



National Park Service  
**CLIMATE CHANGE  
RESPONSE STRATEGY**  
2023 UPDATE

**UNDERSTAND**



**ADAPT**



**MITIGATE**



**COMMUNICATE**



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**National Park Service**  
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Hyperlinks throughout this document provide access to expanded content and additional resources. Though each link was verified at time of publication, the location of resources may change over time. As a service to the reader, links to all resources are also available on [this public-facing page](#) and will be updated as necessary. Links accessible only to National Park Service employees are annotated as "internal NPS link" in the text.

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# CONTENTS

- From the NPS National Leadership Council ..... 3
  
- Introduction ..... 5
  
- The Strategy Cornerstones ..... 7

  -  **UNDERSTAND** ..... 9
  -  **ADAPT** ..... 15
  -  **MITIGATE** ..... 25
  -  **COMMUNICATE** ..... 29

  
- Conclusion ..... 35
  
- List of Acronyms ..... 36
  
- Acknowledgements ..... 36
  
- Glossary ..... 38
  
- References ..... 39



Over the past century, Joshua Tree National Park has become both hotter and drier in large part due to human-caused climate change, threatening the persistence of the desert wildlands and cultural values it was established to protect.

# FROM THE NPS NATIONAL LEADERSHIP COUNCIL

The effects of climate change are evident across the National Park System, with impacts permeating every aspect of National Park Service (NPS) responsibilities, including natural and cultural resource stewardship, facility management, planning, park operations, and visitor experiences. To achieve its mission, the NPS must address climate change caused by human activities as part of its core responsibility to protect resources unimpaired for future generations. This obligation is anchored in the 1916 Organic Act, management goals in park-specific enabling legislation, and trust responsibilities.

The *NPS Climate Change Response Strategy 2023 Update* builds on longstanding attention by the NPS to climate change. The Strategy retains the overarching and integrated components of science, adaptation, mitigation, and communication while offering important new approaches that reflect considerable growth in knowledge and experience. We are pleased to share this strategy with our staff, partners, and stakeholders, and recognize that the complex and wide-ranging impacts of climate change require collaborative, inclusive solutions that provide the best possible future for parks and people.

We look forward to applying the insights, ideas, and actions articulated in the Strategy to address the complex challenges brought by climate change. Through our roles and responsibilities as members of the NPS National Leadership Council Strategy and Operations Teams\*, we recognize the relevance, importance, and urgency for NPS climate change response and invite you to join us as we advance and implement this strategy.

**“Given the scope of its responsibility for the resources and values entrusted to its care, the Service has an obligation to demonstrate and work with others to promote leadership in environmental stewardship. The Park Service must set an example not only for visitors, other governmental agencies, the private sector, and the public at large, but also for a worldwide audience. Touching so many lives, the Service’s management of the parks presents a unique opportunity to awaken the potential of each individual to play a proactive role in protecting the environment.” – NPS, 2006**

*\*Please see the Acknowledgements section for membership and affiliations.*

## Managing for Change

In 2016, the NPS entered its second century in a world already vastly altered by human-caused climate change. While NPS founders would not recognize many things in our world today, thanks to the work of their successors, they would still find much that is familiar in the national parks they knew. A similar statement may not hold true when the NPS nears the end of its second century.

Climate change will alter national parks in ways we cannot yet imagine. And it will doubtless heighten their importance as continued scribes of our natural and cultural history, as refugia for some species and corridors for others, and as places of recreation, respite, and learning for people.

Indeed, as we peer ahead—anticipating climate-driven changes far beyond any we’ve experienced—our responsibility remains the same: to protect these parks for the enjoyment, education, and inspiration of this and future generations.

Though the challenge is great, the privilege of working to meet it is greater.

We are up for it.



In 1903, President Theodore Roosevelt, John Muir, and others camped in the Mariposa Grove of Giant Sequoias at Yosemite National Park. Photographs from that trip captured the group posing before the famed Grizzly Giant. Thanks to the dedicated work of visionaries, the National Park Service, and our partners, similar sights and experiences still await our visitors today. Though rapid environmental change presents substantial and increasing challenges, our charge to ensure future generations have the same opportunities for enjoyment of park resources remains constant. *Historic photo credit: Joseph Nisbet LeConte*

# INTRODUCTION

The National Park System protects many of our nation’s most treasured places for the enjoyment, education, and inspiration of the world. Over 300 million people visit our parks annually to experience the sights, sensations, and stories of our collective heritage. From the Arctic to the tropics, national parks connect America’s diverse geographies. Similarly, parks chronicle our shared past, from acknowledging injustices suffered to celebrating those people whose determination, humility, and courage changed the trajectory of our nation.

Deep layers of history are on full display in our parks, as are the complex connections we share with one another and the world around us. Parks are magnificent picture windows through which we view the past, take in the present, and occasionally glimpse tomorrow.

But visions of tomorrow are increasingly troubling as human-caused climate change inscribes a new story in our national parks—a story of unintended consequences. Rising temperatures, droughts, wildfires, sea-level rise, species extinctions, and extreme weather are but a few of the notable threats transforming once-familiar places in complex and novel ways. Changes that formerly occurred on geological timescales now occur within human lifetimes.

The American public increasingly recognizes climate change as a challenge to the mission and work of the NPS. Driving these perspectives is the fact that climate change exacerbates many other concerns: habitat and biodiversity loss, declining freshwater availability, invasive species, outbreaks of pests and diseases, damage to—or loss of—cultural resources, and deteriorating infrastructure, among others. Climate change is a systemic threat that affects everything we manage and protect in national parks.

Our efforts to understand and address the effects of climate change are not new. The NPS appointed a Global Change Program Coordinator in 1990, published the *Interpreting Global Change* handbook in 1994, created the Climate Friendly Parks Program (CFP) in 2003, established the Climate Change Response Program in 2009, and released the first *NPS Climate Change Response Strategy* in 2010.

While these established a solid foundation, advancements in both climate change science and management options have grown rapidly since 2010. This *Climate Change Response Strategy 2023 Update* positions us for an expanded and accelerated response across our national parks. Through this strategy, the NPS reaffirms and strengthens its commitment to addressing the challenge of climate change.

Strong leadership across all levels of the NPS is required to meet the goals of this strategy. Simultaneously, we must be a learning organization: one that ensures our workforce has the necessary knowledge and skills, and is deliberate in seeking to learn from climate response efforts. Empowering managers to pilot ideas, processes, or solutions where the final outcome may be uncertain is essential. We will make mistakes, and creating a culture in which sharing “lessons learned” is actively encouraged will move the entire NPS forward. Transparency is critical in sharing with our visitors, communities, and stakeholders the inherent challenge of managing their parks unimpaired in the face of climate change.



Climate change has multiple implications for the National Mall, including tidal flooding, threats to the integrity of the seawalls, earlier flowering of cherry trees, and impacts to surfaces of monuments and memorials. Responding to climate change in parks is necessarily multifaceted.



# THE STRATEGY CORNERSTONES

This strategy is a high-level blueprint to guide NPS work to address the ongoing climate crisis. NPS subject matter experts across many disciplines served as principal architects, and numerous rounds of employee input shaped and added content.

The strategy stands on four cornerstones of action that organize our efforts across the NPS—Understand, Adapt, Mitigate, and Communicate. Each has its own section and vision statement, followed by supporting goals, examples of progress, and priority next steps. The order of the sections does not imply priorities, as the four cornerstones are integrated and equally important. *Text formatted in this manner* indicates key terminology for which specific definitions are provided in the accompanying glossary.

The four cornerstones provide a consistent structure for our servicewide response. But just as the parks themselves are highly diverse, the work of the NPS is similarly far-ranging and multi-dimensional. Thus, this document is not a cookbook with prescribed actions. Instead, it provides a framework to develop more detailed strategies and action plans relevant to specific NPS functions.

All NPS employees have a role in responding to *climate change* within the context of their work. Therefore, this strategy serves all NPS central offices, regions, programs, and parks. The fundamental objective of this strategy is to “mainstream” *climate-informed* practices across all NPS operations, which means to consciously address climate change as a routine part of our work. As we do so in the months

and years ahead, we will share additional resources, updates, and lessons learned through [a supporting, online companion](#) (internal NPS link) to this strategy.

