difference, do you see a difference, a significant difference, between our sentiment expressed—and thank God they are, and I supported all of these things—in the authorization bills, and the actual health card bill, the appropriations to make sure these Acts actually carry out their purposes?

Mr. JACKSON. Yes, definitely a difference. I think if we don't follow up with investment in the legislation, in the ability of agencies to implement those things, then it does remain as a get-well card.

To me this is an issue of decision making. If you understand the degree of dependency we have on natural——

[Electronic interference.]

Mr. JACKSON.—is that sufficient for what you get in turn? Internationally, a recent study showed that we get somewhere around $33 trillion a year from ecosystem services, comparing that to gross national product globally of $16 trillion a year. But if you look at the investment in economic issues versus environmental issues, I think we are fundamentally failing to understand where our dependency lies as human beings.

Mr. KILDEE. Thank you very much. I yield back, Madame Chair.

Ms. BORDALLO. I thank the gentleman from Michigan, Mr. Kildee.

And now I would like to recognize the gentleman from the Commonwealth of the Northern Marianas, Mr. Sablan.

Mr. SABLAN. Thank you very much, Madame Chairman. And I am very happy that you continue to give some attention to the issues that are very important to the area we represent. I come from the Northern Mariana Islands, a part of Micronesia.

And I am very pleased with the commitments or the attention that the oceans and climate change has been, are being given, because frankly, whether it involves that we are concerned about the polar bears in the Arctic or whether we are concerned about the inhabitants of an island in the Kiribas, climate change are indeed affecting these people and these mammals, these species.

Dr. Pomponi, obviously despite that sometimes governments give their departments, their patients healthcare cards, sometimes patients compete for attention from doctors.

So, the testimony highlighted the need for continued coordination among Federal ocean agencies. And that problem was highlighted in the report of the Commission on Ocean Policy.

But can you tell us, please tell us how the lack of coordination has affected your own work through time?

Ms. POMPONI. I think that the fact that there are multiple—you know what, I will give you one good example. I thought of actually just one example.

One is that my own work involves marine natural products drug discovery. It is discovery of novel compounds from marine organisms that can be used to treat diseases, like cancer.

The National Science Foundation doesn't fund drug discovery, and the National Institutes of Health doesn't fund kind of ocean-

related work. So, that type of research often falls between the cracks.

So, that is one example that I can give you from my own personal experience. And so, for example, when you go to the National Science—and there has been an approach to address that, and that is the establishment of these ocean, the centers for oceans and human health, that have been joint ventures between the National Science Foundation and the National Institutes of Environmental Health Sciences.

There are just a few of those. And the funding for those programs has dwindled. It has been drastically reduced. But that is an example of where going to a single agency is not, is not effective, but efforts have been made to collaborate among two or more agencies, to provide the necessary resources to address ocean and human health issues.

Mr. SABLAN. Thank you, Doctor. Now we really need that health card.

[Laughter.]

Mr. SABLAN. Dr. Jackson, in your submitted, your written testimony, you have said that the ocean drives weather patterns and so many other things. But I agree with you that marine ecosystems often extend across political jurisdictional boundaries.

And so my question is, implementing existing law and accurate valuations for understanding that this Subcommittee on Insular and Ocean and Wildlife had oversight responsibility for certain agencies under NOAA or the Department of the Interior.

What would be the focus of policy reforms to increase the commercial rewards for conserving biodiversity, and increased penalties for biodiversity laws?

Mr. JACKSON. I am not sure if I am qualified to answer that question. In fact, I don't think I can talk about national legislation to that extent. I am sorry.

Mr. SABLAN. All right. So, my other question is how do you envision regional ocean management agreements governing the range of activities and process currently affecting marine ecosystems?

Mr. JACKSON. Yes. I think you mentioned before that the, many of these marine ecosystems cross political jurisdictions, not just internationally, cross internationally. And an area of substantial weakness at the moment in international law is, it relates to the high seas, particularly to the U.N. Floor of the seas.

I think that you could show considerable leadership here in engaging in these issues, at least from the agencies' perspective, with research into understanding the opportunities and constraints of improving that. We talked before about the ecosystem approach, applying that to the international high seas.

It is something that is not impossible for several governments to come together, perhaps also with the private sector, the fishing industry, with the conservation community, to look at how can this be done in an effective manner, to yield longer-term benefits, both in terms of in biodiversity, but also in terms of economics of making those fisheries more sustainable. This is particularly important for island communities that are heavily dependent on those fisheries.

