



Climate Change Action Plan 2012–2014



Golden Gate National Recreation Area California, is one of many coastal parks experiencing rising sea level.

NPS photo courtesy Will Elder.

The background of the page features a scenic view of the Golden Gate Bridge in San Francisco, California. The bridge's iconic orange-red towers and suspension cables are visible against a clear blue sky. In the foreground, there are vibrant purple lupine flowers in full bloom, adding a touch of natural beauty to the scene. The overall atmosphere is bright and clear, suggesting a sunny day.

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Letter from the Director



Almost one hundred years ago – long before “the greenhouse effect” or “sea level rise” or even “climate change” were common concepts – a two-page Congressional bill signed by President Woodrow Wilson christened the National Park Service (NPS). Two years later, a similarly brief letter from Interior Secretary Lane to NPS Director Stephen Mather framed the agency’s first management policies, prescribing a vision of national parks as areas “maintained in absolutely unimpaired form for the use of future generations as well as those of our own time. . .faithfully preserve(d) for posterity in essentially their natural state.”

As we anticipate our upcoming centennial anniversary, the reality of change seems to shout from the land. How different the world is now from that of our founding in 1916 and how complicated is our charge to *faithfully preserve* all national park units for posterity. Yet meeting this responsibility could not be more important than it is today.

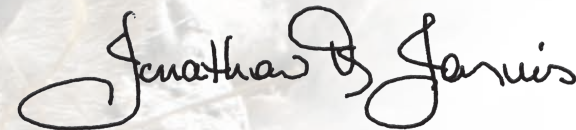
Over recent months, the National Park System Advisory Board’s Science Committee tackled critical questions regarding NPS resource management goals and policies in context of our changing world and landscapes. In the report *Revisiting Leopold: Resource Stewardship in the National Parks* is an important declaration, that to preserve ecological integrity and cultural and historical authenticity, NPS resource management should “steward NPS resources for continuous change that is not yet fully understood.”

Continuous change and uncertainty – climate change embodies both. Yet these are not new facets of park management. Conditions change and decisions must always be made with some level of uncertainty. However, uncertainty is not the same as knowing nothing. Building on the *NPS Climate Change Response Strategy*, the *Climate Change Action Plan* guides us in incorporating uncertainty while moving forward with science-informed actions and engaging, amongst ourselves and with our visitors and partners, in a deeper, ongoing dialogue about how we continue meeting our stewardship responsibility in these new times.

The Action Plan articulates the unique contribution the NPS can make at local, national and international levels in responding to climate change. Among the high-priority “no regrets” actions presented here are many that parks can pursue to support resilience and sustainability within their ongoing resource and facility management operations. These are not the only actions we should take, but they provide examples that may be emulated or built upon. The Action Plan provides criteria and areas of emphasis that help frame the priority actions we can collectively take now, while at the same time offering flexibility for innovation and ingenuity. It also acknowledges some of the changes on the horizon and begins to articulate ways we can prepare now to meet these changes.

The actions we have already taken to address climate change and sustainability have prepared us well to continue to forge ahead. Our interpreters and educators have come a long way in becoming comfortable talking about climate change. We now know through social science conducted in parks that our visitors are looking to NPS staff for honest dialogue about this critical issue. We must continue to provide this service to our public by utilizing the tried and true interpretive techniques and embracing new approaches, like facilitated dialogue, to delve deeper into the conversation about climate change. The communication actions we take today are critically important in setting the tone for how the NPS will continue to reach out to visitors and our communities in the future.

Looking back to the context of the prevailing, early 20th-century sentiments for development and prosperity, the vision of “setting aside” areas to conserve as national parks in an “unimpaired” condition was a remarkable, forward-thinking idea. It remains a humbling responsibility, and a challenging task, perhaps now more than ever. Our response to climate change must be equally forward thinking. With this *Climate Change Action Plan*, we continue that journey together to shepherd in a new century of management in the NPS.

A handwritten signature in black ink that reads "Jonathan B. Jarvis". The signature is written in a cursive style with a large, looping initial 'J'.

Jonathan B. Jarvis
DIRECTOR, NATIONAL PARK SERVICE
November 2012

Urban landscapes of the National Mall and Memorial Parks, District of Columbia, experience changes to phenology and water levels. NPS photo.



Executive Summary

The National Park Service *Climate Change Action Plan* follows on the *Climate Change Response Strategy*, released in 2010, in providing guidance to help park managers and staff effectively plan for and respond to climate change today and in the years ahead. It is intended primarily for internal use by the National Park Service (NPS) workforce. At its core, the Action Plan articulates a set of high-priority no-regrets actions the NPS is currently undertaking, or is committed to undertake, in the next one to two years. The Action Plan also acknowledges how changing social and environmental conditions, including advances in science and information technology, will require new thinking and new approaches, and suggests ways in which the NPS might prepare to meet the challenges and opportunities that lie ahead. The Plan is divided into three sections.

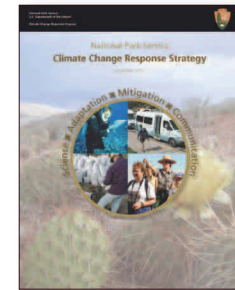
IN SECTION I: CONTEXT FOR ACTION, we identify federal and NPS-specific guidelines that direct and support implementation of climate change science, adaptation, mitigation, and communication actions. We also include a brief background on the establishment and organization of the Servicewide Climate Change Response Program. Two new NPS documents, *A Call to Action* and the *Green Parks Plan*, along with recommendations put forward in the recently released report, *Revisiting Leopold: Resource Stewardship in the National Parks*, offer opportunities to leverage the *Climate Change Action Plan* with other important, visionary initiatives. The NPS has important and unique responsibilities both inside and outside park boundaries that contribute to national and international solutions for climate change. We are setting examples that others can emulate.

SECTION II: IDENTIFYING NEAR-TERM PRIORITIES outlines criteria for immediate actions needed to begin to incorporate climate change considerations into all aspects

of NPS operations. This is not a “do more with less” approach but provides a tool to identify cost-effective actions that deliver results. Table 1 displays high-priority actions, grouped according to eight emphasis areas, together with identification of the NPS programs responsible for the actions and how the actions are relevant to parks. Park and program managers will recognize many initiatives in which they are already involved or can play a role in implementing. The high-priority no-regrets actions represent a framework for building capacity and meeting on-the-ground needs for information and tools. They can be applied or expanded upon as appropriate to the circumstances of park or regional operations.

SECTION III: PREPARING FOR NEW CHALLENGES AND OPPORTUNITIES describes how park and program managers might consider additional actions in anticipation of future conditions. New developments that unfold over the next several years and beyond will help shape our actions. While we cannot unequivocally know what the future may hold, we can be fairly confident of some dynamics and conditions that will emerge based on evidence we see today.

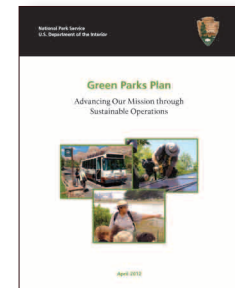
Overall, the Action Plan aims toward building a flexible and coordinated NPS capacity to cope with climate change as it affects park resources and operations now and for decades to come. It articulates specific near-term actions, as well as developments on the horizon. It is meant to be flexible and, as such, will require frequent review and revision. The actions in the plan will be reviewed annually and a substantive revision conducted in 2014. We intend the Action Plan to provide guidance, inspiration, and motivation to act.



CLIMATE CHANGE RESPONSE STRATEGY
www.nps.gov/climatechange/



A CALL TO ACTION
www.nps.gov/calltoaction/



GREEN PARKS PLAN
<http://www.nps.gov/greenparksplan/>



1

CONTEXT FOR ACTION

National Directives

A Servicewide Climate Change Response

The Role of the NPS in a Changing Climate

Flexible Planning



Warmer temperatures in Denali National Park, Alaska, and other mountain parks cause treeline to shift to higher elevations and reduce suitable habitat for alpine species. NPS photo.

NATIONAL DIRECTIVES

The National Park Service (NPS) climate change response operates within several federal directives introduced since 2007 to reduce emissions of greenhouse gases (GHGs), achieve sustainability, and implement science and planning tools for adaptation.

These directives invoke two fundamental tactics that address climate change: (1) mitigation (activities that either reduce GHG emissions or enhance their removal from the atmosphere) and (2) adaptation (activities that help people and natural systems better cope with climate change effects by moderating harm or exploiting beneficial opportunities). The 2010 NPS *Climate Change Response Strategy*, coupled with two implementation plans—this *Climate Change Action Plan*, and the recently released *Green Parks Plan*—put the federal directives for climate change adaptation and mitigation into practice for the NPS.