## Mainstreaming climate-informed practices in national parks means we work to...



**UNDERSTAND** how climate projections for our parks differ from historical conditions and what the potential effects might be on park resources, facilities, and operations,



**ADAPT** through strategies that reduce the vulnerabilities of resources, facilities, and operations to climate change effects,



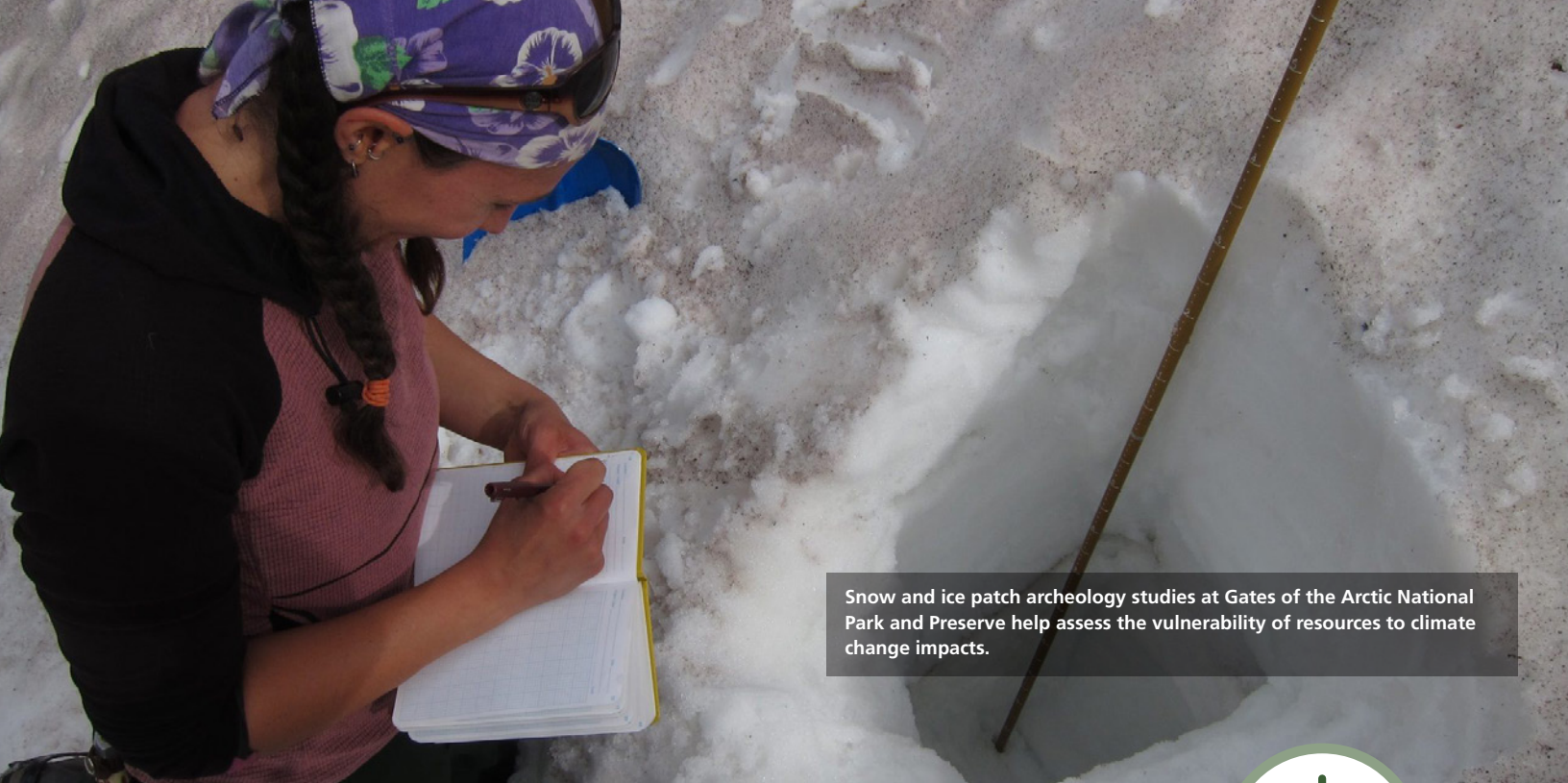
**MITIGATE** our own carbon footprint by minimizing the emissions of greenhouse gases from park operations, and increasing carbon storage where appropriate, and



**COMMUNICATE** about the effects of climate change on our national parks, what we are doing to address them, and what we are learning through our efforts.



Long-term monitoring helps us understand the impacts of warming ocean temperatures and acidification on rocky intertidal communities at Olympic National Park.



Snow and ice patch archeology studies at Gates of the Arctic National Park and Preserve help assess the vulnerability of resources to climate change impacts.

# UNDERSTAND



The changing climate challenges the NPS to reduce our *greenhouse gas* (GHG) emissions and adapt to novel conditions. Understanding how climate change affects NPS resources and responsibilities is the foundation for our response. The use of high-quality information is required to anticipate changing environmental conditions, navigate *uncertainty*, and evaluate the efficacy of our efforts.

Preparing for the future through climate-informed management allows us to reduce—and in some cases avoid—the most consequential and undesirable impacts of climate change. But doing so effectively requires close collaboration among scientists, resource professionals, partners, Indigenous Peoples, and stakeholders. Collaboration among those with shared interests deepens our knowledge, multiplies creative insights and solutions, advances landscape-scale responses, and expands the benefits of climate change information and lessons learned.

The goals below describe actions required to make existing high-quality information actionable for decision-makers, and actions required to develop new science to address unmet information needs. Both goals require clear understanding of the relevant knowledge and level of detail needed to inform various NPS decisions. Information needs shared by multiple parks or programs are clear priorities.

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**Vision statement: The NPS uses high-quality information on plausible future climates and resource impacts to inform adaptation and mitigation efforts and track effectiveness over time.**

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## **Goal 1. Base mitigation and adaptation decisions on high-quality information, including the best available science and Indigenous Knowledges.**

The rapid proliferation of climate information challenges our ability to discover and interpret it. This can be a significant barrier for decision-makers. Overcoming this challenge requires a clear, consistent process to identify specific information needs and quickly deliver actionable information to managers. It also requires guidance on how to make decisions

using available information even when consequences are uncertain. Information is most actionable when derived jointly by decision-makers, planners, scientists, and other stakeholders through sustained collaboration (Meadow et al. 2015). Considerable progress in this arena by the NPS over the last decade provides a solid foundation for broader success.

Climate change isn't "just another problem" to confront in meeting our responsibilities to conserve national parks—it compounds numerous other issues and will ultimately move our environment beyond the bounds of what humankind has experienced. As we respond to the numerous facets of climate change effects, applying multiple lines of evidence and "ways of knowing" can foster better-informed decisions. Insights from Indigenous Knowledges can inform development of adaptation strategies through broader understanding of lands and waters conserved in the National Park System, and how Indigenous Peoples have interacted with and adapted to the environment over time.



A long history of fire suppression and the compounding effects of climate change threaten culturally important black oak groves in Yosemite National Park. As of 2022, the Tending Traditions project planted over one thousand black oak saplings in Yosemite Valley through the hard work of more than one hundred tribal members from seven traditionally associated tribes.



A 2022 assessment found roughly one-third of all building and transportation assets at Castillo de San Marcos National Monument are highly vulnerable to coastal hazards and sea level rise.

## Examples of Progress

- The [Coastal Hazards & Sea-level Rise Asset Vulnerability Assessment Protocol](#) provides a standardized method for using national data sources to assess the *vulnerability* of facilities at coastal parks, such as visitor centers, historic structures, and roads (Peek et al. 2022). These assets are fixed in place, provide important services, and represent significant investments. The assessment method covers multiple coastal *hazards* exacerbated by climate change, and results allow for comparison of asset vulnerability across local, regional, and national levels. The assessments synthesize information to inform management decisions (such as hurricane recovery investments) and provide a foundation for operational resilience planning.
- The [Cultural Resources Environmental Vulnerability Assessment Toolbox](#) helps resource managers in the Intermountain Region assess vulnerabilities, develop adaptation options, and prioritize response actions to climate and other environmental factors. This geospatial decision support tool synthesizes *exposure* data for climate

change attributes most damaging to cultural resources in the area, as well as information on the different climate sensitivities of various materials used in cultural sites.

- Methods and tools to address the uncertainty inherent in analyzing the future of climate change continue to advance (NPS 2020; Runyon et al. 2020). The NPS can now generate park-specific summaries of *climate projections* for the vast majority of NPS units. These summaries are a key component of best practices for participatory, park-focused climate change scenario planning; and support a variety of planning processes such as Resource Stewardship Strategy efforts (Lawrence et al. 2021; Miller et al. 2022).

## Action in Parks

- Longstanding suppression of wildfire coupled with a warming climate threaten oak woodlands in California, and black oaks in **Yosemite National Park** have shown poor regeneration for years. But acorns remain an important cultural food for local Indigenous Peoples. The Yosemite

Conservancy funded the Tending Traditions project in 2021 to restore traditional stewardship of oak groves in Yosemite Valley. Over 100 members of local Indigenous nations have provided on-the-ground management, which promotes the intergenerational sharing of Indigenous Knowledges so that high-quality acorns can be produced for future saplings, people, and wildlife.