Mr. SABLAN. Thank you, Chair.

Ms. BORDALLO. I thank the gentleman from the Commonwealth of the Northern Marianas, Mr. Sablan.

I would like to recognize the gentlelady from the Virgin Islands, Mrs. Christensen.

Mrs. CHRISTENSEN. Thank you, Madame Chair. I just have maybe a few questions. But I would just like to point out that this afternoon at Salt River in the Virgin Islands is a meeting on the Joint Institute for Caribbean Marine Studies, a marine research and education center that the University of the Virgin Islands is collaborating with several other universities. And we have been working on it for years. So, hopefully, we will be able to contribute to the kinds of research that we are discussing today, and do it in the right way.

It started out as a reef research center. So, the fact that it has gone from reef to marine, I think we are heading in the right direction. We are not just focusing on one, one entity in the oceans.

Mr. Nutter, we live on, I represent the U.S. Virgin Islands. We can't move from our coastal areas or get out of the way of the hurricanes.

And I have been here 12 years, and we have not been able to really pass any good legislation to provide for disaster insurance and windstorm insurance. I believe early on there was one, H.R. 2 it might have been, that was around for several years, where states were required to put together an entity to provide reinsurance.

You seem to not want the Federal government to do it. But do you have any opinions about that approach? Or is there some kind of regional approach where risk could be spread? We would look at that, but it seems like no matter where you are, you are subject to some kind of a disaster.

So, if you can understand what I am asking.

Mr. NUTTER. I think I do, and I appreciate the frustration of dealing with a very high-risk area that has hurricane exposure, has lived through many difficult time periods.

Mrs. CHRISTENSEN. And is experiencing some of the effects of climate change.

Mr. NUTTER. Absolutely. Certainly the companies that we represent, the reinsurance companies, do in fact provide a risk-spreading mechanism for insurers that provide insurance to homeowners in a variety of areas. I am not as familiar with the Virgin Islands perhaps as I should be to answer your question.

But it seems no question that, that a solution clearly is hazard mitigation, to see that the Federal government does provide sufficient funding for the Virgin Islands and states to give people against their taxes, for instance, for providing mitigation against natural hazards—shutters, improved roofs, those kinds of things—so that people survive these natural disasters.

And those kinds of efforts would seem to me to go a long way toward moderating the cost of insurance and the availability of insurance in particularly high-risk areas like that.

Mrs. CHRISTENSEN. Well, we have done some of those things. We haven't gotten tax credits for them. And our insurance costs didn't go down commensurate to the fact that we did apply new building codes, new roofing standards, and so forth. But thank you for your answer.

Dr. Pomponi, I have listened, and I went through your testimony last night on ecosystem-based management. And obviously it brings together all of the ecosystem and managing, the marine resources. And as I understand it, it also coordinates activities between those entities that impact adversely or positively on the marine environment.

But in my district, and I suspect others, it is the fishing community that bears the brunt of any restrictions or attempts to address for any, the reduced fish resources of marine resources, or adversely impacted marine resources.

So, in your experience, how have we been able to address points toward non-point-source pollution and development, and their impact on our marine resources. Because we haven't been able to do it successfully.

Ms. POMPONI. And in my experience, we are not doing it successfully in many other areas, as well. So, it is not only the Virgin Islands.

By the way, the reason I am a marine scientist today is because of an experience I had in the Virgin Islands when I was in college, so that is what led to me going into this field.

Mrs. CHRISTENSEN. Great.

Ms. POMPONI. I think that in general, any group that is targeted—let me give you an example. In the state of Florida, non-point-source pollution that is attributed to nutrients coming in from septic tanks has been a very great cause of concern.

And so, you know, what has happened in our state is that there is legislation that has been passed that is going to reduce that, both point and non-point-source pollution from nutrients, sewage going into our coastal environments.

But it is a balancing act for each of these. I know that the fisheries are often targeted. And I think that when we start looking at establishment of these marine protected areas or habitat areas or particular concerns, we have to be really careful in terms of saying OK, which areas are ones where fishing can occur, or which areas are ones where bottom-trawling should definitely not ever occur.

So, it just requires more detailed information about the environment itself, about the actual impacts of the environment, and being able to show that there is a true cause-and-effect relationship.

Does that sort of answer your question?

Mrs. CHRISTENSEN. I think it begins to get to it. I think, you know, sometimes it is just politics that gets in the way.