A SERVICEWIDE CLIMATE CHANGE RESPONSE

In 2007 the NPS Director established the Climate Change Response Program (CCRP) under the Natural Resource Stewardship and Science (NRSS) Directorate, with the charge of working with parks, regions, other directorates, programs, and partners to develop a cross-cutting, interdisciplinary approach to respond to the challenges of climate change. To facilitate servicewide input and explore the needs and issues of parks, several ad hoc working groups were formed beginning in 2008. A Climate Change Steering Committee, created in early 2009, consisted of park, regional, and Washington office representatives, to foster communication and guide the development of a servicewide strategy. The NPS secured base funding for the CCRP beginning FY2010, and the *Climate Change Response Strategy* was launched in September 2010.

The Strategy outlines a series of NPS goals and objectives nested within four major components: science, adaptation, mitigation, and communication. In the strategy, Director Jarvis created the Climate Change Coordinating Group (CCCG) to guide the servicewide program. The CCCG comprises four associate directors: Natural Resource Stewardship & Science, Cultural Resources & Science, Interpretation & Education, and Park Planning, Facilities, & Lands. Advising the group are the science advisor to the director, regional director of the Midwest Region, superintendent of Everglades & Dry Tortugas National Parks, and the Climate Change Response Program chief. With the release of the strategy and establishment of the CCCG, the NPS embarked on a servicewide vision and long-term commitment that reaches beyond traditional stovepipes to involve all levels of the NPS in addressing the issues arising from climate change.

Since publication of the *Climate Change Response Strategy*, two major NPS initiatives relevant to climate change were released: *A Call to Action* in 2011 and the *Green Parks Plan* in 2012. Additionally, the Science Committee of the National Park System Advisory Board put forward *Revisiting Leopold: Resource Stewardship in the National Parks* in August 2012. As the NPS prepares to enter its second century, *A Call to Action* provides an overarching commitment to expand our contributions to society through enhanced public engagement, sustainability, and adaptation to change through our workforce, policies, and collaborative relationships for conservation. The *Green Parks Plan* further provides a blueprint for reducing our carbon footprint, operating parks sustainably, and illustrating best practices to the public. And finally, *Revisiting Leopold* calls for new strategies that go beyond park boundaries and for the NPS to steward our resources “for continuous change that is not yet fully understood.”

Download the *Climate Change Response Strategy* at:
www.nature.nps.gov/climatechange/docs/NPS_CCRS.pdf

NATIONAL DIRECTIVES

Executive Order (E.O.) 13423 (Jan. 2007), *Strengthening Federal Environmental, Energy, and Transportation Management*, sets goals for improved energy efficiency, renewable energy, sustainable environmental and construction practices, and reduced emissions, fuel, and water consumption.

E.O. 13514 (Oct. 2009), *Federal Leadership in Environmental, Energy, and Economic Performance*, adds more specific requirements for federal agency energy, water, and waste reduction targets. It further requires federal agencies to (a) evaluate risks and vulnerabilities to manage short- and long-term effects of climate change on agency mission, programs, and operations, and (b) integrate climate change adaptation into agency planning, operations, policies, and programs.

Congress, through the FY2010 Appropriations Act Conference Report calls for development of a government-wide approach for adaptation, resulting in the *National Fish, Wildlife and Plants Climate Adaptation Strategy*, scheduled for release winter 2012/2013.

Secretarial Order 3289 (amended, Feb. 2010) establishes a science and adaptation strategy for the Department of the Interior (DOI) and requires bureaus to consider and analyze climate change impacts in planning and decision making, and in designing research agendas.



Citizen scientists monitor vegetation change in Golden Gate National Recreation Area, California. NPS photo courtesy Will Elder.

Many NPS parks, regional offices, and national programs began to take action years ago, working with their partners to reduce their carbon footprint and communicate about climate change and its impacts through interpretive programs and educational materials. Over the past several years, with the launch of the servicewide CCRP, the NPS established a core staff with expertise in science, adaptation, mitigation, communication, planning, and policy. The CCRP provides subject-matter expertise, guidance, and technical assistance to parks and NPS offices to implement a range of activities that support adaptation and mitigation actions at park and landscape scales. Major initiatives over the past three years include resource vulnerability and risk assessments, adaptation and scenario planning, collaboration across jurisdictions and organizations to promote shared conservation goals and values, policy guidance, communication and training, and initiation of an enhanced monitoring capability for 94 parks to address rapid climate change.

NPS employees at all levels of the organization contribute to the goals and objectives of the *Climate Change Response Strategy*. Individual initiative is a core strength of NPS staff, who provide innovation and commitment to action when it is needed most, and many of the actions identified in this Action Plan are the result of that individual initiative. At the same time, the scope, magnitude, and complexity of the changes and the tools needed to manage require a capacity that is beyond any individual park unit, program area, or even the NPS as a whole. Meeting the challenge of global climate change will require an unprecedented level of cooperation and collaboration within the NPS and with our partners.

The *NPS Climate Change Action Plan* is meant to provide overall guidance to help park and program managers prioritize decisions so that, as a whole, high-priority NPS actions are coordinated, focused and integrated. The Action Plan's primary audience is the professional NPS

workforce. While the strategy highlights the overall components, principles, and vision for NPS efforts, the Action Plan describes near-term priority actions along with approaches to address climate change and its impacts in the medium to long term. The Action Plan encourages participation, innovation, and full engagement at all levels of the agency.

THE ROLE OF THE NPS IN A CHANGING CLIMATE

The *Climate Change Response Strategy* describes a vision whereby "...the NPS adapts to climate change and effectively preserves and restores park resources and opportunities for visitor enjoyment. Through collaboration with our employees, partners and the public the NPS teaches and promotes climate change science and applies the best management practices and sustainable behaviors toward reducing climate change and its impacts." This is what we must achieve to continue meeting our mission in an era of change. Moreover, the NPS has a larger function in society as a role model and leader, setting examples that others can follow.

Climate change affects landscapes, species, and the cultural and natural systems upon which civilizations depend. As a leading conservation organization the NPS serves an important role in demonstrating effective adaptation strategies and practices at local, national, and international scales. The geography and range of resource types in national parks offer many opportunities for exemplary and highly visible forms of adaptation, including coastal zone management, cultural and historic site preservation, and ecosystem restoration. Parks, wilderness, and other protected areas provide "natural solutions" for climate change, including biodiversity, ecosystem services, and connectivity across large landscapes. The NPS has an important and leading role in promoting ecosystem resilience and addressing impacts on natural

and cultural resources, both within and outside of park boundaries.

National parks also have immense and increasing value to the human environment as laboratories for basic research. In many cases these areas, especially wilderness areas, offer the best baselines from which to understand the complex ways in which climate change affects natural and cultural systems. Many special places within national parks host materials and practices that exemplify how living cultures interact with climate and how societies responded to variable environments in the past and illuminate linkages between cultural values and healthy ecosystems. Through research focused on our natural and cultural landscapes, national parks present many opportunities to learn from our past and apply that knowledge to our future.

The “power of place” is one of the most valuable and characteristic contributions the NPS offers with regard to climate change. The reality of climate change seems distant and abstract to many people, making it difficult to connect the issue to their daily lives. With more than 300 million visitors each year, the NPS has an unparalleled ability to tell compelling stories and connect people to places they care about. As a trusted organization known nationally and internationally for excellence in communicating about park resources and values, the NPS is uniquely positioned to raise awareness, illustrate the importance of reducing GHGs, and to build a stewardship ethic for this issue. Few organizations in the world have as powerful a position in which to make climate change real, immediate, and relevant for people.

FLEXIBLE PLANNING

Through routine operations over the coming years, the NPS will undertake a range of activities that will have long-term consequences. We will deliver messages to

youth and their families that help instill life-long stewardship values. We will maintain access for visitors to enjoy their favorite places for years to come. We will create plans to guide park decision making through decades ahead. We will collect and analyze data to assess how our landscapes are changing and use that information to protect park resources now, and fifty years from now. All of these activities offer opportunities to address the challenge of climate change by communicating and applying what we know and acknowledging areas of uncertainty where new information is needed.

The NPS *Climate Change Action Plan* addresses issues of today while keeping the long view in mind. Many strategic and planning processes work to deliver certainty to an organization. With a vision of the future, most plans set goals and a series of actions to achieve them. This is a straightforward approach, resulting in a fixed plan that describes exactly what should be done and ideally when and by whom. The complexities and uncertainties that characterize climate change require a somewhat different approach—one that employs enough specificity to act in the short term but allows for an iterative, learning process. Therefore, this Action Plan is structured around five general characteristics (see sidebar).

