

**STATEMENT OF JONATHAN B. JARVIS, REGIONAL DIRECTOR,
PACIFIC WEST REGION, NATIONAL PARK SERVICE,
DEPARTMENT OF THE INTERIOR
BEFORE THE HOUSE COMMITTEE ON NATURAL RESOURCES,
SUBCOMMITTEE ON NATIONAL PARKS, FORESTS AND PUBLIC LANDS
ON THE IMPACTS OF CLIMATE CHANGE ON
AMERICA'S NATIONAL PARKS**

APRIL 7, 2009

Mr. Chairman and members of the subcommittee, thank you for the opportunity to present testimony on the role of the Department of the Interior (DOI) and the National Park Service (NPS) in addressing climate change impacts on America's greatest treasures – units of the National Park System.

Secretary Salazar has prioritized the issue of climate change within the Department of the Interior. He is in the process of designing a climate change strategy to integrate the work of each Bureau to mitigate and adapt to the effects of climate change in the pursuit of each Bureau's mission – this includes the National Park Service, Fish and Wildlife Service, U.S. Geological Survey, Bureau of Land Management, Bureau of Indian Affairs, Bureau of Reclamation, and Minerals Management Service. In 2008 the Department of Interior had a multi-agency taskforce that put forth a number of recommendations relating to climate change adaptation and mitigation activities. The Department works closely on many levels with NOAA and the U.S. Forest Service in coordinating activities relating to climate change.

An integration of science, adaptive management tools, and other resources across the Federal Government is essential to the DOI's mission to address climate change across all federal lands, wildlife, and cultural and natural resources (including mitigation, adaptation, and communication/engagement strategies) and to the NPS' mission to do the same. We are pleased that you chose Joshua Tree National Park as the site of this field hearing since this is a good example of a desert park whose resources are being impacted by climate change.

Climate change is potentially the most far-reaching and consequential challenge to our mission than any previously encountered in the entire history of the NPS. In setting aside Yellowstone National Park in 1872, Congress stated that the purpose of the park was:

preservation, from injury or spoliation, of all timber, mineral deposits, natural curiosities, or wonders, within the park, and their retention in their natural condition.

This concept of “retention in their natural condition” became the cornerstone of our National Park System when Congress passed the National Park Service Organic Act, which states that the mission of the NPS is:

...to promote and regulate the use of the...national parks...which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

Climate change challenges the very foundation of the National Park System and our ability to leave America's natural and cultural heritage unimpaired for future generations. Our national park units can serve as the proverbial canary in the coal mine, a place where we can monitor and document ecosystem change without many of the stressors that are found on other public lands.

DOI and the NPS are rising to this challenge, and today my testimony will focus on four major areas. First, our observations of the effects and potential future changes related to climate change in national park units. Second, the actions and programs we have underway to prepare for the current and anticipated changes from climate change. Third, some of the actions the NPS plans to undertake in the coming years. And fourth, some other considerations related to climate change.

The Effects of Climate Change in National Park Units

Parks are already experiencing some dramatic impacts that may be resulting from climate change. Warming temperatures may be accelerating melting of mountain glaciers in national parks such as Glacier and North Cascades while perennial snowfields throughout Alaska are disappearing. Reduced snowpack and changes in the timing and amount of stream flow affect aquatic communities. Alaskan parks are seeing some of the earliest impacts of possible climate change – melting sea ice threatens marine mammals as well as coastal communities, while thawing permafrost can destabilize buildings, roads, and facilities and disrupt the structural basis of large regions of interior lands. In Yosemite and Great Basin National Parks, we have documented high-elevation species, such as the pika and alpine chipmunk, moving upslope, thereby reducing the effective area for their survival; this upslope migration may be attributable to changes in climate. In Bandelier and Rocky Mountain National Parks, higher temperatures and drought have brought high mortality to pine forests as infestations of bark and pine beetles have expanded to higher elevations and new ranges that may also be occurring because of climate change. (Parmesan 2006, Marcogliese 2001)

Fire frequency and intensity may also be related to climate change. NPS data indicates that fire ignitions are occurring both earlier and later in the season now and the average duration of time that a wildfire burns has increased from less than 10 days to more than a month. Fires in some places may be increasing in frequency and intensity, threatening native plant communities and contributing to the spread of invasive exotic species.