Ms. POMPONI. The public, yes, the political will.

Mrs. CHRISTENSEN. Yes, and the need for development. And I listened to Nature Conservancy, you know, talk about trying to bring some balance. But sometimes in a small community, that balance is very difficult to achieve.

Thank you, Madame Chair. I don't have any other questions.

Ms. BORDALLO. I thank the gentlelady from the Virgin Islands. And I just have a couple of wrap-up questions here.

First, for Mr. Nutter. In a recent chartered Insurance Institute report, the CEO writes, and I quote, "In reality, climate change is here now. And it is as much opportunity as risk for those who are wise enough to adapt early on."

So, how can the government help the insurance and reinsurance industries adapt and create opportunities in these times? And how can the government provide better climate-change information, so the reinsurance industry can reduce or mitigate for risk? At what scale is this information needed?

Mr. NUTTER. That is a very good question, and I think the scale is really the answer to your overall question.

Climate science that is being pursued by the National Science Foundation, the University Center for Atmospheric Research, and other climate researchers really need to localize as much of the climate information as possible, in order to do financial planning for the insurance industry or local planning for local governments in dealing with infrastructure—bridges, levees, roads, that sort of thing that localize climate information—would make a huge difference in helping everyone assess the risk, both to storm surge, to increase in intensity or severity of storms, as well as increased precipitation.

So, I think the answer to your question is that if we could set a priority that we need to have localized impacts of climate change, as best we can get it, that would make a large difference in how we assess the risk, and how we manage the risk.

Ms. BORDALLO. Thank you, thank you very much. And Mr. Nutter, in your opinion, if we do a better job of recognizing and mitigating the risk of natural hazards in the coastal zone, can we expect to see more and better opportunities for fish and wildlife conservation as a collateral benefit?

Mr. NUTTER. It is a question for me? Certainly, the coalition that we are working with that involves a number of environmental groups, the Consumer Federation of America, a number of taxpayer groups, is really seeking to find that balance between proper land-use management that preserves coastal ecosystems that can be used as buffers for extreme weather events, as well as to allow the development that Mrs. Christensen was talking about, to find that balance.

So, absolutely. Trying to find that coordination between preserving coastal areas that provide habitat, as well as provide protection for people, would be the best long-term solution to providing local land-use planning and financial management.

Ms. BORDALLO. Dr. Rothschild, did you want to comment on that?

Mr. ROTHSCHILD. I didn't have anything to add.

Ms. BORDALLO. You just agree, right?

Mr. ROTHSCHILD. Yes, right.

Ms. BORDALLO. Thank you. I have one that, well, this takes me home.

Dr. Jackson, I am particularly interested in the section of your testimony that discusses mitigation banking in the context of wetlands. So, I would appreciate your thoughts on how mitigation banking might be utilized in Guam.

Could the principals underlying the development of wetland mitigation banks be employed to mitigate any adverse ecological impacts of the current military buildup?

Mr. JACKSON. Yes. I think the simple answer is yes, I think they could be. There have been, the early development of them, which was pioneered here in the United States, has been very promising.

I think you have to keep in mind they are a tool, a tool that needs to be used with other regulatory mechanisms, not just to be based on financial mechanisms. But they are a very promising tool. The user-pay system I think is the basic principle behind it, and the precautionary principle behind that again.

So, I think for Guam, yes, they could be. You know that you have also the environmental challenges, invasive species being a particular one. And we also know how that was introduced, some of those species introduced into Guam via the military. And I think that that principle of wetland banking or biodiversity banking could certainly be applied more generally, which would help with mitigation efforts, but also help with a broader understanding of if you have to make a change, then who is responsible and who should pay.

Ms. BORDALLO. Thank you. Thank you, Doctor.

Do you have any questions, our Ranking Member? Mr. Kildee?

[No response.]

Ms. BORDALLO. I want to thank the witnesses on the second panel for their participation in the hearing today. It was certainly very informative. And Members of the Subcommittee may have some additional questions for the witnesses, and we will ask you to respond to these in writing.

The hearing record will be held open for 10 days for these responses.

And if there is no further business before the Subcommittee, the Chairwoman again thanks the Members of the Subcommittee and our witnesses for their participation here this morning.

And the Subcommittee stands adjourned.

[Whereupon, at 12:04 p.m., the Subcommittee was adjourned.]