Some of the actions identified in the Action Plan are underway, others are planned for the near future, and others target a longer time frame. Simultaneously, the Action Plan embraces the uncertainties and dynamic nature of climate change and acknowledges that new information, technologies, and ideas will emerge over the coming years. To implement a flexible plan and address changing conditions and needs, the NPS will review actions annually and will conduct substantive revisions to the *Climate Change Action Plan* on a two- to three-year time frame. The first revision will occur in 2014 through the staff and organization of the NPS servicewide Climate Change Response Program.

FIVE CHARACTERISTICS OF A FLEXIBLE ACTION PLAN

- Criteria to help prioritize near-term actions that can be taken under current conditions over the next one to two years
- A set of specific no-regrets actions that meet those criteria and also provide latitude for individual park- and program-level initiatives and innovation
- Flexible direction for expected future situations
- Guidance for preparing to meet less certain long-term changes and circumstances
- Commitment to follow up, reporting, and re-evaluation of priorities



Research in Indiana Dunes National Lakeshore, Indiana, helps managers understand how climate change is affecting populations of the Karner Blue Butterfly. NPS photo.



2

IDENTIFYING NEAR-TERM PRIORITIES

Criteria for Prioritization

Eight Emphasis Areas for Action

Table 1: NPS Commitments to High-Priority Actions

The Natchez Trace Parkway is a historical path that extends 444 miles through Alabama, Mississippi, and Tennessee. NPS photo.

CRITERIA FOR PRIORITIZATION

High-priority near-term actions to advance climate change science, adaptation, mitigation, and communication must reflect the realities of today's economy and society. Growth prospects for the U.S. and global economies are currently subdued, and government spending is likely to remain constrained. Thus, to maintain momentum on this issue, the NPS must identify and implement actions over the next several years that can be accomplished within a limited budget and leveraged with many other competing issues and needs.

At the same time, we cannot lose sight of the fact that climate change is a significant problem facing the world and will remain a relevant issue for park managers, the public, and stakeholders. Parks will continue to require climate change-related information and guidance, especially with respect to communication, vulnerability, and adaptation.

The combination of limited resources and high expectations requires that we work smarter and more efficiently, prioritizing some actions over others, while keeping our overall mission and long-term responsibilities in mind. Given these circumstances, the NPS Climate Change Coordinating Group identified the following criteria to select high-priority no-regrets actions from the many potential actions that could be taken. The term "no regrets" signifies actions that can be initiated now and are beneficial regardless of how future conditions unfold; their benefits generally equal or exceed their costs. High-priority climate change actions:

- **Embed knowledge** about climate change and how to address it within all parts of the organization such that we come to understand it as a routine part of doing business. Climate change will affect everything we do, and we must take every opportunity to educate ourselves and our partners about the effects and explore options for action.

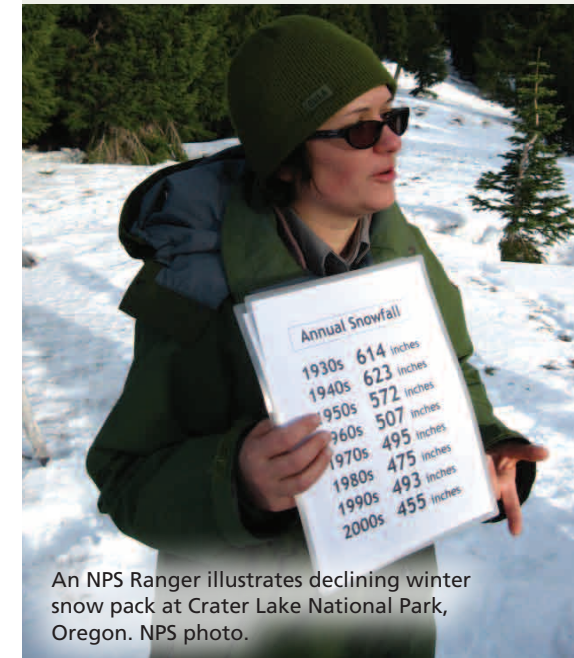
- **Work within the limits of existing staff and funding** to achieve results. While a long-term, robust capacity to manage for climate change will likely require additional staffing and funds, in times of fiscal constraint, it is essential to identify and implement actions that do not require additional resources.
- **Result in multiplier effects** that create momentum to benefit parks and society beyond the initial action and investment. Education, working with partners, and implementing short-term steps toward long-term goals are all examples of actions that fit this criterion.
- **Deliver a unique contribution** to the climate change arena. As a national and world leader in protecting our collective natural and cultural heritage, the NPS can and should deliver perspectives and approaches to climate change adaptation, mitigation, and communication that no other organization can.
- **Leverage selective partnerships** and collaborations. National parks and wilderness are high-value areas within a broader landscape. By working with our partners, we have the opportunity to promote these values within a networked system of protected areas, and we also acknowledge that we cannot protect these high-value resources alone.

EIGHT EMPHASIS AREAS FOR ACTION

Table 1 (page 20) lists the high-priority no-regrets actions to which the NPS is currently committed. Each action meets one or more criteria outlined above. These actions are a subset of potential actions identified through several working groups that met over a six-month period in 2011 to articulate recommendations for the Action Plan. While it represents a subset, Table 1 is nonetheless an ambitious list with over 50 individual actions representing commitments across parks, regions, and national NPS programs over the next one to two years.

EIGHT EMPHASIS AREAS FOR NPS CLIMATE CHANGE ACTION

- Enhance Workforce Climate Literacy
- Engage Youth & Their Families
- Develop Effective Planning Frameworks & Guidance
- Provide Climate Change Science to Parks
- Implement the *Green Parks Plan*
- Foster Robust Partnerships
- Apply Appropriate Adaptation Tools & Options
- Strengthen Communication



An NPS Ranger illustrates declining winter snow pack at Crater Lake National Park, Oregon. NPS photo.



To facilitate a logical presentation of the actions, they are grouped into eight distinct emphasis areas:

- 1) Enhance Workforce Climate Literacy
- 2) Engage Youth & Their Families
- 3) Develop Effective Planning Frameworks & Guidance
- 4) Provide Climate Change Science to Parks
- 5) Implement the *Green Parks Plan*
- 6) Foster Robust Partnerships
- 7) Apply Appropriate Adaptation Tools & Options
- 8) Strengthen Communication

Each action in Table 1 is associated with at least one lead and generally multiple co-leads that are committed to its implementation. Many actions target more than one goal of the *Climate Change Response Strategy* and may also respond to the *NPS A Call to Action*. Additionally, some actions address interagency guidance, such as the *National Fish, Wildlife and Plants Climate Adaptation Strategy*. To aid the reader in recognizing these mutual opportunities, actions in Table 1 cross-reference the latter three documents.

It is important to note that while the table of high-priority actions is ambitious, it is not exhaustive. Instead it provides a framework for building capacity and meeting on-the-ground needs for information and tools. The purpose is to convey a set of feasible, pragmatic actions that demonstrate commitment and integrate strategically, providing a structure to which regions, parks and programs can add.

The following pages offer a brief description of each emphasis area and an example high-priority action from Table 1.

1. Enhance Workforce Climate Literacy

Building a workforce that is literate about climate change effects and response options is fundamental to ensure that managers can address climate change as part of routine operations. The purpose of these actions is to provide cost-effective training and learning opportunities that complement other important priorities. For efficiency, a focus will be to design climate change topics and modules to fit into existing curricula and training programs rather than as separate, stand-alone training. It is also important to use communications technology, such as video and online training access, in an engaging way to enable larger numbers of people to benefit from the training resources and materials.

EXAMPLE #1

New Superintendents' Academy Modules

A prototype series of online training sessions for new superintendents launched in July 2012. Four superintendents who are leaders in the arena of climate change in the NPS illustrated case studies from their parks, addressing effective risk-taking, decision-making tools, lessons learned, and best practices. The series will be refined and continued in 2013 and beyond and will initiate a community of practice for park managers.

Left: NPS staff participate in climate change literacy training at an Earth to Sky workshop at the Goddard Space Flight Center, Maryland. NPS photo.

2. Engage Youth & Their Families

Younger generations are eager to be involved in initiatives around climate change. Engaging young people brings diversity, energy, and inspiration to the issue of climate change, encouraging innovative thinking and problem-solving. There are many benefits to these actions, including hands-on work experience, education, and training for tomorrow's workforce and decision-makers; increased knowledge and information for the NPS and the general public about protecting park resources in a changing climate; and enrichment of interpretive programs, school outreach, and other aspects of public visitor experiences. Investing in youth and their families provides a tremendous multiplier effect by fostering a life-long connection to parks and instilling a stewardship ethic in the next generation.