- The NPS and partners used [three-dimensional digital documentation techniques](#) to record historic graffiti, artwork, and architectural features of **Castillo de San Marcos National Monument**. This makes inaccessible, difficult-to-see components of the Castillo’s history available to visitors and provides records of current conditions and baseline data to monitor effects of climate change. The use of digital technologies supported 3D modeling of sea-level rise projections over time at the Castillo and the **St. Augustine Town Plan National Historic Landmark District**.

### Next Steps

- Improve access to NPS data and information products useful for assessing the climate exposure and *sensitivity* of resources and facilities (such

as those derived from analyses of Vital Signs Monitoring Program data, or synthesis of staff knowledge of events that trigger exceptional maintenance needs).

- Where relevant, use externally available tools and information to support NPS decision-making, including clearinghouses such as the National Oceanic and Atmospheric Administration [Climate.gov site](#) or the U.S. Global Change Research Program [U.S. Climate Resilience Toolkit](#). Other examples include more targeted tools, such as the U.S. Geological Survey (USGS) [Strategic Hazard Identification and Risk Assessment Risk Mapper](#) for lands managed by the Department of the Interior (DOI), or the NPS [Climate Analogs tool](#).
- Synthesize information on potential adaptation strategies across different resource and asset types, and promote the sharing of knowledge and experience between organizations with similar interests and responsibilities.
- Expand consultation with Indigenous Peoples and other partners to incorporate Indigenous Knowledges into planning and decision-making processes, as appropriate, and in accordance with DOI policy and guidance.



In addition to recording important baseline information, this laser scan of a bronze cannon from Castillo de San Marcos allows online visitors to peruse details about the historic weapon using an interactive, three-dimensional interface. *Photo Credit: University of South Florida Digital Heritage & Humanities Collections*



## Goal 2. Fulfill priority needs for new information and share NPS advances with partners.

Climate change greatly increases the uncertainties with which managers must contend. *Mitigation* and adaptation decisions often raise questions for which answers are either not readily available at the appropriate scale or do not yet exist. Meeting information needs will require multi-disciplinary efforts ranging in scale from broad climate modeling to targeted, management-driven inquiries. And as actions are implemented, new methods for measuring the relative efficacy of management efforts will be required. Meeting NPS information needs will increasingly require multi-disciplinary integration.

Science needs associated with climate change *vulnerability assessment* (VA) efforts include improved understanding of plausible future trends in hazards (such as inland flooding and fire, water availability and drought, extreme precipitation, insect pests and diseases, etc.) at scales appropriate for NPS decision-making. Additional information is also needed on the climate sensitivity of—and potential impacts to—priority facilities and natural, cultural, and biocultural resources. And greater clarity is needed

on the susceptibility to—and potential rates of—climate-driven transformation in different ecosystems (Crausbay et al. 2022; Schuurman et al. 2022).

Social science needs include understanding the effects of climate change on park visitation, as well as how to make better adaptation decisions (Clifford et al. 2022) and design collaborative governance strategies for issues that increasingly require coordination at the landscape scale (Magness et al. 2022). And the growing body of research on effectively communicating climate change science will aid us in sharing information with park audiences.

Parks, programs, and directorates all have a role in identifying, conducting, and sharing the best available science. Some needs will be met through our own science capacity while others may be addressed through the work of other federal, state, or academic science partners. Partnering with Indigenous Peoples, local communities, and non-governmental organizations will focus attention on shared information needs and enhance the collective capacity to address them.



Exploring ice caves at Apostle Islands National Lakeshore is one of many treasured visitor experiences across the National Park System impacted by a warming world.

## Examples of Progress

- [\*Historical Changes in Plant Water Use and Need in the Continental U.S.\*](#) provides improved understanding of potential resource impacts of climate change (Tercek et al. 2021). The model integrates projections of temperature, precipitation, and other environmental attributes with projections of the amount of water available to plants, snow accumulation and melt, runoff, and aridity. **Great Sand Dunes National Park and Preserve** used the model [to understand potential impacts on natural processes](#) such as streamflow, vegetation production, and wildfire ignition (Thoma et al. 2020).
- Despite significant climate change vulnerabilities in parks, relatively few have assessed them. To help fill this gap, [\*A Strategic Analysis of Climate Vulnerability of National Park Resources and Values\*](#) assessed the relative magnitude of several factors affecting vulnerability of park resources and built assets in the contiguous U.S. (Michalak et al. 2021). The results identified priorities for more detailed VAs and strategies to conduct them, including grouping parks with common threats or sensitivities and conducting regional assessments of high-priority threats.

## Action in Parks

- [\*Warming aquatic habitats and invasive lake trout\*](#) threaten the persistence of local populations of native bull trout in **Glacier National Park**. To hedge against a warming climate and establish a bull trout population secure from invasive species, a team of park and USGS biologists selected genetically diverse juveniles and moved them upstream above an impassable waterfall. Managed relocation (also known as assisted migration or conservation translocation) is rarely used as an adaptation strategy within the NPS. Results from this project over time will inform potential adaptation strategies in other settings.

- It is increasingly difficult to complete multi-agency moose monitoring surveys in **Alaska national parks** due to declining snowpack conditions. The NPS worked with the Alaska Department of Fish and Game, the U.S. Fish & Wildlife Service, and the Western Alaska Landscape Conservation Cooperative to document the scope of the issue and consider the implications of climate projections on the ability to complete moose surveys. The resulting shared awareness (Kellie et al. 2019) prompted research on new methods to provide the necessary information even under changing environmental conditions.

## Next Steps

- Determine priorities for inventorying and assessing resources and facilities at potentially higher risk using sources such as *A Strategic Analysis of Climate Vulnerability of National Park Resources and Values* and similar analyses.
- Expand programs that test historic building materials to include archeological and other cultural resource material types. Such testing can establish the sensitivity to climate change exposure of a wider range of cultural resources, and, in some cases, inform the design of effective maintenance.
- Identify key questions and address emerging science needs to support adaptation and *adaptive management* (Lynch et al. 2022). Examples include identifying indicators of *ecological transformation*, developing vegetation management strategies that improve carbon storage potential, or devising maintenance strategies that best protect historic structures subject to climate extremes.





Eco-tents at the popular Flamingo area of Everglades National Park can be disassembled and stored in advance of tropical storms, or relocated further inland as sea levels rise over time.

# ADAPT



The NPS recognizes the importance of accounting for the myriad effects of climate change during park planning and identifying opportunities to adapt to changing conditions.

Resources and facilities that are protected and maintained in good condition are better positioned for successful, proactive *climate change adaptation*. Recovery and restoration efforts following acute, critical incidents (such as wildfires, storms, or floods) also provide opportunities for adaptation. Thus, forward-looking adaptation—alongside restoration as needed—can help conserve cultural and natural resources, develop resilient infrastructure, enhance human safety, and foster a positive visitor experience.

Because park resources and facilities may have different significance for various communities, engagement with Indigenous Peoples, underrepresented groups, and other stakeholders is critical. Adaptation actions should consider diverse values and perspectives and—where appropriate—be informed by Indigenous Knowledges. Consultation with Indigenous Peoples on adaptation actions that may directly or indirectly affect their interests, practices, or traditional use areas will advance our shared interests in stewarding park natural and cultural resources under changing environmental conditions.

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**Vision statement:** The NPS anticipates and adapts to climate change effects in order to protect natural and cultural resources, facilities, park operations, visitor experience, and human health.

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## Goal 3. Address climate change as a standard practice in all levels of NPS planning.

While climate change adaptation does not require a stand-alone planning effort, it should be incorporated as a standard component of routine planning and decisions. To meet our mission under conditions of rapid environmental change, the NPS must address climate effects across our full range of planning, thinking holistically about how to adapt across resource types, facilities, and visitor use management.