[Additional material submitted for the record follows:]

[The prepared statement of Mrs. Capps follows:]

Statement of The Honorable Lois Capps, a Representative in Congress from the State of California

Thank you, Madame Chairwoman, for holding this hearing today to explore how we might better manage the oceans and our wildlife resources as we move forward in the 111th Congress and in working with the new Administration.

Thank you also to our witnesses who have traveled to testify before us today.

I represent a district that spans more than 200 miles of coastline, and includes two national marine sanctuaries, a national forest, a national estuary program, two national monuments, and a national park. The well-being of my district depends almost entirely on the health of our oceans and the welfare of our natural resources.

Our country is in the midst of a financial crisis and we face difficult choices. However, we cannot let these challenges deter us from investing in our future.

One of the best ways to invest is by protecting some of our nation's biggest economic drivers—our oceans and our coasts.

We need to reauthorize the National Marine Sanctuary Act. Our national marine sanctuaries are some of our nation's greatest treasures.

We need to make sure that our Sanctuary Office has the tools to employ adaptive, ecosystem-based management that ensures that all the ecosystem services our Sanctuaries provide—from tourism to sustainable fisheries—remain intact.

I look forward to delving into this legislation in the coming months.

It is also crucial that we reauthorize the Coastal Zone Management Act, and include in it the tools we need to mitigate global warming and adapt to our changing

environment. In the coming weeks, I will introduce two bills to begin to address these issues.

The first is the "Coastal State Renewable Energy Promotion Act", which will provide grants to states to survey the coastline to identify areas suitable for renewable energy development.

The second is the "Coastal State Climate Change Planning Act", which will provide assistance to coastal states to voluntarily develop climate change adaptation plans.

These two policies will help our nation on its path to energy independence, and assist us as we prepare for an uncertain future on a warming planet.

We also need to continue to invest in the Coastal and Estuarine Land Conservation Program (CELCP). CELCP provides states with matching funds to purchase significant coastal and estuarine lands.

For example, in my congressional district I've worked collaboratively with environmental groups, willing sellers, and the State to conserve lands and waters around Morro Bay, on the Gaviota Coast, and near the Piedras Blancas Light Station.

These projects have offered numerous benefits to local communities by preserving water quality, natural areas for wildlife and birds, and outdoor recreation opportunities—thereby protecting for the future the very things we love about the coasts.

This hearing could not come at a more opportune time. As we move forward as a new Congress and with a new Administration, I look forward to working together to better manage the oceans and our wildlife resources.

Response to questions submitted for the record by John Baughman, Member, Sporting Conservation Council

Questions from Ranking Republican Member Henry E. Brown, Jr., SC

A. North American Model of Wildlife Conservation

Mr. Baughman, thank you your excellent testimony and references to the North American Model of Wildlife Conservation.

Notwithstanding the durable success and accomplishments of the North American Model, in your opinion, under the present "user-pays-user benefits" system of financing conservation, can we maintain funding for existing programs let alone take on new initiatives?

We cannot meet the needs of existing programs and take on new initiatives without doing something to increase revenue for federal and state programs. We could expand the user-pays concept to more adequately provide for conservation of all species and all forms of wildlife-related recreation and enjoyment by increasing the categories of outdoor equipment that are subject to a federal excise tax (e.g. binoculars, sleeping bags, backpacks, hiking boots, bird seed, outdoor guidebooks, etc.). This has been suggested and congressionally pursued in the past, but it met resistance due to the complicated taxing and collection mechanisms and the political unpopularity of supporting any new tax. Other user fees such as permits for general access to federal and state lands, permits for certain wildlife viewing areas, etc. could be implemented, but again it results in a complicated system of collecting and administering lots of small pots of money, and the public eventually pushes back when subjected to the inconvenience of lots of small user fees. A more logical approach would be to dedicate a small portion of federal and state revenues for conservation of fish, wildlife, and their habitats, so that in affect, all Americans are sharing in the costs of conservation. The revenues need to be dedicated, so they don't drop to zero every time there is a war or healthcare crisis. Revenue from new Outer Continental Shelf or new onshore energy production, or revenue from trading carbon credits have been proposed as reasonable sources.

Are there specific strategies you might be able to recommend to broaden the number of user groups that might pay into a system of wildlife conservation to diversify and increase available sources of funding?