EXAMPLE #2

George Melendez Wright Youth Initiative

The George Melendez Wright Climate Change Youth Initiative was initiated in 2010 to support diverse student internship and fellowship opportunities in parks. Fellows conduct independent climate change research in parks, and interns provide parks with science, adaptation, mitigation, and communication service and expertise. The program is collaborative with the University of Washington and provides a continuous "pipeline" for professional development and hands-on education of undergraduate and graduate students.

3. Develop Effective Planning Frameworks & Guidance

Climate change requires us to rethink traditional planning processes in two main ways. First, the NPS and other bureaus are now required to consider climate change in all existing planning processes and documents. Second, the uncertainty of climate change effects and rapid development of climate change science make it imperative that we employ new, more flexible planning approaches. These actions address both requirements, while also delivering more targeted guidance and checklists. Actions are coordinated across many disciplines in the NPS.

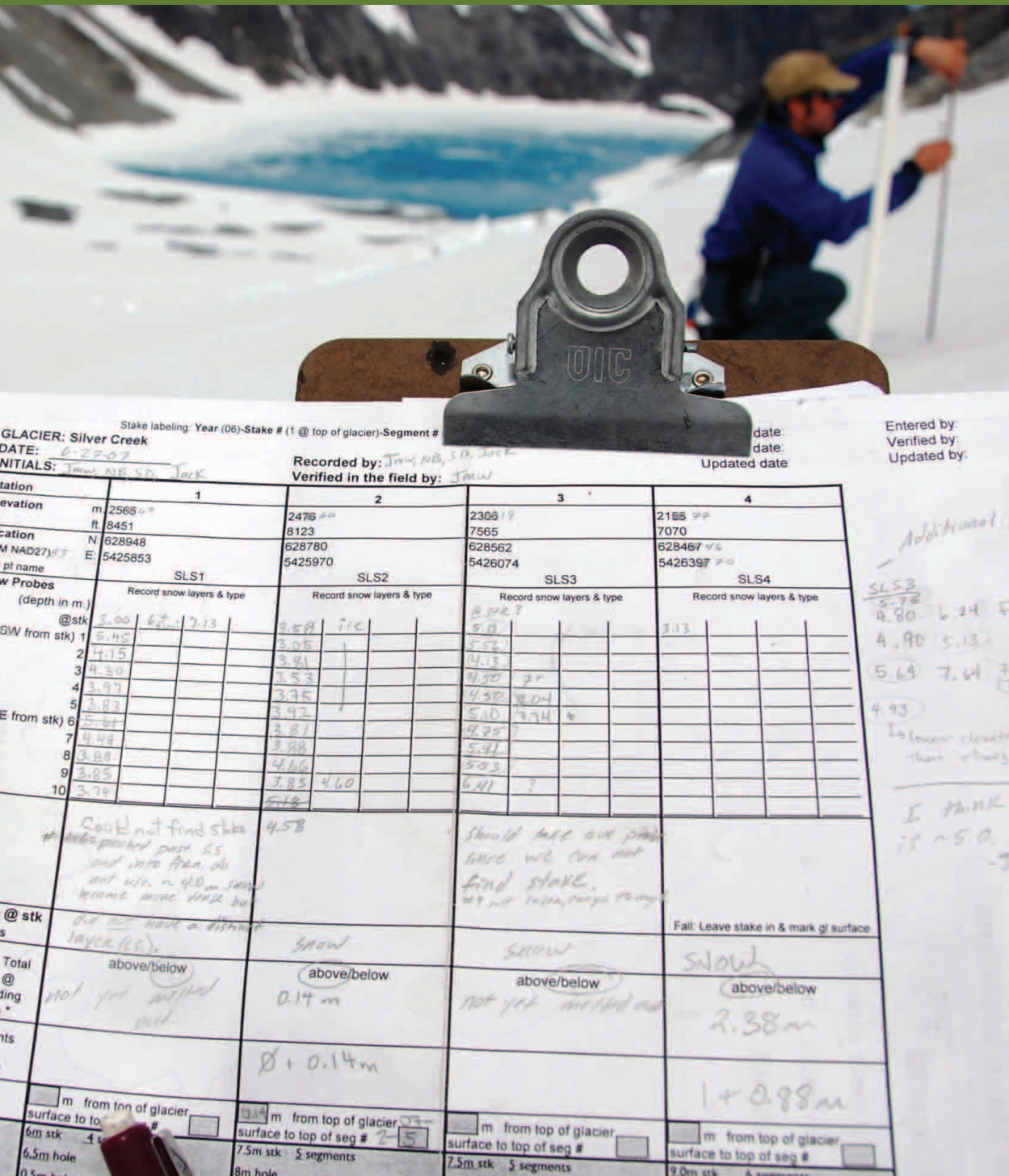
EXAMPLE #3

Development Advisory Board (DAB) Project Review & Checklist

The Project Review Report now includes a checklist requiring all projects presented to the DAB to address the impacts of climate change. The requirement applies to all parks in all areas including coasts, river corridors, deserts, high elevations and high latitude, all of which are highly vulnerable to the effects of climate change. Follow-up reviews of design and implementation documents confirm these requirements are met.

Right: A George Melendez Wright climate change fellow monitors changes in lodgepole pine to inform adaptation strategies at Devils Postpile National Monument, California. NPS photo.





4. Provide Climate Change Science to Parks

It is essential that the NPS continues to encourage the use of parks as laboratories for basic and applied research and that we monitor for changing conditions. Basic information about park conditions as well as historical and projected climate change trends is required at park-relevant scales to inform planning and action. Additionally, a critical high-priority focus is to assess vulnerability of park natural and cultural resources. The Department of the Interior (DOI) requires all bureaus to report progress on this front. These actions use internal knowledge and expertise as well as leverage science partnerships to provide scientific information to park managers on the ground.

EXAMPLE #4

Analyze Historical and Projected Climate Trends for All NPS Units

Through a partnership with the University of Wisconsin, the NPS will deliver spatially explicit climate information to all parks (currently 397 units covering a total of 340,000 km²) as an input for vulnerability analyses, resource management planning, and development of climate change adaptation measures.

Left: Scientists regularly monitor the rate of glacial change in the high country of North Cascades National Park, Washington. NPS photo by Jim McLeod.

5. Implement the *Green Parks Plan*

“Go Green” (Action 23) in *A Call to Action* affirms the NPS commitment to reduce our carbon footprint and increase sustainability. Released in April 2012, the *Green Parks Plan* (GPP) details specific objectives that parks, regions, national program offices, and partners can meet. The primary way in which the NPS mitigates GHG emissions is by conserving energy, fuel, water, and other valuable resources. Many parks and offices have already made great strides to integrating sustainability and mitigation into their facilities and operations. Adopting a robust and integrated approach whereby each employee, office, and program can make valuable contributions will further advance these efforts. The specific actions listed in Table 1 are a subset of those articulated in the GPP, which is the primary source for the range of actions that can be taken to mitigate the cause of anthropogenic climate change by reducing GHG emissions. Mitigation actions leverage many partnerships to create multiplier effects that result in larger, long-term benefits for parks and society.

EXAMPLE #5

NPS Sustainable Buildings Implementation Plan

The NPS will finalize the *Sustainable Buildings Implementation Plan* as a roadmap to achieve compliance with the guiding principles for high performance and sustainable buildings and begin assessment at selected parks.

Right: Kenai Fjords National Park, Alaska, received an Environmental Protection Agency Champions of Environmental Leadership and Green Government Award in 2008 for actions to achieve a zero net carbon footprint for park operations. NPS Photo.





6. Foster Robust Partnerships

Collaboration with organizations, communities, and other partners is one of the most important means to mitigate the cause of global climate change and adapt to its effects. The scale of climate change impacts far exceeds the ability of any one park, agency, or organization to effectively respond as a single entity. Integrated, cooperative adaptation strategies applied across large geographic areas will provide more informed, comprehensive, and successful results. The NPS participates in numerous existing partnerships among federal, state, tribal, private, academic, and non-governmental entities at local, regional, national, and international levels.

Many NPS partnerships predate the recent focus on climate change response. Existing relationships, which have evolved over time, are an ideal platform to support combined efforts towards mutual goals for climate change mitigation or adaptation. NPS participation in the Cooperative Ecosystem Studies Units (CESUs) is an important mechanism for focusing partnerships on current issues like climate change. Additionally, new partnerships specific to climate change science and landscape conservation, such as the DOI Landscape Conservation Cooperatives (LCCs) and Climate Science Centers (CSCs) and the National Oceanic and Atmospheric Administration (NOAA) Regional Integrated Science and Assessment (RISA) teams, are beginning to work closely with park and program managers on a range of science and adaptation tools for decision making.