Wildland fire frequency and intensity can have a significant impact on cultural resources, as hotter fires and our efforts to fight them directly damage buried archeological sites. At

Mesa Verde National Park, fires have damaged historic structures and threatened the loss of archeological sites according to NPS data. (Westerling 2006)

Coastal parks are extremely vulnerable to climate change. The NPS manages 74 coastal units encompassing more than 5,100 miles of coast and three million acres of submerged resources including beaches, wetlands, estuaries, coral reefs, and kelp forests. These parks attract more than 75 million visitors every year, and generate over \$2.5 billion in economic benefits to local communities. The *U.S. Climate Change Science Program Synthesis and Assessment Product on Coastal Sensitivity to Sea Level Rise* (2009) states:

Critical coastal ecosystems such as wetlands, estuaries, and coral reefs are particularly vulnerable to climate change. Such ecosystems are among the most biologically productive environments in the world.

These coastal ecosystems are significant habitats for the production and health of recreationally and commercially valuable fish and shellfish, they provide important environmental services, and offer beautiful landscapes for marine recreation and wildlife watching. These ecosystems are predicted to change as sea level, ocean acidity, and water temperatures rise. Shorelines and park boundaries will change as sea level rises resulting in a net loss where parks cannot migrate inland. At Everglades National Park, rising seas may overwhelm the mangrove communities that filter out saltwater and maintain the freshwater wetlands. Indeed, changes have already been observed as coral bleaching and disease caused by increased sea surface temperatures led to the loss of more than 50 percent of reef-building corals in the Virgin Islands park units since 2005. (IPPC 2001, Hoegh-Guldberg 1999, Buddemeier 2004) Increasing the resilience and adaptive capacity of coastal ecosystems will be critical to maintaining their enormous biological value and ecological services to the nation and local communities. NPS's Organic Act uniquely positions us to work cooperatively with states, local agencies and the public to address the cumulative impacts of overfishing, pollution, and coastal development that aggravate and accelerate the effects of climate change on these valuable ecosystems.

While some impacts from climate change are already measurable, the long-range effects of climate disruption on park natural and cultural resources, infrastructure, and visitor experience are just beginning to be understood. Here at Joshua Tree, the park may lose its namesake species as warmer winters cause the freezing temperatures required for the trees' reproduction to occur less frequently. The policy implications for protecting species in a rapidly changing climate are complex and without precedent.

Cultural resources will also be significantly affected by climate change, primarily due to increased erosion from rising seas and more intense storm (and hurricane) surge. Rising sea levels are already damaging archeological sites, historic structures, and cultural landscapes such as Fort Jefferson in the Dry Tortugas and Jamestown. Sea level rise and storms threaten the tangible remains of some of the earliest human occupation sites, dating back over 10,000 years, along the west coast, as well as associated Native American burial grounds at places like Channel Islands National Park and shell middens

on the Gulf Coast of Everglades National Park. Alternately, decreasing lake levels expose vulnerable archeological resources and critical park infrastructure in places like Lake Mead National Recreation Area. Our nation's maritime history, including lighthouses from Massachusetts to Oregon, historic forts including Fort Jefferson and Fort Sumter, and historic coastal communities also face threats from rising seas and more intense storm surges.

The 1980 Alaska National Interest Lands Conservation Act (ANILCA) created 10 Alaskan parks and expanded parklands by 43 million acres. It also recognized the critical importance of access to subsistence resources found in parks, including fish, game, and plants, to both Native and non-Native residents of rural Alaska, and directly linked this access to their continued physical, economic, social, traditional, and cultural existence. While the threats that climate change poses to salmon, caribou, and seals may be viewed as threats to natural resources, they also clearly challenge our ability to provide appropriate subsistence opportunities to local rural residents around our units in Alaska.