See the above item. My suggestion is to pursue reasonable, sustainable funding from a portion of the rents, royalties and/or other receipts from new energy production, or a portion of any income received due to carbon trading protocols established by future climate change legislation. Every state should also have a significant, sustainable stream of state generated funding to support conservation within their borders. Congress could provide incentives to encourage states to generate this funding that would compliment—not substitute for—federal revenue.

B. Clarification of Landscape Conservation Recommendation

Mr. Baughman, in your statement you recommend that the Congress authorize and the Administration implement landscape-level programs to treat at-risk forest, grassland, and wetland habitats?

Can you please explain what you mean by "at risk" habitats?

Habitats, just like species (e.g. Threatened and Endangered species) can be at risk; in fact, habitat degradation is one of the most common causes of jeopardy to species at risk. In the West, the sagebrush-steppe ecosystem is at risk due to effects of long-term drought, over-grazing, and invasive species—particularly cheat grass which results in a more frequent fire cycle that can completely eliminate sagebrush over vast areas. As the sagebrush disappears, sage grouse, sagebrush sparrows, and mule deer disappear too.

Would the migratory bird Joint Ventures be a model that might serve as a template for these broader "landscape" initiatives?

The migratory bird Joint Ventures are excellent examples of "landscape" initiatives, as are the efforts that are being supported by the Healthy Lands Initiative. All of these efforts treat the causes, rather than the symptoms, of habitat loss over wide areas, and they deliver conservation through partnerships and highly leveraged funds.

Response to questions submitted for the record by Dr. Peter Kareiva, Chief Scientist, The Nature Conservancy

Questions from Hon. Madeleine Z. Bordallo

Dr. Kareiva, please respond to the following questions regarding decision support tools and valuing ecosystem services.

1. What is the biggest limiting factor in getting ecosystem services valued appropriately when making decisions?

At this moment in time there are two limiting factors. The first is simply that most decision-processes in the USA do not build in any sort of comprehensive ecosystem service valuation, and most decision-makers are not yet aware of this approach. That is changing.

The second big limitation is that we lack easy-to-use tools that can help public institutions do these valuations in a scientifically credible manner using widely available land or coastal marine management data. A major goal of the Natural Capital Project is to develop these tools and to make sure they are consistent, transparent and scientifically credible. It will likely be 2-5 years before the tools have been sufficiently developed, and easy-to-use web interfaces allow non-specialists to begin using the tools in routine planning exercises.

2. If the decision-support tools you discuss lead to a decision to halt a development project, won't that mean fewer jobs for public works?

First, one of the greatest values of decision support tools that rely on maps of ecosystem services is that they generally do not lead to prohibitive decisions such as "no development", but instead provide guidance about where to move the development or how to do the development differently to reduce degradation of ecosystem services. Unlike prescriptive regulations, ecosystem service analyses point to options.

Second, thoughtful valuation of ecosystem services will often lead to a new kind of development project—development projects that restore or build up ecosystem services. Examples of these include reforestation on steep slopes, floodplain restoration, planting out oysters to rebuild oyster reefs and so on. These all are labor intensive.

Lastly, we should not forget that ecosystem service valuation can reveal that a development project that might produce jobs in one place, could reduce jobs elsewhere because of undesirable ecosystem impacts. Thus ecosystem service assessments should provide a more complete "jobs analysis" than decisions that do not take into account impacts on ecosystem services that are often felt downstream, offshore, or twenty years later.

3. How close are we to realizing your vision of a network of tools that can accurately assess threats to our most vulnerable ecosystems?

As I mentioned above we are 2-5 years from having a portfolio of web-based tools that could be widely and easily applied. At this point in time the tools require a team of PhD scientists to do the analyses. Frankly how fast it happens depends on

the resources available to the Natural Capital Project and to scientists doing studies that connect land use and coastal marine activities to ecosystem services.

4. What policy frameworks could Congress propose to ensure these tools are explicitly and systematically integrated into decision-making by individuals, corporations and governments?

There are many options for this. One possibility is to use the existing EIS framework, and require an ecosystem services assessment as part of that EIS process. Ecosystem service assessments could also be required of U.S. Army Corps of Engineer Projects. Some have argued that we should institutionalize ecosystem service assessments as a routine component of policy analyses concerning everything from energy options to transportation systems. This is being experimented with in some states. Secondly, for those cases where the private sector requires licenses or some sort of "approval", ecosystem service assessments could be required.