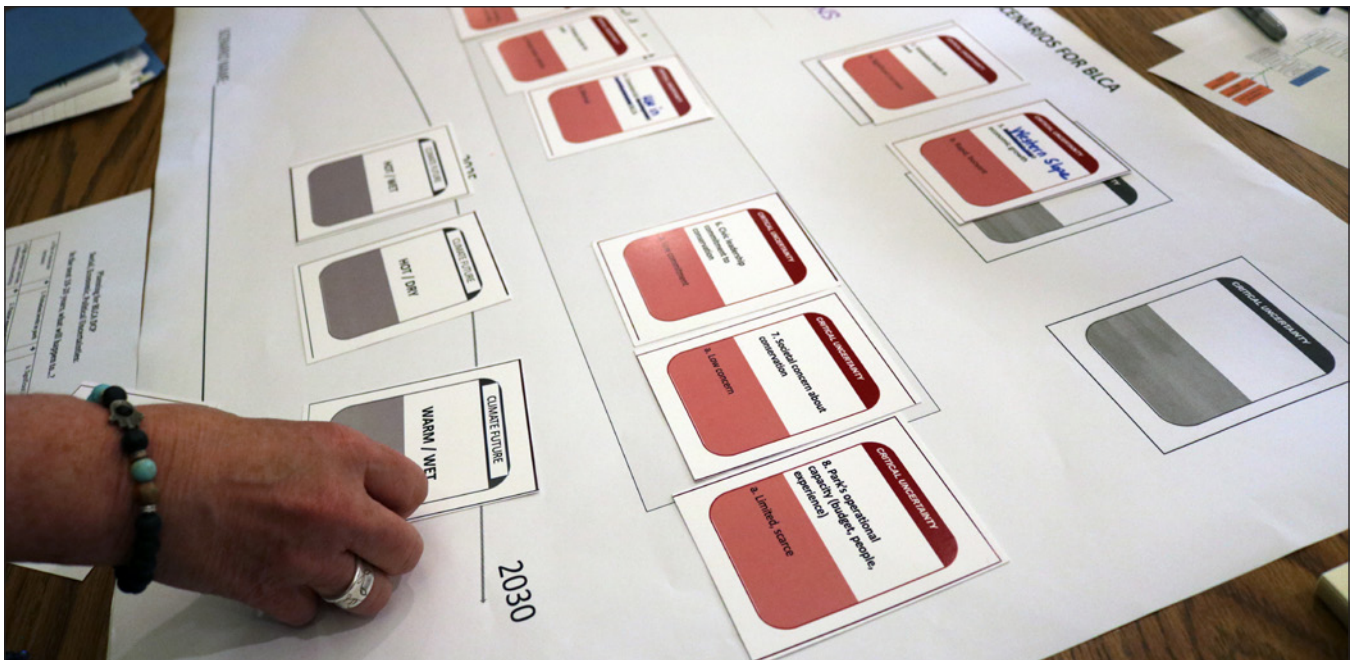
### Examples of Progress

- [Planning for a Changing Climate](#) provides guidance for developing robust climate change adaptation strategies (NPS 2021a). Through a general adaptation planning framework that considers climate projections and scenarios, the guide helps to mainstream climate change into all NPS planning.
- The [Climate Change Scenario Planning Showcase](#) features publications, guides, and examples of

park scenario planning efforts. The NPS Climate Change Response Program also provides training in scenario planning for NPS staff and partners.

### Action in Parks

- Scenario planning provides a structured process for considering a range of plausible futures that managers may face. The Resource Stewardship Strategy for **Wind Cave National Park** served as [a pilot effort](#) to incorporate climate projections into planning. Park and regional NPS staff, climatologists, park planners, and other experts provided a set of plausible scenarios for natural and cultural resources (Runyon et al. 2021).
- Prior to investing in large-scale water infrastructure, leadership at **Big Bend National Park** sought clarity on possible water supply dynamics under various climate scenarios. Specialists from the Natural Resource Stewardship



Scenario planning work, such as this workshop at Black Canyon of the Gunnison National Park, supports managers in making informed decisions that consider plausible future conditions under climate change.

and Science Directorate used [downscaled climate projections and modeling to explore implications for Oak Spring](#), the sole water supply for the Chisos Basin Developed Area (Lawrence & Runyon 2019). The analysis showed that in the best case, the spring's failure rate remained the same as current, but in the worst case, it would fail twice as often. The park used these insights to hedge against both climate futures through improvements in both water conservation (fixing leaks, etc.) and water storage (to prepare for more variable availability). The resulting climate-informed investments at Big Bend are a good case study for parks facing similar issues.

### Next Steps

- Evaluate relevant legal and policy considerations for planning and climate adaptation decisions. Revise policies and guidance as needed for consistency with DOI or NPS requirements, and to clarify roles, responsibilities, and authorities for climate change response.
- Provide training, guidance, and tools to enhance and accelerate the ability of NPS planners to incorporate climate change as a standard practice across all planning efforts.
- Expand the types and number of plans that incorporate climate information through collaboration among parks, regions, and directorates, and the use of interdisciplinary planning teams.
- Provide “menus” of adaptation strategies and actions that park planners and managers can tailor to meet their needs.
- Collaborate on landscape-scale planning efforts to identify cross-boundary adaptation strategies.
- Consistent with the NPS National Disaster Planning, Response, and Recovery Initiative, identify opportunities to incorporate climate change into Incident and Emergency Management preparedness and response, including Fire Management Plans and determining management priorities within ecosystems.



Scientists at Big Bend National Park monitor and study how changes in precipitation and temperature, induced by climate change, could impact the availability of water for both people and wildlife.



## Goal 4. Implement adaptation actions to manage natural resources under conditions of continuous change.

Current NPS management policies (NPS 2006) define “natural” conditions as those “that would occur in the absence of human dominance over the landscape.” While the NPS seeks to maintain natural conditions whenever and wherever feasible, the effects of climate change are ubiquitous and require additional, alternative strategies of accepting new conditions, or even directing trajectories towards preferred ones. Resisting climate change is more complex than resisting effects of traditional stressors, often requiring a sustained or escalating effort involving potentially large tradeoffs with other management objectives.

Thus, climate change adaptation compels an evolution in our work. Adaptation requires new approaches because climate change is an unprecedented challenge—a continuously intensifying transformation of ecosystem conditions and processes that is irreversible within standard management timelines.

### Examples of Progress

- The NPS developed the [Resist–Accept–Direct \(RAD\) Framework](#) in partnership with others to help managers make informed, strategic choices as they navigate ecological transformation (Schuurman et al. 2020). The RAD Framework is simple and flexible, complements other climate change adaptation approaches, and [applies to a wide range of decisions that resource managers will increasingly face](#). Furthermore, it offers a generic approach that can support managers in developing adaptation strategies across jurisdictions and at landscape scales. While originally developed for stewarding ecosystems undergoing strong climate-driven change, if carefully applied it can also be helpful for thinking about managing changing impacts of climate on facilities, cultural resources, and the visitor experience.
- Managers are increasingly considering measures such as managed relocation (also known as “assisted migration”) to protect at-risk species



Recognizing threats from warming water temperatures and non-native lake trout, Glacier National Park managers moved juvenile bull trout to cooler waters above a natural barrier that prevents competition and predation from lake trout. *Photo Credit: Ron Bend*

by moving them beyond their historical range to locations with more favorable biotic or climatic conditions. Such actions require careful deliberation, as they entail risks to both the target organism and the recipient ecosystem. [Ecological Risk Assessment of Managed Relocation](#) describes protocols to help natural resource managers evaluate potential risks as part of planning and decision-making (Karasov-Olson et al. 2021).

- [Climate change VAs](#) help identify why, where, when, and which resources may be most at risk from climate change. In recent years, the NPS worked with partners to develop a method for [integrated coastal climate change VAs](#) that helps park managers identify adaptation options that consider linkages across different resource types (Ricci et al. 2019a).

### Action in Parks

- Informed by scenario planning, parks are considering a range of potential future conditions

to improve chances of long-term success. **Acadia National Park** is [testing methods to re-establish plant communities](#) on the summit of Cadillac Mountain, including seedlings from downslope and further south that are suited for warmer conditions.

- Hurricane Sandy [breached a stretch of coastal wilderness](#) at **Fire Island National Seashore** in 2012. The decision to allow it to remain open was an example of intentionally accepting change (as it would be later described in the RAD Framework). Natural sediment processes that are part of inland migration of the barrier island will support its ability to keep pace with sea-level rise, with the added benefit of improved water quality in Great South Bay.

### Next Steps

- Increase and accelerate adaptation actions using existing guidance and frameworks and, where appropriate, work with partners to accomplish adaptation at landscape scales.

- Foster strong collaboration among NPS employees and external partners to share knowledge and advance large-landscape adaptation that restores connectivity and ecological processes such as predation, migration, nutrient cycling, and disturbance.
- Determine the highest-priority adaptation actions, considering legal mandates, management goals, ecosystem processes, available information and resources, and feasibility given future climate projections. Prioritization requires recognizing that maintaining historical conditions and processes is increasingly difficult and often infeasible, and fosters strategic action that seeks to minimize costs and maximize benefits.
- Assess routine resource management activities regularly to ensure that they are climate-informed and adaptation-oriented. Eliminate activities that are counterproductive or no longer effective.



After careful consideration, park managers elected not to attempt to close a breach in the Otis Pike Fire Island High Dune Wilderness caused by Hurricane Sandy. Subsequent years showed improved conditions for seagrasses, crustaceans, and finfish, and declines in harmful brown tide events in the adjacent Great South Bay.