Many questions exist regarding how physical processes, species populations, and ecosystems will respond to a changing climate. The science of predicting the complexities of these interactions over relatively long periods of time is highly uncertain, yet the NPS is committed to understanding and monitoring the effects of climate change on park resources and ecosystems. The focus of the climate change discussion has largely shifted from the evidence to what we can do about it. As stewards of our nation's natural and cultural heritage, we have an obligation to act now.

Current Climate Change Actions and Programs

To effectively respond to the challenges of climate change, the DOI is undertaking a collective and coordinated strategy that builds upon and expands existing partnerships such as those between NPS, other bureaus, parks, regions, and national program offices. Building the capacity to respond to climate change will involve identifying, linking, prioritizing, and implementing a range of short and long-term activities. The complex and cross-cutting nature of this issue will require an unprecedented level of cooperation across the DOI Bureaus, other federal and state agencies, the entire NPS, and our partner organizations.

Because climate change has been identified as one of highest priorities for the NPS, many actions and activities have already been undertaken at parks and within regions. The NPS is now in the process of developing a strategic framework for action that will detail short and long-term actions in three major areas: mitigation, adaptation, and communication. The NPS has hired a Climate Change Coordinator and created six working groups – Legal & Policy; Planning; Science; Resource Stewardship; Greenhouse Gas Emission & Sustainable Operations, and Communication. We will use the information from these groups to develop a strategic framework for action that will address park, regional, and national-level needs and concerns.

Over the past three years, the NPS has hosted or participated in a series of regional and interagency workshops to explore climate change impacts and coping strategies. In conjunction with the Environmental Protection Agency in 2003, the NPS initiated the Climate Friendly Parks Program to promote sustainable operations in parks and create climate action plans to reduce greenhouse gas emissions; almost 60 parks now participate. The NPS also requires Environmental Management System Plans that help parks track and reduce their environmental impacts and set targets for sustainable park operations. The NPS adopted an Ocean Park Stewardship Action Plan in 2006 to guide actions to reduce ocean-related climate change impacts. Finally, NPS formed a service-wide Climate Change Response Steering Committee to foster communications, provide recommendations, and serve as an advisory body to NPS leadership.

Successful approaches to mitigating climate change impacts require the very best science, not only in physical and biological disciplines, but also in social, and cultural sciences. Since 1999, the Cooperative Ecosystem Studies Units (CESU) Network has provided the NPS with a mechanism to collaborate with leading research institutions, including universities, NGO's and State and federal partners to provide the necessary science for sustainable adaptive management of NPS resources. Since 1999, 17 CESUs have been established covering all regions of the country, with a total of 250 partners including 13 federal agencies. The program has been highly successful in funding cutting edge collaborative research and providing technical assistance and capacity building to the NPS, as well as State and local agencies and other federal partners.

Looking to the Future—Mitigation, Adaptation, Communication

While efforts to date are significant, much work lies ahead. The NPS must position itself to respond to the effects of climate change on park resources and to prescribe management actions that are suitable for parks. Building an effective response to the threats posed by climate change will require action in three interrelated areas: mitigation, adaptation, and communication. These efforts will necessarily involve strong intra- and interagency cooperation and leadership. We need to build on the collective knowledge that is available to create new solutions for protecting resources and resource values.

Mitigation—Leading by Example

Our collective carbon footprint must be understood to be managed responsibly. In the area of mitigation, the NPS is leading by example in reducing our carbon footprint and promoting sustainable operational practices. The Climate Friendly Parks Program and the Energy SmartPARKS Program are two of the key ways that NPS is mitigating GHGs through these areas of emphasis:

Emissions Inventories: Parks quantify and track their emissions and identify specific areas where reductions can be most readily achieved. An online tool – the Climate Leadership in Parks (CLIP) Tool created in 2005, allows parks a new and simplified way to do this assessment and to guide them through the process.

Climate Action Planning: Parks use the CLIP tool to identify carbon reduction goals and actions to follow through on these goals. Sixty parks are now in the process of completing these plans.