Left: A visitor shuttle system reduces CO₂ emissions in Sequoia National Park, California. NPS photo.

Involvement of Native Americans and other stakeholder communities is another important key to development of cultural and natural resource adaptation tools that will support landscape-level collaboration for years to come.

In evaluating where to focus our time and commitment, it will be essential to identify what we hope to achieve through collaboration and partnerships with respect to climate change. Partners are essential to acquire new knowledge about climate change and its impacts, raise awareness regarding those impacts to places people care about, and evaluate and implement strategies and actions that require cooperation outside park boundaries. Investing in effective partnerships, or augmenting existing partnerships, is an example of actions the NPS can take now to provide multiplier effects into the future.

EXAMPLE #6

Clean Cities NPS Partnership

The Clean Cities NPS Partnership is a collaboration with the Department of Energy (DOE) to support vehicle- and fuel-replacement projects that increase NPS use of high-efficiency/ low GHG-emitting vehicles and reduce petroleum use.

7. Apply Appropriate Adaptation Tools & Options

Healthy parks, wilderness, and other protected areas are essential in helping ecosystems, species, and human communities adapt to climate change. Many near-term adaptation tools and options focus on promoting resilience—the capacity for systems to withstand change and still retain their vital characteristics. In the long term, as climate continues to change, effective adaptation will require new thinking about conservation goals and the features and processes our decisions aim to protect.

Adaptation is not only about natural systems. Human and cultural systems and the built environment are also affected. As a leader in cultural resource protection, the NPS is well positioned to understand and help shape human interactions with the environment. Near-term priority actions in this arena will establish risk criteria and consistent frameworks to link together adaptation tools, such as vulnerability and risk assessments, and climate change scenarios to adaptation planning frameworks that can inform specific management decisions.

EXAMPLE #7

Develop Risk Screening Tool & Adaptation Guide for Coastal Resources

A high-level risk screening tool is under development for facilities, historic structures and other resources in coastal parks. This will provide an initial “triage” tool to characterize vulnerability and identify parks with assets most at risk. Two case studies will test the tool, considering sea level rise and storm-related coastal inundation and erosion. A complementary project will provide guidance for coastal adaptation options.

8. Strengthen Communication

Many opportunities exist to communicate with and engage citizens of all ages in experiencing the wonders of national parks and witnessing the changes that are taking place. Through direct experience in natural classrooms or via a wide range of interpretative and educational media, the public can come to understand how climate change is affecting the planet’s resources and how they may adapt their behavior to mitigate the cause of climate change and promote resource stewardship. Communication via the web provides a tremendous opportunity to connect with visitors, the broader public, and park employees in new ways. This set of actions emphasizes the importance of civic engagement and place-based citizen science as tools to empower the public to contribute to the body of knowledge through field and web-based learning activities. In addition to embedding climate literacy as a central element for NPS internal training, these actions incorporate climate change into interpretation and education with the public and partners.

EXAMPLE #8

Interactive Interpretive Exhibits

Interpretive exhibits are being developed to allow visitors to use smartphones to connect climate change effects in one park (e.g., sea level rise, phenology) to similar effects in national parks across the country. Visitors are able to understand the widespread changes that are occurring and explore both the drivers of those changes and related effects through supplemental online resources that promote resource stewardship and climate change literacy.

Right: A portion of Fort Jefferson is already underwater at Dry Tortugas National Park in Florida and is highly vulnerable to continued rising sea level. NPS photo.





Above: Harbor seals rest on the ice in Johns Hopkins Inlet, Glacier Bay National Park, Alaska. NPS photo.

Table 1: NPS Commitments to High-Priority Actions

Contacts for each action, identified by superscript numbers, and a list of acronyms are given at the end of the table on page 27.

ACTIONS	WHO HAS A ROLE
EMPHASIS AREA #1 – ENHANCE WORKFORCE CLIMATE LITERACY <i>CCRS GOAL 13; C2A #23, #30, #31; NFWPCAS STRATEGY 3.1</i>	
Conduct vulnerability and risk assessment training ¹	I&M lead with CCRP support; Parks may request onsite training or take course at National Conservation Training Center
Develop framework for Interpreting Climate Change competency; make broadly available online ²	Collaboration between CCRP, I&E, L&D incorporating natural and cultural content; Parks may submit technical assistance requests; online training available in 2013
Identify existing NPS training curricula; develop and insert appropriate climate change and sustainability content (e.g., superintendents, resource professionals, interpreters) ²	Collaboration between CCRP and L&D; Park staff may contact their training manager or career field academy for opportunities; Regions, parks, program offices can incorporate climate change into local training programs
Create innovative videos and online training modules for use in numerous training forums ^{2,3}	Collaboration among Mather Training Center, Eppley Institute, Colorado State University, CCRP and participating park staffs; Prototypes will be available online in 2013; Parks and regions can create their own case studies
Conduct Green Procurement Training for parks ⁴	SOCC leads as part of the GPP; Regions and parks may request training
EMPHASIS AREA #2 – ENGAGE YOUTH & THEIR FAMILIES <i>CCRS GOAL 13; C2A #2, #7, #18, #20, #36; NFWPCAS STRATEGY 6.2</i>	
Continue George Melendez Wright climate change fellowship and internship opportunities to support park high priority needs ³	CCRP leads; Parks are encouraged to submit internship proposals and encourage young researchers to seek funding for park research through the fellowship program
Leverage climate change through other youth and diversity programs (i.e., the Student Conservation Association (SCA), webrangers, diversity program) ³	Collaboration across multiple program areas
Provide mentorship opportunities for youth interested in climate change management and policy issues ³	Parks, regions, and national program offices



Above: Erosion of beach habitat from sea level rise and storms may add stress to the survival of green sea turtle hatchlings in the Gulf Coast. NPS photo.

Table 1: NPS Commitments to High-Priority Actions, *continued*

Contacts for each action, identified by superscript numbers, and a list of acronyms are given at the end of the table on page 27.

ACTIONS	WHO HAS A ROLE
EMPHASIS AREA #3 – DEVELOP EFFECTIVE PLANNING FRAMEWORKS & GUIDANCE <i>CCRS GOALS 2, 3, 5, 8; C2A #23, #30; NFWPCAS STRATEGIES 2.1, 4.2</i>	
Require all projects submitted to Development Advisory Board (DAB) address climate change impacts; provide reviews ⁵	CPMD sets requirement, CCRP reviews; Parks identify how they have considered climate change in proposed projects
Implement climate change guidance for Long-Range Transportation Plans (LRTPs); conduct prototypes ⁶	Collaboration among PFMD, CCRP, and participating regions and parks Prototypes in SER, NER, AKR and Cape Cod NS and a national LRTP underway
Conduct prototypes for incorporating climate change into a range of park planning processes and stewardship activities (e.g. GMPs ⁷ , RSSs ⁸ , FMPs ⁹ , LRIPs ²)	Collaboration among PPSS, DSC, CCRP, WRD, and participating parks (e.g. Assateague Island NS, Pinnacles NM, Sequoia & Kings Canyon NPs, Catoclin Mountain Park, Joshua Tree NP); All park planning processes should consider climate change effects and responses
Review all GMPs to ensure climate change is being considered and appropriately addressed ⁷	Collaboration between PPSS, DSC and CCRP; Parks conducting GMPs should consider climate change and may submit technical assistance requests to CCRP for support
Provide scenario planning guidance and training; maintain “community of practice” ^{10, 14}	CCRP, WRD collaborate with other directorates, divisions and regions; Parks and regions may submit technical assistance requests
Develop guidance and incorporate climate change into Foundation Documents (FDs) ⁷	PPSS collaborates with CCRP and parks; All parks should consider historical and projected climate change in their FDs
Create regional climate change strategies ¹¹	Regional coordinators and teams work together to share approaches (e.g. PWR, AKR, NER, MWR); Parks become familiar with regional climate change strategy to identify their role
Develop and implement strategy for cultural resource climate change core program ¹²	CR adaptation coordinator collaborates with Desert Southwest CESU, CR, regions, and parks
Provide guidance for considering climate change under the National Environmental Policy Act (NEPA) ¹⁹	NRSS leads in releasing interim guidance that parks can implement while the Council on Environmental Quality develops and establishes final policy guidance



Above: Brown Pelicans along the Gulf Coast face ongoing threats from offshore oil and wind development, sea level rise, and hurricanes. USFWS photo.