## Goal 5. Implement adaptation actions to manage cultural resources under conditions of continuous change.

The NPS promotes the protection and preservation of cultural resources within parks as well as those managed by other governmental and non-governmental organizations. The NPS contributes to national and global efforts to identify, develop, and carry out strategies for adapting resources most at risk from the impacts of a changing climate.

Current NPS management policies (NPS 2006) define cultural resources as “archeological resources, cultural landscapes, ethnographic resources, historic and prehistoric structures, and museum collections.” Climate change affects cultural resources daily, causing loss of integrity and in some instances the loss of entire cultural sites.

Strategic cultural resource management aims to maintain historic significance and integrity. Where necessary and feasible, it tries to reduce partial or complete loss. Such approaches must consider the tangible and intangible aspects of cultural resources and the array of values associated with them. As such, adaptation approaches should be developed and implemented in close consultation with local

communities, Indigenous Peoples and other traditional communities, and underrepresented groups and emphasize environmental justice considerations and perspectives.

### Examples of Progress

- The [Cultural Resources Climate Change Response Strategy](#) (Rockman et al. 2016) provides guidance that builds from the broader NPS Climate Change Response Strategy (2010) by identifying overarching goals and associated actions, and describing impacts from five climate change-related drivers on the principal cultural resource types.
- The [Guidelines on Flood Adaptation for Rehabilitating Historic Buildings](#) provides technical information for adapting historic properties at risk of flooding (Eggleston, Parker & Wellock 2021). Changing weather patterns, stronger hurricanes and other extreme weather, sea-level rise, and more frequent nuisance flooding are



The mission church at Tumacácori National Historical Park is one of many adobe structures across the National Park System. Adobe is susceptible to damage from warming temperatures and changing precipitation patterns driven by climate change.



Archeological excavation units at the historic townsite of Dyea within Klondike Gold Rush National Historical Park were lost within one week of excavation, destroyed by flooding from the Taiya River. Emergency archeological data recovery is ongoing at the site to document and preserve cultural materials before they are lost due to severe riverbank erosion. *Photo Credit: Shina duVall/NPS*

some of the factors increasing the risk of damage to historic properties.

- The Climate, Science, and Disaster Response Program includes cultural resource staff who are part of the NPS Climate Change Response Program. These positions include a historic architect and archeologist dedicated to climate change adaptation for cultural resources (Wright & Hylton 2022).

### Action in Parks

- Climate change led managers at **Colonial National Historical Park** to assess the vulnerability of cultural resources, consult with Indigenous nations, and prioritize adaptation actions. The NPS and partners piloted a rapid assessment using existing data and expert knowledge to understand general vulnerability across natural resources, cultural resources, and facilities, and promote coordinated strategies for adaptation (Ricci et al. 2019b).

### Next Steps

- Utilize decision-making tools (such as the RAD Framework) to help managers develop adaptation strategies for the five principal types of cultural resources.
- Inventory the condition of cultural resources routinely to inform adaptation and, where necessary, document and interpret the loss of integrity or the resource itself.
- Provide boilerplate language in contracts for Historic Structure Reports and other planning documents to ensure that potential treatments include suitable climate change adaptation strategies.
- Engage State Historic Preservation Offices, Tribal Historic Preservation Offices, and other stakeholders to support cultural resources adaptation in collaboration with the NPS, including actions for National Heritage Areas and National Historic Landmarks.



## Goal 6. Develop and implement strategies to understand and manage climate change effects on visitation, park operations, visitor experience, and human health.

Climate change influences the timing and spatial distribution of visitation to parks, as well as visitor motivations. Changing visitation patterns have implications for the operation of NPS units, concessioners, gateway communities, and other partners. And shifts in visitation can harm natural and cultural resources and park infrastructure.

Climate change also affects the quality of the visitor experience. Impacts include changes to fundamental resources, facilities, and values visitors hope to enjoy, and related shifts in visitor activities as previous experiences become unavailable. And uncertainty around extreme weather—and its potential to render some areas inaccessible or unsafe—can make visitor use management challenging.

The NPS must consider and safeguard against the potential negative impacts of climate change on visitor experience and safety, as well as impacts on employee wellbeing. Because parks can provide physical, mental, social, and spiritual benefits, we can simultaneously harness the power of parks as a public health resource.



Warming temperatures and associated impacts can directly influence visitor safety, access, and experience, and have consequences for local communities.

### Examples of Progress

- NPS research on [park visitation and climate change](#) explored potential shifts in visitation based on a comparison of historical and projected future temperatures (Fisichelli et al. 2015). The results—summarized across 340 park-specific briefs—provide a crucial first step for park managers and local communities to anticipate and plan for changes in visitation.
- The [Interagency Visitor Use Management Council](#) has developed numerous resources to help federal managers provide sustainable access to lands and waters.
- For over 100 years, the NPS has been dedicated to protecting public health and promoting parks as a health resource. This includes providing information about potential hazards exacerbated by climate change, such as extreme heat. The NPS recognizes human wellbeing is intimately linked to the health of the natural world, and works to improve the health of humans, animals, and the environment alike through the [One Health](#) (internal NPS link) initiative.

### Action in Parks

- Staff at **Muir Woods National Monument** used the Visitor Use Management (VUM) Framework to improve [sustainable visitor access and arrival facilities](#) that balance visitor experience and safety with climate change impacts on natural and cultural resources. The VUM Framework provides an adaptive management approach to providing high-quality visitor experiences while protecting park resources in the face of changing visitation patterns and behavior.
- Staff at **Haleakalā National Park** used the VUM Framework to develop the [Kīpahulu Comprehensive Plan](#), which improves visitor access, reduces impacts to cultural and natural



resources, promotes visitor safety, and ensures adequate operational capacity and facilities. To address potential climate-related impacts to visitor safety—such as flash flooding—the park developed “risk-aware area” safety messaging to help visitors make informed decisions.

### Next Steps

- Regularly incorporate climate change considerations into visitor use planning, building on the VUM Framework, its [rapid assessment tool](#) (internal NPS link), and other associated guides.
- Develop processes, tools, and funding to support parks in planning for climate change impacts to visitor access and experience, and attendant changes in managing operations, facilities, and resources.

- Communicate early with partners, other stakeholders, and the general public about climate-related impacts to visitor access or experience, such as closures due to flooding or wildfire, particularly in areas that typically don’t experience such events. Collaborate with local communities to better understand impacts of shifting visitation patterns and to contribute to management strategies beyond park boundaries.
- Promote the adoption of climate change mitigation practices as part of the [Green Parks Plan](#) for sustainable operations (NPS 2023). Such practices also confer ancillary visitor benefits; for example, installing efficient lighting protects night skies, and adopting carbon-free energy production improves air quality.



Rising temperatures and higher rates of visitation will likely increase incidents of heat illness at places like Grand Canyon National Park, requiring additional measures to protect the visiting public, such as water fill stations, shade structures, and emergency preparedness.



## Goal 7. Prioritize adaptive practices for resilient design, construction, and maintenance of park infrastructure.

Climate change impacts to infrastructure have implications for transportation access, water supply, and utilities, among others. Specific impacts vary depending on the type of asset, and its location, design, function, and condition. Selecting appropriate adaptation strategies over a range of plausible and cumulative climate change impacts is required for major construction investments.

### Examples of Progress

- The NPS convened the interdisciplinary Climate Adaptation and Resilience in Facility Investments forum, which established shared responsibility and specific tasks for coordination across directorates.
- Through exposure analyses or VAs, threats unique to various sectors, such as energy, transportation assets, communication, and water supply and treatment, are included in project reviews. Sustainable design guidance has been organized and incorporated into Denver Service Center project workflows.
- The NPS established the Bureau Investment Review Board to oversee adherence to a new Facility Investment Strategy that includes adapting to the potential effects of climate change hazards and impacts on operational sustainability, consistent with [Policy Memorandum 15-01](#). Major construction projects must incorporate climate-adapted or climate-resilient components that improve facilities or operations.

### Action in Parks

- The NPS and partners analyzed opportunities to reduce operational vulnerability at coastal parks including **Pu‘uhonua o Hōnaunau National Historical Park, Cape Cod National Seashore, and Timucuan Ecological and Historic Preserve.**

- Constructed in the 1960s, the aging Flamingo Lodge at **Everglades National Park** closed following substantial hurricane damage. Instead of fully rebuilding permanent structures, “eco-tents” were adopted as one sustainable solution for overnight accommodations. The tents can be moved in case of severe hurricanes or permanently relocated as sea level rises in subsequent decades.
- Glacier retreat at **Mount Rainier National Park** alters the hydrology of numerous rivers in the park, including the [Carbon River](#), where ongoing channel aggradation affects visitor access. The Carbon River Road once provided the closest access from Seattle to a popular park glacier, but [massive flooding throughout the park in 2006](#) damaged the road and other infrastructure. In response, the park converted the road to a trail for pedestrian and bicycle access.