Energy Conservation: Significant portions of GHG emissions in parks come from transportation, building energy consumption, and waste management. Mitigation solutions include sustainable design and construction, adaptive “green” reuse of historic structures, use of high-mileage and alternative-fuel vehicles, solid waste reduction, and alternative transportation systems that integrate all modes of travel within a park, including land and water-based vehicles.

Renewable Energy: An increasing number of parks are generating and using clean renewable energy such as photovoltaic systems and geothermal heat exchange. The Energy SmartPARKS program is a partnership with the Department of Energy that is focusing on generating renewable energy and showcasing sustainable energy practices in parks. Currently, NPS-wide, 3.8% of energy in parks comes from renewable sources.

Regions are also moving forward with their own climate change initiatives. For example, the Pacific West Region (PWR) of the NPS has a very ambitious Climate Change Leadership Initiative that promotes Climate Friendly Parks. The overall objective is to support Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management, by setting GHG targets. The 58 parks in the region have set a target of carbon neutral for park operations by 2016 and now generate over 4% of their energy from renewable sources. For example, Joshua Tree National Park generates 40% of its energy from renewable sources.

The NPS has made carbon management, energy conservation, and renewable energy a major focus for our future. Accordingly, we have set a goal to significantly exceed the federal requirements for reducing total energy use in NPS operations and having some of our energy come from renewables by 2016, the 100th year anniversary of the establishment of the National Park System. Additionally, the NPS has set a goal of having all parks identify their carbon footprint and have climate action plans in place before 2016.

Safeguarding and Protecting Park Resources—Adaptation Planning

While mitigating the cause of climate change is essential, scientific evidence demonstrates that even if we stopped emitting greenhouse gases today, our past actions have already committed the planet to some degree of change. Because of processes in the atmosphere and oceans, it will take carbon dioxide and temperature on the order of centuries to stabilize once GHG emissions are under control. Other responses, such as sea level rise, can take millennia. We have to start planning for adaptation options now – while we simultaneously work to stabilize emissions.

For adaptation planning and implementation, our highest priority is to support ecosystem integrity and the resilience of species and communities to respond to changing conditions. As climate change causes shifts in weather, we will see changes in water availability, fire, and community structure and composition. Park vegetation and wildlife will need to adapt to these new regimes or have the ability to migrate. By building resilience and reducing other ecosystem stressors, the NPS will help to reduce the extent of some of the most deleterious impacts on park resources from climate change. For example, the NPS needs to be aggressive in its actions to prevent the intrusion of invasive species, eradicate where feasible, and control the spread when prevention and eradication efforts fail. The NPS also will undertake measures to restore natural ecosystems, making them healthier and more resilient to the effects of climate change. Examples include our on-going efforts to restore major ecosystems such as the Everglades, and the establishment of marine reserves in units of the National Park System.

A critical component for adaptation planning and implementation involves building our science information and ecosystem monitoring capacity for sound decision-making by park managers. National park units represent a wide range of ecosystems scattered across the nation, embracing a broad spectrum of diverse and natural environments of North America. Parks present a tremendous opportunity to observe the effects of climate change on resource conditions that scientists and managers have documented over decades. Begun almost nine years ago, the NPS Natural Resources Challenge Initiative has funded parks across the nation to conduct inventories and initiate vital signs monitoring of natural resources under the NPS's jurisdiction.

The combination of these sources of information, long-term legacy monitoring data, and new inventories has provided timely examples of the possible effects of climate change now visible in parks. The NPS Inventorying and Monitoring (I&M) Program's primary goal is to collect, organize, and make available natural resource data. This program includes 32 networks serving more than 270 parks. The Vital Signs Program, which is part of the I&M Program, is strategically positioned to help parks acquire the information they need to make informed decisions and to employ adaptive management so that we can be flexible in the face of change. In addition, NPS has also been funding baseline documentation, including condition assessments of its cultural resources and ethnographic studies that include data on natural resources utilized and monitored by native groups. This data provides critical information for evaluating the potential and real impacts of climate change on cultural resources. Information from these programs also informs state policymakers and assists scientists in looking at regional and national trends.