Table 1: NPS Commitments to High-Priority Actions, *continued*

Contacts for each action, identified by superscript numbers, and a list of acronyms are given at the end of the table on page 27.

ACTIONS	WHO HAS A ROLE
EMPHASIS AREA #4 – PROVIDE CLIMATE CHANGE SCIENCE TO PARKS <i>CCRS GOALS 1-3, 6-8; C2A #28; NFWPCAS STRATEGIES 4.2, 5.2, 5.3</i>	
Monitor change and resource condition at parks ¹	Vital Signs monitoring conducted through I&M networks includes climate change drivers and effects; CR collaborate with I&M to improve linkage to cultural resource condition assessment
Participate in international and national climate change science and adaptation synthesis and assessment studies (i.e., Intergovernmental Panel on Climate Change [IPCC], the National Climate Assessment [NCA]) ¹³	NPS scientists (e.g., CCRP, GRD, CR, I&M, AKR) collaborate with partners
Analyze historical and projected climate trends for NPS units; link to park planning and provide guidance for how to use the reports ^{13, 14}	CCRP collaborates with PPSS, the University of Wisconsin, and park planners; Online access will be provided to park-specific downscaled information and synthesis reports
Incorporate climate change into State of the Parks reporting ¹⁰	NRSS leads; Park-specific climate information included in State of the Parks database
Assess vulnerability of park resources and ecosystems ¹³	Servicewide Comprehensive Call (SCC)–funded climate change projects reported as part of the DOI High Priority Performance Goals; list available on climate change intranet site
Establish vulnerability assessment framework for consistency and comprehensive coverage for NPS units ¹³	CCRP (I&M, CR, GRD, and others) collaborate with park and regional scientists; Interested parks may request technical assistance
Research and communicate how past cultures adapted to changing climates ¹²	CR will collaborate with parks, regions, and program offices (e.g., BRMD, I&E, I&M)



Above: Chesler Canyon. Canyonlands National Park, Utah, preserves one of the last relatively undisturbed areas of the Colorado Plateau. NPS photo.

Table 1: NPS Commitments to High-Priority Actions, *continued*

Contacts for each action, identified by superscript numbers, and a list of acronyms are given at the end of the table on page 27.

ACTIONS	WHO HAS A ROLE
EMPHASIS AREA #5 – IMPLEMENT THE <i>GREEN PARKS PLAN</i> (SELECTED ACTIONS) <i>CCRS GOALS 9-11; C2A #23, #25; NFWPCAS STRATEGY 7.2</i>	
Increase the number of Climate Friendly Parks (CFP)	<p style="text-align: center;">These actions are being implemented largely through park and regional initiatives; Coordination is conducted through the Sustainable Operations and Climate Change Branch of PPMD as part of implementing the <i>Green Parks Plan</i> ⁴</p>
Use the Climate Leadership In Parks (CLIP) tool to assess greenhouse gas operational emissions	
Conduct energy audits at parks and implement Energy Conservation Measures (EMCs)	
Conduct water audits at parks and implement Water Conservation Measures (WCMs)	
Pursue Fleet Optimization opportunities to “right-size” NPS fleet	
Finalize NPS <i>Sustainable Buildings Implementation Plan</i> ; begin assessment at selected parks	
Issue “no idling” policy for non-law enforcement or emergency vehicles	
Use Energy Star Portfolio Managers to understand and improve energy efficiency for high-consumption parks and facilities	
Deploy “My Green Parks” web tool to facilitate sustainable practices at each employee’s worksite	



Above: One of North America's largest wading birds, a great blue heron, is about to eat a frog dinner. USFWS photo.

Table 1: NPS Commitments to High-Priority Actions, *continued*

Contacts for each action, identified by superscript numbers, and a list of acronyms are given at the end of the table on page 27.

ACTIONS	WHO HAS A ROLE
EMPHASIS AREA #6 – FOSTER ROBUST PARTNERSHIPS CCRS GOALS 6, 12; C2A #1, #11, #22, #26; NFWPCAS STRATEGIES 3.2, 5.1, 6.3	
Strengthen regional partnerships with DOI Landscape Conservation Cooperatives (LCCs) & Climate Science Centers (CSCs) to ensure NPS climate change science and adaptation needs are addressed ¹⁰	Regional staffs provide adaptation coordinators to four LCCs (Great Northern, Pacific Islands, South Atlantic and North Atlantic); Regional staff, I&M staff, and park superintendents engage with LCC technical or steering committees
Engage NOAA Regional Integrated Science and Assessment (RISA) teams in science and adaptation planning for parks ¹⁰	CCRP leads; Parks and regions may apply for new RISA project funding opportunity targeting NPS scenario planning
Coordinate Clean Cities NPS Partnership with the Department of Energy to fund transportation efficiencies ⁴	Actions from GPP
Maintain and strengthen relationships within the air quality community (state, federal and tribal regulators; industry; interest groups; air quality science community) to influence GHG emission reductions ²⁰	ARD leads
Build communities of practice with gateway communities in cooperation with non-profit organizations ³	Pilot projects conducted through CCRP in collaboration with the National Parks Conservation Association and participating Research Learning Center staff in parks (i.e., Kenai Fjords and Glacier National Parks and Indiana Dunes National Lakeshore)
Expand new relationship with Department of Education to include climate change literacy ¹⁵	I&E in collaboration with the Department of Education
Identify landscape conservation goals and adaptation strategies with adjacent jurisdictions ^{10, 12}	Collaboration among BRMD, CR, CCRP, university, and other partners; CR provides assistance to LCCs in developing landscape-scale approaches to cultural resources



Above: Red Sockeye salmon at Lake Clark National Park & Preserve, Alaska, face potential consequences from changes in streamflow and water temperatures. NPS photo.

Table 1: NPS Commitments to High-Priority Actions, *continued*

Contacts for each action, identified by superscript numbers, and a list of acronyms are given at the end of the table on page 27.

ACTIONS	WHO HAS A ROLE
EMPHASIS AREA #7 – APPLY APPROPRIATE ADAPTATION TOOLS & OPTIONS <i>CCRS GOALS 3, 5-8, 12; C2A #21; NFWPCAS STRATEGIES 3.3, 4.2</i>	
Create director’s memo to provide management guidance on policies related to the effects of climate change on cultural resources ¹²	Cultural Resources & Science Directorate
Create director’s memo to provide management guidance on policies related to the effects of climate change on facilities ⁵	Park, Planning, Facilities & Lands Directorate
Conduct “listening sessions” with NPS employees on <i>Revisiting Leopold</i> recommendations and next steps ¹⁰	CCCG collaborates with the Science Committee of the NPS Advisory Board
Pilot adaptation planning processes and actions that connect vulnerability assessments and scenarios to park planning; report to DOI and communicate widely ¹⁰	CCRP leads; adaptation actions reported to DOI High Priority Performance Goals (posted on the CCRP SharePoint site); Parks may submit examples
Complete <i>Renewable Energy Installation Siting Guidance</i> ¹⁷	Collaborative with PFMD, ARD and GRD
Initiate decision framework for navigating various resource adaptation options and practices ¹⁰	Collaboration across natural and cultural resources and facilities; Parks can get involved through the adaptation review team
Create risk screening tool for assessing risk to facilities; extend to cultural resources ^{4, 10, 12}	Collaboration across natural and cultural resources and facilities; Selected park prototypes



Above: Youth Conservation Corps (YCC) members enjoy the view at Yellowstone National Park. NPS photo.

Table 1: NPS Commitments to High-Priority Actions, *continued*

Contacts for each action, identified by superscript numbers, and a list of acronyms are given at the end of the table on page 27.