### Next Steps

- Complete a servicewide screening of park infrastructure that is likely to be impacted or threatened by climate change. Use the NPS Facility Management Software System in conjunction with data on climatic events to assess likely threats.
- Update Policy Memorandum 15-01 and protocols for conducting VAs for facilities.
- Support facility and project managers in designing adaptation features based on climate change projections, and provide a framework for addressing controversial outcomes, such as sacrificing infrastructure that cannot be maintained due to recurring or extreme damage.



The Mesa Verde National Park Visitor and Research Center is among several NPS buildings that have earned Leadership in Energy and Environmental Design (LEED) certification.

# MITIGATE



The preservation-centered mission of the NPS requires us to reduce the impacts of climate change on the National Park System—including focused efforts to quantify and reduce our own carbon footprint. Climate change mitigation identifies, assesses, and lessens operational GHG emissions. Increasing the use of carbon-free energy, conserving resources, improving efficiency, minimizing waste, reusing materials, and adopting low-carbon vehicle technology will reduce NPS emissions and set an example for partners, gateway communities, and visitors.

**Vision Statement: The NPS reduces operational GHG emissions towards a net zero future, promotes the efficient use and operation of structures and resources through sustainable materials and practices, and conserves or restores structures and ecosystems that store carbon.**



## Goal 8. Reduce carbon emissions to net zero by 2045 through commitment to environmentally sustainable operations and practices.

The NPS generates GHG emissions from its operations, including facility energy use, fleet fuel use, and waste disposal. Emissions also result from other activities, such as visitor use and concession operations, and—more broadly and indirectly—from visitor travel. The NPS will encourage employees, partners, and visitors to recognize our collective responsibility to reduce our operational carbon footprint.

The NPS has made good progress reducing GHG emissions from these and other emission sources and making its operations more sustainable. Many opportunities remain to further reduce emissions towards net zero. The [Green Parks Plan](#) describes goals, objectives, and near-term priorities to reduce emissions, among other sustainability measures.

### Examples of Progress

- The annual servicewide inventory of GHG emissions from NPS operations provides insight into key sources and helps identify opportunities to reduce our carbon footprint.

- The [Green Parks Plan](#) is a framework to integrate sustainable practices into every aspect of operations. The plan articulates an overarching vision for more sustainable operations by establishing environmental performance targets, empowering staff to make necessary changes, collaborating with partners and stakeholders, and engaging millions of visitors to support the effort in parks and at home.
- The Climate Friendly Parks Program (CFP) provides tools to address climate change and ensure sustainable park operations. The CFP goals include measuring park-based GHG emissions, providing education, and developing strategies and actions to reduce emissions and anticipate impacts on park resources. This work provides a foundation for getting parks to net zero GHG emissions. Parks that complete a set of four planning tasks receive the “Climate Friendly Park” designation.



Mass transit and alternative transportation options in parks—like this demonstration electric autonomous visitor shuttle tested at Wright Brothers National Memorial—help reduce greenhouse gas emissions while conferring additional benefits, such as reduced traffic congestion, improved air quality, and enhanced visitor experience. *Photo Credit: the North Carolina Department of Transportation*



Onsite generation of alternative energy in parks reduces greenhouse gas emissions, lessens energy loss from long-range delivery, and supports continuity of operations following regional disruptions.

### Action in Parks

- **Homestead National Historical Park, Katmai National Park and Preserve, and Nicodemus National Historical Site** all belong to a growing network of more than 120 Climate Friendly Parks. Member parks put sustainability planning at the forefront of operations, developing strategies to meet GHG reduction targets.
- In 2008, **Golden Gate National Recreation Area** joined the CFP network. By 2019, the park achieved [carbon neutral status](#) by using 100% renewable electricity, adopting electric and hybrid vehicles, and purchasing carbon offset credits with assistance from the Golden Gate National Parks Conservancy.

### Next Steps

- Conduct priority actions in the [Green Parks Plan Implementation Strategy](#) (internal NPS link) to reduce emissions across all aspects of NPS and concessions operations.
- Collaborate with partners such as the National Renewable Energy Laboratory to identify emission reduction opportunities in areas of highest consumption of building energy and fleet fuel, and pursue 100% carbon-free energy within park operations.
- Include GHG reviews that account for the carbon cost of new construction versus reuse of existing structures, and required mitigation actions in park management plans, environmental compliance documents, and project development processes.
- Ensure efforts to reduce emissions are consistent with NPS resource stewardship responsibilities.



## Goal 9. Identify opportunities to increase carbon storage as a function of healthy ecosystems and a component of structures.

The National Park System includes ecosystems that store carbon through natural processes. Carbon is also stored in structures. Maintaining and restoring both has associated functional benefits, such as providing wildlife habitat or preserving historic buildings.

### Examples of Progress

- Conservation and sustainable management of forests, soils, and other lands within the national parks provide key ecosystem services, including transforming and storing carbon. In collaboration with USGS scientists, NPS is calculating carbon reserves, carbon transformation, and carbon storage [benefits using the Land Use and Carbon Scenario Simulator model](#) at **Golden Gate National Recreation Area** and **Jean Lafitte National Historical Park and Preserve**. A key objective is to provide a tool for DOI bureaus to run their own models.

### Action in Parks

- A highly disturbed 30-acre wetland that historically contained spring seeps, wetland meadows, forested wetlands, and a stream system was restored at **Delaware Water Gap National Recreation Area** using tactics that include projected climate change effects. Adverse climate change effects addressed in the restoration design included increasing daily air temperatures, stream and groundwater temperatures, stream erosion, precipitation, and lake evaporation.
- Carbon-storing wetlands have been rehabilitated at numerous parks including **Sequoia and Kings Canyon National Parks**, **Channel Islands National Park**, **Palo Alto Battlefield National Historical Park**, **Moore's Creek National Battlefield**, and **Pecos National Historical Park**.

### Next Steps

- Leverage partnerships to develop science-based carbon accounting data for ecosystems.
- Explore and identify opportunities for managing carbon so that investments are consistent with ecosystem restoration goals.
- Consider the carbon storage potential of the built environment in addition to that of the natural environment by providing technical guidance and best management practices.



The shoreline mangrove forests of Biscayne National Park are among numerous NPS landscapes capable of sequestering large amounts of atmospheric carbon.



Parks are ideal spaces to engage audiences on the meaning, significance, and personal relevance of climate change, and are powerful places to encourage action.



# COMMUNICATE

Thanks to the collective efforts of our employees, contractors, interns, volunteers, and partners, we welcome millions of visitors annually to explore parks in-person and online. Our reach—and the power of the places we protect—uniquely position us to advance dialogue on climate change.

As we work to address the climate crisis, we will share our efforts in an open, honest manner with visitors, partners, and communities. Within the multiplicity of parks—and the diverse populations we serve—some will be at greater risk from climate change than others. Intentional, inclusive, and proactive dialogue will help secure the best possible outcomes for people and parks.

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**Vision Statement:** The NPS workforce recognizes the implications of climate change for the management of parks and prioritizes candid, collaborative communications with coworkers, visitors, the American public, and the world.

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## Goal 10. Increase understanding of climate change within the NPS workforce and among our partners to ensure operations are climate-informed.

The exchange of climate-related information among our colleagues is an important step toward the ultimate goal of applying that knowledge to on-the-ground management. Thus, the NPS will develop a structured program of training to cultivate a climate-informed workforce across occupational categories, accommodate a variety of learning styles, and leverage the full array of technologies available for workforce engagement.

### Examples of Progress

- The [Workforce Climate Change Literacy: Needs Assessment and Strategy](#) guides climate-related NPS training efforts (NPS 2016). The [Climate Change in the National Parks e-learning module](#) (internal NPS link) provides an on-demand foundational primer for all NPS employees. And several robust, [climate-related training opportunities](#) now support specific NPS occupational series. In addition, the NPS coordinates regularly with DOI sister bureaus on the development and delivery of department-wide climate training.
- The NPS Climate Change Response Program has conducted scenario-based climate change adaptation planning and training at over three dozen parks from Maine to Alaska and Hawai'i, and developed guidance for incorporating scenario planning into servicewide planning processes.