Finally, it may be fruitful to include ecosystem service valuations into national accounts of productivity or well-being. Some countries, such as China are even experimenting with identifying certain counties as especially important because of their ecosystem services, and to then track the "productivity" of these counties in terms of both traditional metrics of economic production "but also an accounting of the value of the ecosystem services. In that way, if a county achieves economic development at the cost of degraded ecosystem services, that degradation could be subtracted from its more traditionally reported productivity. Similarly, Canada is constructing a "well-being index" that will be used as an alternative measure to GDP to gauge the well-being of Canadians. It includes, among other things, a measure of ecosystem health—using the same ideas that have inspired China to embrace a more thorough accounting, whereby a degradation of ecosystem health counts negatively toward the overall human-well being index.

In general, consideration should be given to applying these tools explicitly and systematically as new legislation is developed. For example as we grapple with the adaptation provisions of climate change legislation, care should be taken to require that these tools be used to ensure that ecosystem service assessments are an integral part of both domestic and international adaptation programs. The same could be said of legislation governing the development of new energy sources.

5. Can decision support tools and accurate ecosystem service valuations provide short-term economic benefits, in addition to long-range sustainability benefits?

Of course they can. Imagine a big infrastructure or energy project that is conducted without any ecosystem service assessment. Then that project will either proceed or not, and if it proceeds it will produce the jobs and economic benefits directly related to the project. Now imagine the same project that has been evaluated using an ecosystem service assessment and has been found to produce some negative impacts that need mitigation action. Then the very same project produces its original job and economic benefits, but now also has a mitigation component that represents additional jobs. In some ecosystems, habitat restoration and mitigation can also enhance fisheries productivity, increase recreation opportunities, and even enhance water quality and human health.

In a climate stressed world, natural ecosystems can be especially beneficial in a way that would be revealed by a careful ecosystem service valuation. As a result of climate change it is already evident that heat waves are more common and more severe. These heat waves actually are a significant source of mortality in cities, which because of all the concrete and lack of vegetation can act as heat sinks with temperatures as much as 10 degrees higher than nearby rural landscapes. An ecosystem service assessment of climate mitigation could lead to investment in more green space in cities, and ultimately a cooling effect that reduced the health costs of urban heat overloads—which preferentially put children and the elderly at risk.

6. What are the key actions that the federal government can take to bring decision support tools to decision makers?

There are two major steps the federal government could take. First they could invest in research at universities, and federal agencies and in NGO's that is aimed at testing and validating these tools in an experimental manner. Second they could offer incentives to private industry and to public institutions that perform ecosystem service assessments of alternative options—those incentives could be more streamlined approval processes and expedited support for development projects that have used ecosystem service valuations in their project design.

7. How can the United States be a leader in implementing these mapping and decision-support tools?

Through its great universities, and some pioneering initiatives surrounding ecosystem services on the part of the USDA and EPA, the U.S. is already the world leader in the development of ecosystem service assessments. However other countries such as Australia and China are farther ahead in terms of requiring ecosystem service assessments as a prelude to their public planning or infrastructure decisions. The U.S. needs to invest heavily in applying ecosystem service assessments to real-life decisions as soon as possible, and then to evaluate the quality of decisions made when ecosystem services are considered compared to when ecosystem services are not considered. If the U.S. combined such experimentation with its already vanguard research, it would truly lead the world in land-use, infrastructure, and development decision-making.

Response to questions submitted for the record by Jeff Trandahl, Executive Director, National Fish and Wildlife Foundation

Questions from Hon. Madeleine Z. Bordallo

Please respond to the following questions.

Question 1: Mr. Trandahl, you have testified that Congress should provide clear prioritization of federal conservation goals and objectives in order to increase conservation funding from private sources.

How would federal prioritization improve the availability of funding from private sources?

There are un-tapped funding resources for conservation in the private funding community. Private funders are seeking leveraging opportunities and enthusiasm by the federal government to invest in conservation priorities through collaborative public-private partnerships. A new set of federal priorities for conservation, implemented as a single effort, would catalyze private resources for conservation.

Administrative and/or legislative language that recommends and encourages agencies to pool federal resources and combine them with funding from the private sector is needed. Incentives for agencies to pool funds in a simple fashion have been nearly nonexistent. Encouraging Federal agencies and Departments to pool funds and work together would help administrative hurdles and should reduce overall cost by limiting total overhead and result in greater conservation outcomes.

Question 2: Can you help us to better understand why NFWF still finds it difficult to convince federal agencies to partner with you? If it is a cultural issue, as you describe, what can be done to promote a more constructive culture?