ACTIONS	WHO HAS A ROLE
EMPHASIS AREA #8 – STRENGTHEN COMMUNICATION <i>CCRS GOALS 5, 6, 8, 12-14; C2A #3, #14, #17, #19; NFWPCAS STRATEGIES 6.1, 6.2</i>	
Link new interpretive exhibits using social networking tools to present climate change issues common to many parks (e.g., sea level rise; phenology) ²	Collaboration among Harpers Ferry Center, CCRP, and participating park staffs; Prototype waysides can be used as templates by interested parks
Include climate change in national social media strategy ¹⁸	I&E leads; Parks serve as innovative examples and implement approaches in their local communications
Create a “network of champions” throughout parks to share compelling stories and messages of hope to empower other parks and visitors to take action ²	Cross-cutting effort involving L&D, CCRP, CR, ARD, and park leaders; Parks are encouraged to find and share their examples
Disseminate successful internal communication products to public audiences ²	Parks and regions identify and share best practices with the public
Continue regular climate change webinars for employees ¹⁶	CCRP collaborates with other divisions, directorates and regions (e.g., AKR, WRD, CR, SOCC) Parks and regions are encouraged to submit topics of interest
Develop internal website to share planning, adaptation, and communication guidance and products; include park stories and an online forum to support communities of practice ²	CCRP collaborates with other divisions and directorates (e.g., WRD, CR, BRMD, GRD, ARD)
Develop and release a national interpretive plan for climate change ^{2, 15}	I&E collaborates with CCRP, regional, and park staff
Coordinate climate change and cultural resource community of practice ¹²	CR adaptation coordinator leads conference calls and online community, with participation and support from CR, other directorates, regions, and parks



Above: Cliff Palace, Mesa Verde National Park in Colorado offers an intimate glimpse into the lives of the Ancestral Pueblo people who made it their home for over 700 years. NPS photo.

Table 1: NPS Commitments to High Priority Actions, *continued*

Contacts for each action, which were identified by superscript numbers in previous sections of the table, and a list of acronyms are given below.

CONTACT LIST FOR ACTION ITEMS:				ACRONYM LIST:					
1 John Gross CCRP (I&M) John_Gross@nps.gov	2 Angie Richman CCRP Angie_Richman@nps.gov	3 Tim Watkins CCRP Tim_Watkins@nps.gov	4 Shawn Norton SOCC Shawn_Norton@nps.gov	AKR	Alaska Region	ARD	Air Resources Division	BRMD	Biological Resource Management Division
				CZA	<i>A Call to Action</i>	CCCG	Climate Change Coordinating Group	CCRP	Climate Change Response Program
5 Mike LeBorgne DSC Mike_LeBorgne@nps.gov	6 Kevin Percival DSC Kevin_Percival@nps.gov	7 Patrick Gregerson DSC Patrick_Gregerson@nps.gov	8 David Vana-Miller WRD David_Vana-Miller@nps.gov	CCRS	Climate Change Response Strategy	CPMD	Construction Program Management Division	CR	Cultural Resources & Science Directorate
				DOI	Department of the Interior	DSC	Denver Service Center	FMP	Fire Management Plan
9 Jeff Manley NIFC Jeff_Manley@nps.gov	10 Cat Hawkins Hoffman CCRP Cat_Hawkins_Hoffman@nps.gov	11 Regional climate change points of contact	12 Marcy Rockman CCRP (CR) Marcy_Rockman@nps.gov	GMP	General Management Plan	GPP	Green Parks Plan	GRD	Geologic Resources Division
				I&E	Interpretation & Education Directorate	I&M	Inventory & Monitoring Division	IMR	Intermountain Region
13 Patrick Gonzalez CCRP Patrick_Gonzalez@nps.gov	14 Don Weeks CCRP (WRD) Don_Weeks@nps.gov	15 Julia Washburn I&E Julia_Washburn@nps.gov	16 Melanie Wood CCRP Melanie_Wood@nps.gov	L&D	Learning & Development Directorate	LRIP	Long Range Interpretive Plan	MWR	Midwest Region
				NCR	National Capital Region	NER	Northeast Region	NFWPCAS	National Fish, Wildlife and Plants Climate Adaptation Strategy
17 Julie Thomas McNamee ARD Julie_Thomas_McNamee@nps.gov	18 John Tobiason HFC John_Tobiason@nps.gov	19 Bruce Peacock EQD Bruce_Peacock@nps.gov	20 Susan Johnson ARD Susan_Johnson@nps.gov	NRSS	Natural Resource Stewardship & Science Directorate	NIFC	National Interagency Fire Center	PFMD	Park Facility Management Division
				PPSS	Park Planning and Special Studies	PWR	Pacific West Region	RSS	Resource Stewardship Strategies
				SER	Southeast Region	SOCC	Sustainable Operations & Climate Change	WASO	Washington Support Office
				WRD	Water Resources Division				

A photograph of the Cape Lookout Lighthouse at night. The lighthouse is illuminated from within, showing its spiral pattern. A crescent moon is visible in the dark blue sky to the right of the lighthouse. The background is dark, suggesting a night scene with some foliage visible in the foreground.

3

PREPARING FOR NEW CHALLENGES AND OPPORTUNITIES

What to Expect in the Next Few Years

The Road Ahead

Conclusion

The Cape Lookout Lighthouse, Cape Lookout National Seashore, North Carolina, is vulnerable to sea level rise as current projections indicate seas may rise more than two feet over the next fifty years. NPS photo.

WHAT TO EXPECT IN THE NEXT FEW YEARS

In addition to implementing the near-term, priority actions in Table 1, the NPS should keep in mind ongoing and emerging situations that are likely to play out over the next several years, which could affect decision options around climate change. Expected developments over the next two to five years include ongoing advances in communications technology and media, availability of new climate change research and synthesis reports, and continued impacts from climate variability and change, including extreme events and disasters. By being mindful of new developments, and considering what strategies and actions would be most effective in those situations, we are better prepared for new challenges and more able to take advantage of opportunities that present themselves. Many of the priority actions from the previous section will help the NPS prepare for the future. Additional strategies and actions suggested in this section are good investments should funding, staff, or partnership opportunities become available to implement them.

Advances in communication technology

The next few years likely will be a time of continued rapid advancement in data availability and communications technology. Technological advances profoundly change the ways in which organizations and individuals communicate, connect, and solve problems. The result will be a future in which local park issues and decisions may be far more visible than ever before. The NPS is likely to have more informed remote audiences with high expectations for data and information to be widely available. While challenging our current capacity in this arena, these advancements offer tremendous opportunities for parks to connect with visitors, stakeholders, and staff in unprecedented ways.

PREPARE NOW

- Create climate change information for park websites.
- Train and mentor staff in social media technologies and commit to their application for interpretation, outreach, and internal communications.
- Use social networking options for reaching new and diverse audiences.
- Link parks through social media and other evolving tools to demonstrate common climate change issues and facilitate shared learning.
- Employ citizen science techniques to connect youth and their families to climate change and stewardship activities.
- Continue to invest in efficient data management systems and staffing.



Right: A project to control invasive species connects students to the values of protected areas in Great Smoky Mountains National Park, Tennessee and North Carolina. NPS photo.



Release of new climate change research and assessments reports

Climate change is an active area of research, and new results and scientific advances are constantly appearing in the published literature. Two major climate science synthesis efforts will produce reports beginning in 2013. The Intergovernmental Panel on Climate Change (IPCC) fifth assessment report is underway with components to be released beginning in fall 2013 through spring 2014. The report will likely provide more compelling and conclusive evidence of climate change and its effects at global and broad regional scales. Additionally, the U.S. Global Change Research Program will release its National Climate Assessment (NCA) in 2013, including a series of regional climate synthesis reports of relevance to parks. This information will have important implications for park policy and decision making. It will be critical for the NPS to incorporate new findings into planning and adaptation efforts, anticipating that new evidence, new feedback loops, and new consequences may challenge commonly accepted resource management practices or decisions.

Additionally, we must expect a high degree of public and political interest in climate change following release of these reports, along with intense media coverage. Parks should be prepared to discuss how their resources and infrastructure are being affected by climate change and what actions are being taken to protect them. Alternatively, parks should prepare to explain why it may not always be in the public interest to continue some practices, such as rebuilding roads that will consistently wash out or armoring coastlines that will be inundated by sea level rise in the coming decades. New opportunities may arise to “lead by example” through NPS adaptation and mitigation actions that promote resilience and other natural solutions to climate change impacts.

PREPARE NOW

- Provide examples of adaptation and mitigation actions on park and regional websites.
- Identify clear “entry points” in planning documents and processes to accommodate new information and implications for decision making.
- Implement citizen science initiatives to gain new information and engage the public.
- Develop local climate change science communication plans with specific talking points for interacting with the media.
- Engage opportunities for local and regional partnerships to promote park science, adaptation, mitigation and communication efforts.
- Create “information clearinghouses” that enable sharing of data and reports with partners.

Left: Traditional Native American canoes on display at Grand Portage National Monument, Minnesota.

Right: A ranger surveys a destroyed campground following a “rain on snow” storm event in 2006 that resulted in widespread damage to park facilities in Mount Rainier National Park, Washington. NPS photos.