### Action in Parks

- In 2021, the NPS Climate Change Response Program partnered with the National Wildlife Federation to deliver the pilot course *Planning for a Changing Climate in National Parks*. Course attendees—all of whom were park planning leads—were introduced to key concepts of climate-informed adaptation and scenario planning. As a result of the pilot session, climate considerations were introduced into subsequent planning for **Canyonlands National Park, Harriet Tubman**

**Underground Railroad National Historical Park, and War in the Pacific National Historical Park.**

### Next Steps

- Integrate climate change, as appropriate, into existing NPS training.
- Work closely with DOI bureau leads to deliver new developmental pathways and training opportunities for additional career fields.
- Promote informal climate learning through job aids, information sharing, peer-to-peer networks, and collaboration across work units.



The Earth to Sky partnership is an effort between the NPS, the U.S. Fish and Wildlife Service, and NASA to provide professional development opportunities—like this one at Golden Gate National Recreation Area—that model novel techniques to share relevant climate stories.





## Goal 11. Encourage public dialogue on the meanings and significance of climate change for parks and people.

National parks are ideal living laboratories where the effects of climate change are often observed. The NPS will continue to welcome students, teachers, professionals, and visitors to use parks as classrooms for the study of climate change.

In doing so we remember that parks are more than the sum of their physical parts. Parks also encompass the important histories and values of our diverse nation. For some individuals, parks provide meaningful, life-long opportunities for wonder, inspiration, and recreation. For some communities, parks are invaluable neighbors that drive economies and identities. And for Indigenous Peoples, parks harbor deep cultural and spiritual connections forged over millennia. Climate change will have disparate and inequitable impacts on the many bonds between people and parks.

We will prioritize broad, inclusive dialogue on climate change that expands personal understanding and promotes collective action. As physical manifestations of civic efforts, national parks are ideal spaces to promote productive civic engagement on climate change.

### Examples of Progress

- Many units—such as **Bluestone National Scenic River, San Antonio Missions National Historical Park, and Fort Matanzas National Monument**—[interpret climate change robustly online](#) (Roberts, Holly, & Perez 2021). Additionally, many parks provide [lesson plans](#) and [programs](#) on climate change for [students and teachers](#) (Perez et al. 2020). Internship programs such as [Scientists in Parks](#) provide diverse young professionals paid opportunities to apply their knowledge, skills, and experience to high-priority climate change projects. And through efforts such as the *Native Nations and Climate Change* webinar series, the NPS highlights opportunities for collaboration with Indigenous nations on mutually important climate issues.



Starting in 2017, Santa Monica Mountains National Recreation Area hosted a series of facilitated dialogues to discuss climate-related impacts and concerns with the local community. Park interpreters organized these conversations to ultimately explore collective solutions.

## Action in Parks

- The [Park for Every Classroom program](#) pairs staff at NPS units with local educators and community organizations to advance climate-focused, place-based learning. Over 20 parks—including **Cuyahoga Valley National Park**, **Great Smoky Mountains National Park**, and **Saint-Gaudens National Historical Park**—have participated in the program to date.

## Next Steps

- Understand the beliefs, motivations, and expectations of our audiences in relation to climate change as a basis to deliver robust interpretation that is grounded in science, learner-centered, and inclusive.
- Expand employee training to explore relevant climate stories, audience analysis, and best practices in public communication.
- Leverage programs such as the Public Land Corps to invite motivated students and aspiring professionals to lend their perspectives and talents.
- Proactively seek dialogue with communities to encourage collaboration and ensure proposed solutions address the needs of both parks and people.



In 2023, Everglades National Park hosted nearly 20 local educators for an intensive five-day, climate-focused teacher development workshop. Park education staff, together with partners from Zoo Miami and several community groups, developed and delivered the offering.



## Goal 12. Share our full arc of experience with the climate crisis to move conversations beyond impacts to possible solutions within our borders and beyond.

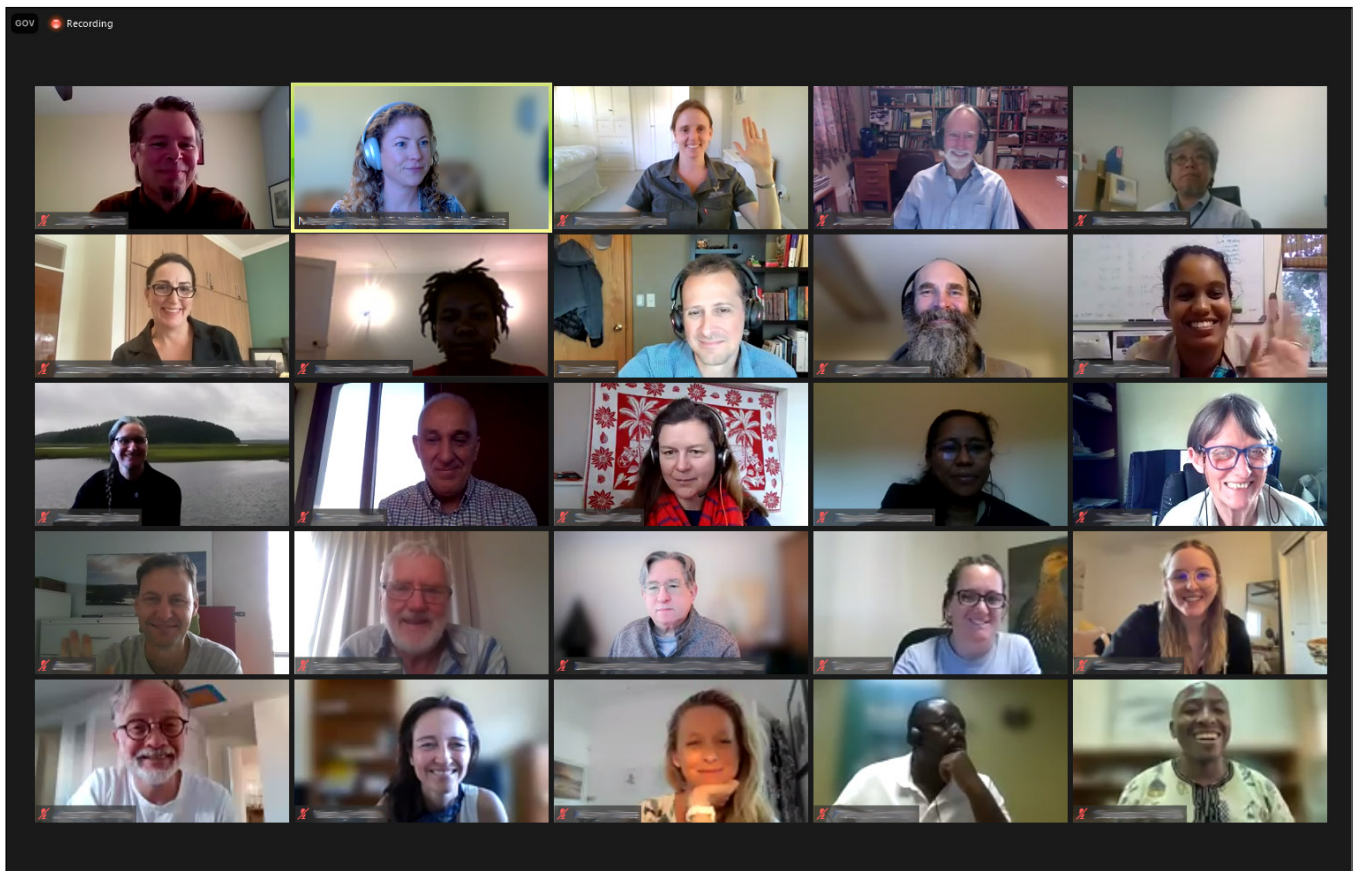
Honest communication about climate change effects on parks is vitally important. The NPS is increasingly adept at discussing impacts to landscapes, ecosystems, wildlife, historic assets, and infrastructure. But meaningful conversations must move beyond impacts alone.

The NPS is not merely a passive victim of the climate crisis. Rather, we are an active player. Over time, we have contributed to, been affected by, and taken action against climate change. Exploring this broader arc of experience yields opportunities to learn from our past, discover common ground, envision solutions, and find hope for the future.

To meet our responsibilities both nationally and abroad, we will share our successes and the lessons we learn to support and inspire climate-informed action beyond our borders.

### Examples of Progress

- The NPS partnered with professional historians to develop the [History and Hope](#) (internal NPS link) toolkit, a resource to help parks interpret modern climate change through exploration of their individual site histories.



In 2022, the National Park Service hosted a year-long, virtual information exchange with professionals from Southern and Eastern African protected areas. The series explored priority climate change issues, best practices, and tools. The series was coordinated in conjunction with the Department of the Interior International Affairs and the U.S. State Department.

- In addition to discussing the impacts of climate change with news media, the NPS also regularly highlights active solutions, such as green transportation and climate-informed planning.
- Internationally, the NPS exchanges experience with Parks Canada, South African National Parks, and the National Forestry and Grassland Administration of China, among others. And the NPS was a founding signatory to a joint statement developed for the 2021 United Nations Framework Convention on Climate Change Conference of the Parties (COP26) calling for renewed focus on climate change and biodiversity loss.