Planning for climate change presents a major challenge for park superintendents, their staff, and NPS programs. Resource management decisions must be based on future expectations. However, in an era of climate change, the future will be characterized by highly consequential and unprecedented changes that cannot be predicted with as much accuracy and precision as we would like. Consequently, the NPS is utilizing a scenario planning approach that uses the best available science to explore a range of plausible "multiple working futures" and consider appropriate actions within them. Currently the

NPS and USGS are working on a scenario planning workshop that will be held the end of this month to look at case studies at Assateague Island National Seashore and Wind Cave National Park. Adaptation also involves rethinking infrastructure and preparing people for those changes that are inevitable. To respond to climate change, park infrastructure may need to be adapted to better perform or maintain functionality. This also includes rethinking park planning issues such as zoning and the design or location of buildings and roads. Scenario planning is being specifically designed to help managers identify policies and actions that will be most effective across a range of potential futures and to promote tactical adaptation responses that are compatible with the NPS mission.

Joshua Tree served as a case study for developing climate change scenarios through a workshop held at the park in November 2007. Some of the issues that were common across all scenarios were the loss of Mojave Desert habitat in the park due to warming and increased invasion by non-native grasses, which in turn is likely to bring more frequent and larger fires to the park. As the park begins its general management plan this year, these scenarios – forecasts of potential landscapes of the future – will help guide that park in identifying appropriate management actions for the future.

The NPS has made scenario and adaptation planning a major goal for the next ten years to ensure parks are prepared for building resilience into ecosystems and ensuring future visitor facilities are sited in appropriate locations.

Parks Serve as Models of Sustainability and Places to Communicate Climate Change Information

There is a great need at this time for messages that communicate the complexities of climate change and the actions that can be taken. With 275 million visitors annually, the parks can serve as models of sustainability and platforms to effectively communicate information about climate change. Parks can thus be the catalyst for visitors to do their part for climate friendly parks. The NPS's interpretive and education programs strive to connect people to the parks, with opportunities for all visitors to form their own intellectual, emotional, and physical connections to the meanings and values found in the parks' stories. Effective interpretive and educational programs encourage the development of a personal stewardship ethic and broaden public support for preserving and protecting park resources so that they may be enjoyed by present and future generations. The public has come to expect high-quality and up-to-date resource information when they visit parks.

The NPS is ideally positioned to raise awareness on climate change and provide information about solutions that are being implemented across the NPS and the Department. A number of efforts are underway to tell the story about climate change and impacts to national parks. These efforts include a monthly web-based seminar series featuring climate change experts on science, communication, and management topics and interpretive training using a decision-tree for developing knowledge around aspects of climate change. The information will be used to frame interpretive programs and answer visitor questions. The NPS has developed a "Climate Change, Wildlife and Wildlands

Toolkit” (in conjunction with other federal agencies) to be used by interpreters in parks, zoos, aquariums, and science centers and by outdoor and classroom educators across the country. In addition, summaries of climate change knowledge for specific bioregions – a series of 11 bioregional documents – are being created in partnership with the U.S. Fish and Wildlife Service that summarize the current state of knowledge about climate change and impacts to protected areas, with a focus on national parks and refuges.

Looking forward, the NPS has a goal of every NPS park having climate change information available through brochures, wayside exhibits, interpretive programs and handouts, and park websites. The Climate Friendly Parks Program has encouraged this and currently, there are many examples such as Point Reyes National Seashore, Glacier National Park, Apostle Islands National Lakeshore, Everglades National Park, Dry Tortugas National Park, and Kenai Fjords National Park where climate change information is readily available to the public. The NPS is currently developing and supporting a new and exciting “Visitor – Do Your Part Program” which will have visitors voluntarily measure and reduce their carbon footprint.

The NPS may also utilize the national preservation programs, such as Preservation Assistance and the National Center for Preservation Technology, to develop and disseminate information on sustainability, historic preservation, guidance for adaptive reuse of historic buildings and addition of renewable energy sources into historic areas.