Federal conservation priorities and associated performance measures are needed to incentivize public-private partnerships within the agencies. Under the current structure, program implementation favors retention of FTE's and federal resources without regard for the potential benefits of establishing meaningful partnerships for the strongest conservation outcomes. As stated above, the agencies need specific motivation (via performance measures, statutory requirements or otherwise) to work together and partner with the corporate, foundation and non-profits.

Agencies tend to maintain control and direct oversight of grant programs and other conservation initiatives, regardless of the potential efficiency or effectiveness gained through multi-sector partnerships. Current measures, i.e. acres/miles restored, do not accurately measure whether or not conservation opportunities have been fully maximized. Similarly, assessing matching funds provided by grantees only provides part of the actual "matching" funds that are available. To promote a more constructive culture, agency performance could be measured according to how well their program funds are leveraged with (1) other federal agencies (2) states (3) corporations and private foundations (4) non-profit organizations (5) individuals.

Question 3: What incentives, especially non-monetary incentives, are most effective in encouraging responsible stewardship of natural resources and in engaging private individuals and entities in promoting such stewardship? Can you think of any examples to show the marked success or failure of incentive approaches?

Safe Harbor agreements are an effective method to motivate landowners to protect wildlife habitats. When faced with a legal threat, private entities are likely to avoid conservation opportunities. Another frustration is multi-layered bureaucracy and roadblocks which delay progress. Assurances for individuals or groups who are

meeting and/or exceeding federal requirements that new requirements will not be put into place after the fact would ensure responsible stewardship of natural resources.

Question 4: Could you please be more specific about the other untapped opportunities you reference to establish new partnerships to expand the base of funding for conservation?

As stated in our testimony, the Foundation is currently working with the USDA Natural Resources Conservation Service (NRCS) to implement the Conservation Innovation Grants (CIG) program. NRCS awards approximately $20 million annually to support projects that advance innovative practices and technology to improve stewardship on working farms and ranches. This program is highly attractive to private funders as it is geared to ensuring that America maximizes food production while enhancing environmental protection goals such as minimizing soil and nutrient runoff, improving wildlife habitat, and reducing water and energy consumption.

Based on our initial inquiries, we were able to identify 6-10 private funders who were excited about the opportunity to work with NRCS and NFWF to leverage funds and expand the pool of financial resources to address the high demand for this program.

Similarly, we believe there are other existing federal programs that offer opportunities to generate partnerships within the federal government and private corporations/foundations. There are multiple invasive species programs that involve various federal agencies and both public and private lands. Rather than creating more new programs that cannot be funded, Congress and the Administration should consider a single, inter-agency program that would be attractive to private partners and leverage significant funds to ensure meaningful conservation outcomes. New programs and potential federal funding for climate change adaptation and mitigation of energy development offer similar opportunities for public-private partnerships. It is critical for the federal government to take full advantage of these partnership opportunities if we want to achieve measurable progress in restoring healthy populations of fish and wildlife and their habitats.

Question 5: Can habitat be managed in a way that respects private ownership? If so, how?

Since the majority of land in the U.S. is privately owned, it is absolutely essential to manage habitat in a way that respects private ownership. The key to private lands conservation has been partnering, identifying common interests, and respecting the landowners' business and conservation goals. Many of the Foundation's grant programs are focused on providing incentives for private landowners to restore and conserve habitat for wildlife. One example is our Columbia Basin Water Transactions Program, a partnership with Bonneville Power Administration, which has successfully created a voluntary marketplace for private landowners to restore in-stream flows for imperiled salmon, steelhead, resident trout and other wildlife species. Through program partners like the Idaho Department of Water Resources, landowners have the opportunity to sell, lease, and/or conserve water while maintaining the traditional agricultural uses of their land.

Question 6: How will the downturn in the economy affect the Foundation and its ability to find private/corporate partners?

To date, the downturn in the economy has not had a significant impact on the ability of the Foundation to maintain our private/corporate partners. More than ever, our private partners are attracted to the opportunity to work hand-in-hand with the federal government and the non-profit community to invest in on-the-ground conservation. Our annual appropriations and discretionary cooperative agreements with the federal agencies are essential to our private partnerships. The federal funds provide a base for the Foundation to generate private funding interests in national conservation priorities.

To ensure success in both private and public investments, we are incorporating monitoring and evaluation into our programs in order to measure progress, promote adaptive management, demonstrate results, and continuously learn from our grant-making.