Continuing extreme events and disasters

Severe weather events and natural disasters are costly and have enormous impacts on communities and populations, natural systems, and cultural resources. As global climate continues to warm, we can expect dynamics of the physical environment to continue to change. Events that might be expected to increase over time include drought in the West, storms along the east coast, fire in many parts of the West and Alaska, and flash flooding in the Pacific Northwest. Scientists already have detected increases in extreme precipitation and heat events throughout the United States, and the trends are projected to continue. While it is not possible to attribute a given heat wave or torrential rainstorm to climate change, it is legitimate to say that a warming climate increases the odds of extreme weather events.

Health and safety for staff and the public are prime considerations during an extreme event or disaster, bringing more pressure on parks to respond to emergencies and putting competing issues on the back burner. The public may see protecting park ecosystems, or allowing systems to change, as less relevant than rebuilding or restoring structures and infrastructure after a storm or fire moves through an area. There may be high expectations that the federal government protect personal property, access, and services in gateway communities.

Parks can be proactive in preparing for these situations. Some of the management tools under development for climate change adaptation, such as storm and hazard risk assessments, climate change vulnerability assessments, and tools for scenario and contingency planning, are useful in the face of any kind of natural hazard or disaster. Parks can help prepare their employees to effectively respond to extreme events and disasters by incorporating emerging assessments and contingency planning tools into routine planning processes.

Extreme events and disasters also provide opportunities for the NPS to communicate climate literacy, including the differences as well as linkages between weather and climate. Park staff can begin now to learn more about these topics and to develop communication products and talking points that present clear, accurate, and consistent information to local media, communities, and the visiting public. This in turn will strengthen public-private relationships and trust, which resilient communities depend on to adapt and rebuild sustainably.

PREPARE NOW

- Conduct risk and hazard assessments for assets in areas prone to extreme events, including cost-benefit analyses for restoration, repair, or rehabilitation of significant structures.
- Conduct ecosystem and species vulnerability assessments and analyses of associated ecosystem services that may be lost due to climate change.
- Incorporate contingency and scenario planning techniques into routine planning.
- Maintain a strong climate science program and equip leaders with climate literacy through training.
- Enhance climate change-related monitoring efforts and report on status and trends.
- Develop close media relationships to manage messaging when events strike.
- Provide tangible, place-based examples that illustrate science meaningfully and keep messages relevant





THE ROAD AHEAD

Climate change and sustainability are moving from the arena of evidence and public awareness to that of action, prompting us to reframe and reinvent aspects of how we live, act, and adapt in the short and long term. Institutions and individuals increasingly recognize climate change as a persistent global issue, and many seek novel solutions. For instance, a growing number of start-up companies, backed by successful venture capital firms, now focus on ambitious clean technologies and climate change mitigation solutions.

The private sector is not alone in driving innovation in climate change initiatives. From university research groups, to national laboratories, to entrepreneurs' garages, many different players continue to push the envelope. We can anticipate initiatives around adaptation and sustainability to become more prevalent over the next decade and beyond, driving developments and opportunities in the climate change arena to occur even more rapidly, with new players and interests represented. Moreover, with cross-cutting effects influencing multiple sectors such as public health, human migration, security, food, water, and energy, climate change will become an increasingly complex policy issue.

The NPS must be prepared to thrive in a more connected, transparent marketplace of ideas and actions around climate change, both at national and international levels. In this rapidly changing world, expanded communication will be absolutely essential so that varied organizations and regions of the nation and the world learn from each other about novel, successful approaches to climate change mitigation and adaptation for protected areas. By heightening the knowledge and understanding among our workforce, and sharing what works and what doesn't, we will consistently improve our response to this funda-

mental challenge. Thus, a dynamic and vibrant training, communication, and education program is imperative as we move forward.

As climate changes, national parks, wilderness, and other protected areas will need to communicate their relevance in a future in which more people will contend for fewer resources. National parks are natural laboratories for research and education, and they provide a wide variety of recreational opportunities and solace. Maintaining a healthy system of networked parks and protected areas is even more critical in a climate-altered future. Parks are centerpieces of conservation and public engagement that can lead to the protection of biodiversity, cultural values, and ecosystem services. The ecological, social, and economic services provided by national parks include clean water, genetic reservoirs, soil stabilization, disaster mitigation, and carbon storage as well as hiking, wildlife viewing, fishing, boating, and simply escape from everyday stress—all of which will be important in a changing climate.

The NPS also has an important role to play nationally and internationally with partners that engage the interests and efforts of non-governmental entities and other stakeholder communities. Indeed, successful conservation now and into the future requires that park managers work collaboratively at much larger scales to promote effective management of protected area networks in North America and worldwide. Parks, linked to other protected areas across large landscapes, can be among the most effective tools for adapting to climate change by providing greater resilience for species to adapt and reducing vulnerability of the environment to catastrophic events. A well-managed network of parks and protected areas will require a comprehensive, bold vision that sees beyond the current system of lands to identify and connect key features and processes through additional protection measures that

include climate refugia, corridors, and buffer zones. Such national and international collaborations will enable better management of parks, and strong participation by the NPS to promote effective management of protected areas networks worldwide.

Conserving biodiversity and ecosystem function as species and habitats adapt to climate change will require high-quality scientific information and flexible planning tools as well as a workforce that is trained to use that information. Parks provide immense and increasing value to civilization as laboratories for serious basic research, often representing some of the most pristine, least-modified lands as the best baselines from which to understand complex environmental interactions. In fact, the recently released report *Revisiting Leopold: Resource Stewardship in the National Parks*, advises that in order to meet the challenge of the future "...the NPS must materially invest in scientific capacity building." This includes investing in research partnerships but also "...as a scientific leader in documenting and monitoring the conditions of park systems..." Therefore, as climate change evidence and

impacts become more apparent, the NPS must continue to advance robust agendas for research, enhanced monitoring, and integrated data systems plans, as well as strategies to fully inventory cultural and natural resources and document change.

Throughout our history, with successive generations and evolving knowledge about our world, the NPS has considered and applied a deeper understanding of our mission in context of current scientific understanding and social values. We will do so with climate change, working across boundaries, evaluating and embracing appropriate new technologies, advancing our knowledge, and considering new, progressive conservation goals, practices, and policies. Through maintaining a clear, full vision of our role in climate change response, and the steps to fulfill that role, the NPS will be equipped to seize the opportunities that unfold over the next decade and beyond.

Left: Interpretive programs encourage the use of sustainable transportation practices in the National Capital Region parks, Washington, D.C. NPS photo.

Right: National parks protect ecosystem services, like clean water and disaster mitigation, and provide recreation and solace in an increasingly hectic world. Point Reyes National Seashore, California. NPS photo courtesy Melanie Wood.





Cascading effects of climate change, including changing streamflow and water temperatures, will affect organisms along entire food chains, such as cold-water salmon species and this brown bear at Brooks Falls in Katmai National Park, Alaska. NPS photo.

Conclusion

The National Park Service has an important leadership role to play in understanding and communicating about climate change and in responding with effective adaptation and mitigation actions. The *Climate Change Action Plan* provides guidance to fulfill that role in both the near and long term. It is designed to focus near-term efforts on a coordinated set of actions while promoting flexibility to incorporate new knowledge, new initiatives, and changing circumstances as the future unfolds.

The Action Plan will reside in an electronic version on the NPS internal website (www1.nrintra.nps.gov/climatechange) along with companion documents, tools, and guidelines that result from the actions underway. New materials and perspectives will emerge continually, thus our commitment to timely review and revision of the plan will be important to stay current and to gauge the success and effectiveness of our activities. In the coming months Climate Change Response Program staff will engage with regions and major program areas to present key concepts and priorities of this Action Plan and gain input on how the plan can evolve to more fully represent all levels of the agency. We expect to review the status of high-priority

actions annually and conduct a substantive revision every two to three years through the staff of the servicewide Climate Change Response Program. The first full revision is targeted for 2014, following release of new information about climate change and its impacts through the upcoming National Climate Assessment and the IPCC reports.

Regardless of flexible intent, a written document remains static words on a page, expressed at a particular moment in time. People who are committed to initiate, follow through, connect, and communicate about their ideas, successes, and failures are the key to creating a “living plan.” This is not about individual divisions, programs or offices, but rather a learning, and growing community of practice. The immediacy of this threat to the integrity of our resources demands that we develop and embrace a culture of risk taking. There are no silver bullets or easy answers to climate change. As stewards of America’s greatest national treasures, we must draw on our strengths and join with our partners to meet this challenge over the long term.

Start where you are—let’s get going.

Right: An NPS scientist measures coral bleaching caused by warming oceans in Dry Tortugas National Park, Florida. NPS photos.





For additional information, please contact the NPS Climate Change Response Program Office at climate_change@nps.gov or visit the intranet site at www1.nrintra.nps.gov/climatechange

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