Other Considerations

In the future, collaboration with gateway communities, private partners and state, local and federal agencies will be a key element to successful mitigation, adaptation, and communication measures. Much of our carbon footprint results from visitor services and movement in and around parks. Thus, our ability to mitigate GHGs is uniquely tied to our gateway communities and the transportation decisions we make. The NPS will need to complement natural mechanisms that mitigate and adapt to climate change through strategic approaches including: ensuring wildlife and stream corridors are established to enable wildlife to migrate if necessary; promoting and protecting healthy reefs, mangroves and coastal wetlands that can minimize damage to coastal communities; and protecting and restoring forests that can reduce soil erosion and mudslides brought on by changing weather patterns and catastrophic events.

At present, the Vital Signs Monitoring Program is well-established as a key source and supplier of reliable, organized, and retrievable information about parks. Climate change monitoring efforts by other DOI bureaus, such as the U.S. Geological Survey, will also be a valuable tool in understanding climate change effects on NPS landscapes. By building on the successful network approach of these programs, the NPS will likely gain additional capability to collect, analyze, and report data on the condition of key natural and cultural resources in parks and how they are changing or may change as a result of climate change.

Coastal and riverine parks are extremely vulnerable to climate change impacts, especially sea level rise and storm surges, and these are high priority areas for developing and implementing adaptation actions. For example, shallow estuaries are significant for the long-term production and health of many commercial species of fish, including salmon and steelhead trout. The survival of these natural resources are also critical to maintaining viable cultures that depend on them such as the salmon and shellfish critical to Northwest tribes and the reefs that support Pacific Island cultures. These important habitats could dramatically change as sea level continues to rise. The impacts of rising sea level also reach surprisingly far inland. The Hudson River, for example, is tidal more than 100 miles inland, at Albany, New York. Implementation of adaptation plans will be critical to ensure facilities and coastal systems such as estuaries and tidal rivers continue to function.

Conclusion

Our national park units are environmental baselines to track change, and they stand as some of the last vestiges where ecological components function naturally. To succeed in its mission in the face of climate change, the DOI and NPS must lead by example in minimizing our carbon footprint and promoting sustainable operational practices. We must take responsibility for understanding how climate change will impact the national parks and take appropriate steps to protect these national treasures. An unprecedented level of collaboration and cooperation with other agencies and partners will be required to acquire needed scientific information, protect resources, and effectively expand the teaching of the benefits and necessity of natural and cultural resource conservation across the nation and the world.

Thank you for the opportunity to present this testimony. I will be pleased to answer any questions you and other members of the subcommittee might have.

Bibliography

Marcogliese, David J., 2001. Implications of climate change for parasitism of animals in the aquatic environment. *Canadian Journal of Zoology*.

Westerling, A.L., et al, 18 August 2006. Warming and Earlier Spring Increase in Western U.S. Forest Wildfire Activity. *Science*. Vol. 313.

IPCC (Intergovernmental Panel on Climate Change) 2001. *Climate Change 2001: Synthesis Report. A Contribution of Working Groups I, II, and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. IPCC 3rd Assessment Report, Cambridge University Press, Cambridge, United Kingdom, and New York, USA.

Hoegh-Guldberg, 1999. Climate change, coral bleaching and the future of the world's coral reefs. *Marine and Freshwater Research*.

Buddemeier 2004. *Coral Reefs and Global Climate Change: Potential Contributions of Climate Change to Stresses on Coral Reef Ecosystems*. Prepared for the Pew Center on Global Climate Change.

Canadian Journal of Zoology 2001. Implications of climate change for parasitism of animals in the aquatic environment.

Bentz, et. al. *Bark Beetle Outbreaks in Western North America: Causes and Consequences*. University of Utah Press

CCSP 2009. *Thresholds of Climate Change in Ecosystems*. A report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. U.S. Geological Survey, Department of the Interior, Washington DC, USA.

Parmesan 2006. *Ecological and Evolutionary Responses to recent climate change*. *Annual Review of Ecology, Evolution and Systematics*.