### Action in Parks

- The Gachado Line Camp in **Organ Pipe Cactus National Monument** is a historic building that recalls a past era of desert ranching. Effects from climate change threaten the long-term integrity of the structure. Park leadership partnered with the NPS Desert Research Learning Center to develop [an illustrated video](#) that introduces the problem and shares innovative actions underway to find

solutions. The park shares the video through its website and social media accounts to encourage public understanding and dialogue.

### Next Steps

- Work proactively with news media to not only share stories about impacts in parks, but also our work to protect resources and adapt, our accomplishments towards reducing our own emissions, and the intent and ancillary benefits of these actions.
- Promote climate-informed efforts through the full range of NPS community assistance and historic preservation programs, including the **Rivers, Trails, and Conservation Assistance Program**, the **Land and Water Conservation Fund**, **National Heritage Areas**, **National Natural Landmarks**, and the **Historic Preservation Fund**.
- Leverage sister park agreements, World Heritage programs, and specialist exchange opportunities to bolster international collaboration.



The NPS [Drawing Connections video series](#) includes this episode on the Gachado Line Camp in Organ Pipe Cactus National Monument. The series won multiple national awards for its use of illustrations to explore subtle, often-overlooked climate change connections at national park sites.

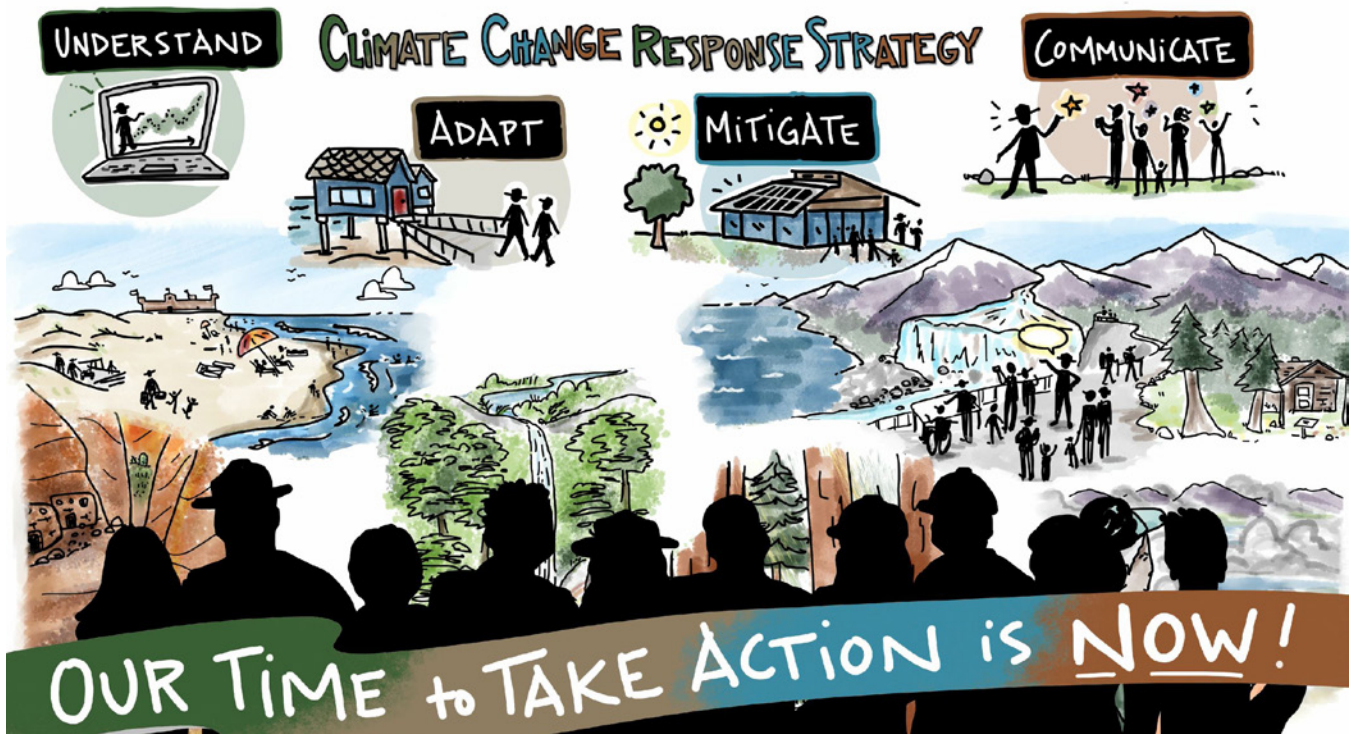
# CONCLUSION

The four cornerstones and twelve goals outlined here offer innumerable opportunities for climate change action across over 420 diverse units of the National Park System. Every day provides a chance to work together to protect the treasures of the National Park System against the single greatest challenge of our time. The possibilities are limited only by our imagination—and our drive.

For the benefit of parks we protect, we welcome you to discover your place in this effort. For the benefit of the American people we serve, we call on you to engage meaningfully on this issue. And for the benefit of future generations yet to come, we urge you not to wait. Our time to take action is now.

**“There are no passengers on spaceship Earth. We are all crew.”**

– MARSHALL MCLUHAN



A Climate Change Response Strategy explainer video featuring this still frame—as well as additional resources, updates, and lessons learned—is available on [a supporting, online companion](#) (internal NPS link) to this strategy.

# LIST OF ACRONYMS

**CFP** – Climate Friendly Parks Program

**DOI** – U.S. Department of the Interior

**GHG** – Greenhouse Gas

**NPS** – National Park Service

**RAD** – Resist-Accept-Direct

**USGS** – U.S. Geological Survey

**VA** – Vulnerability Assessment

**VUM** – Visitor Use Management

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For additional information, please contact the NPS Climate Change Response Program Office at [climate\\_change@nps.gov](mailto:climate_change@nps.gov) or visit [www.nps.gov/climatechange](http://www.nps.gov/climatechange).

# GLOSSARY

Definitions for key terms used in this strategy were abbreviated and adapted from [Coming to Terms with Climate Change: Working Definitions](#) (NPS 2021b).

**Adaptive management:** A decision process that promotes learning in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process.

**Climate change adaptation:** An intentional adjustment in natural or human systems meant to moderate harm or harness beneficial opportunities. Sometimes, adaptation means recognizing when conditions deviate so far from those in the past that earlier management goals must be reconsidered.

**Climate change:** A change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forces, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.

**Climate projections:** The simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases and aerosols, generally derived from computer models.

**Climate-informed:** The intentional and deliberate consideration of climate change in planning and management, realized through adopting forward-looking goals and explicitly linking strategies to key climate impacts and vulnerabilities.

**Ecological transformation:** A dramatic and irreversible shift in multiple ecological characteristics of an ecological system, the basis of which is a high degree of turnover in communities, and not just change in a single species.

**Exposure:** A measure of the character, magnitude, and rate of changes an entity may experience because of climate change. It includes changes in climate drivers (e.g. temperature, precipitation) as well as

changes in related factors such as fire, floods, and changes in sea/lake level.

**Greenhouse gases:** Gases that absorb heat in the atmosphere near the Earth's surface, preventing it from escaping into space. If the atmospheric concentrations of these gases rise, the average temperature of the lower atmosphere will gradually increase, a phenomenon known as the "greenhouse effect."

**Hazard:** The potential occurrence of a natural or human-induced event, trend, or impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, provision of services, ecosystems, and environmental resources.

**Managed relocation:** The intentional movement and release of an organism outside its indigenous range.

**Mitigation:** A human intervention to reduce the sources or enhance the sinks of greenhouse gases.

**Sensitivity:** The degree to which climate change affects a resource, facility, or other entity either adversely or beneficially. The effect may be direct or indirect.

**Uncertainty:** A state of incomplete knowledge, or inability to forecast a precise outcome, that can result from a lack of information, disagreement about what is known or even knowable, or well-defined and quantified natural variation. It may arise from many types of sources, from imprecision in the data to ambiguously defined concepts or terminology, uncertain projections of future human behavior, or random variations inherent to atmospheric processes.

**Vulnerability:** The degree to which a physical, biological, or socio-economic system is susceptible to and unable to cope with adverse impacts of climate change.

**Vulnerability assessment:** An evaluation of the extent to which a system is susceptible to harm from direct and indirect effects of climate change, including variability and extremes.



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The National Park System chronicles countless stories of successful collective action toward a common cause. Places like Cuyahoga Valley National Park remind us that thoughtful, committed efforts can alter the trajectory of change for the better.

