

# Climate Change in National Parks

Climate Change Response Program  
Natural Resource Stewardship and Science

National Park Service  
U.S. Department of the Interior



USGS Image

## Disappearing Ice

Temperatures are rising at national parks across the country. As a consequence, many areas have seen the disappearance of glaciers and ice sheets. And of those that remain, most are shrinking at an accelerated rate.

These changes not only affect what we see on the landscape—they also alter part of Earth's natural water storage system, affecting everything from wildlife to agriculture to human health.

Scientists from the United States Geological Survey (USGS) and National Park Service (NPS) work together to monitor and measure glacier loss. If these changes continue, we will face a future much different than the present, including a Glacier National Park without glaciers.



1938



2013

The dramatic retreat of Grinnell Glacier in Glacier National Park illustrates the sensitivity of glaciers to climate change. The largest glaciers in the park lost roughly 75% of their size since 1850. USGS Images



## Rising Seas



In response to accelerated shoreline erosion and greater storm impacts, Assateague Island National Seashore adopted climate-conscious solutions for beach facilities, including parking areas constructed from native clay and clamshell that can be reused in post-storm repairs. NPS Photo

Both the melting of land-based ice and the expansion of warming ocean waters contribute to rising sea levels in most areas. Over the past century, all marine and coastal national parks experienced changes in sea level.

In 2012, Hurricane Sandy impacted a massive swath of the United States along the Atlantic coast, bringing record storm surge and flooding to areas of New York and New Jersey. Storm events like Sandy remind us how rising sea levels can exacerbate damage from storm surge in both coastal parks and nearby communities.

The NPS is working to anticipate and adapt to coastal climate change impacts, using sea level rise and storm surge projections to identify vulnerable facilities and resources. Park units incorporate this information and apply principles of sustainable design in new and historic structures.



USGS Image

## Altered Ecosystems

Climate change presents many challenges to managing Earth's forests and other ecosystems. Rain may occur in different amounts and at different times of the year, and warming temperatures can exacerbate instances of drought, invasive species, and disease.

In many national parks, climate change has already shifted vegetation upslope and northward, altered wildfire, increased tree mortality, and inundated some coastal areas. These changes can affect the composition, structure, and function of entire ecosystems, and alter habitats for plants and wildlife.

National park areas provide valuable opportunities to study the nature of ongoing change in Earth's ecosystems. Parks serve as living laboratories in which to evaluate our management options in light of climate change and monitor results over time.



Drought conditions in the American Southwest are expected to worsen as climate change renders the region hotter and drier. Piñon pine woodlands in the area of Bandelier National Monument have already experienced episodic extreme drought stress, driving broad-scale die-off of piñon pines (top, 2002) and resultant conversion to juniper-dominated communities (bottom, 2004). USGS Images



## Imperiled Species



Student volunteers assist park scientists during ongoing annual surveys at Saguaro National Park, through which they collect valuable data on both the occurrence and condition of saguaro cacti in the park.

Changes in Earth's climate can affect many species of plants and animals. In mountain ecosystems, warming temperatures can push heat-sensitive species toward higher elevations. In oceans, warmer water can alter the distribution of marine life, and greater acidity can severely weaken the health of coral reefs and other organisms. Changes in seasonal timing and altered patterns of precipitation can also threaten the survival of certain species.

Climate models project warmer winters in the American southwest and a decrease in winter rainfall. A resulting increase in drought and wildfires could threaten the survival of the saguaro cacti of Saguaro National Park. Citizen scientists help park staff monitor the growth and occurrence of saguaros over time. This information helps guide management decisions that may help their survival.

## Losing History & Traditions

National parks are repositories of human experience that chronicle the stories of our collective past. From the cliff dwellings of Mesa Verde to the steps of Ellis Island, each park reveals important chapters of our history. National parks support the lives of contemporary and indigenous people, and preserve valuable evidence about how earlier cultures responded to environmental change. These places provide important lessons for dealing with a warming world.

Along the coast and in the interior, climate change threatens our cultural landscapes, historic structures, archaeological sites, and traditional ecological knowledge. Rising sea levels inundate prehistoric shell mounds, coastal fortifications, and historic cemeteries. Persistent drought leads to falling lake levels, exposing archaeological sites to erosion from wave

action and higher risks of looting and other disturbances. Increased flooding scours important landscapes and damages historic structures and museum collections. And delicate organic artifacts—tools of wood and bone, for example—are exposed to air as snow and ice fields melt, inducing rapid decay.

The NPS actively works to inventory and monitor cultural resources, and uses modeling to help locate previously unknown archaeological sites. Vulnerability assessments are a valuable tool used to determine the relative risk climate change poses to cultural resources and prioritize management efforts. The NPS is working with local communities, traditional cultures, and historic preservation partners to identify appropriate actions and strategies to adapt cultural resources to a changing climate.



Fort Jefferson sits at the water's edge at Dry Tortugas National Park. Sea level has risen steadily since completion of the fort in 1875, threatening several islands of the Dry Tortugas.

# Responding to Climate Change

## Our Past Brings Hope

In 1916 our nation established the National Park Service (NPS) to protect our natural and cultural heritage for the enjoyment of all generations.

Throughout history, the American people have defended their National Park System against all manner of threats. Together we brought species back from the brink of extinction, returned wildfire to its rightful place on the landscape, protected cherished artifacts from the ravages of time, and freed rivers to run wild once more.

As the National Park System enters its second century, climate change will challenge these special places in unprecedented ways. The changing climate will have consequences for many of the species, ecosystems, forces, and structures that have long defined our treasured places.

But if history is our guide, we can expect the American people to once again act with resolve and resourcefulness to ensure that “America’s Best Idea” endures. There is much we can do address climate change *right now*.

## Humans: Cause and Solution

Scientists agree that the current rate of climate change is a result of human activity. Our use of fossil fuels increases the level of greenhouse gases (GHG) in our atmosphere, which traps heat and contributes to Earth’s warming temperatures.

Using historical climate data, scientists create climate models to project potential future climate changes. Continued GHG emissions will cause further warming and long-lasting changes, increasing the likelihood of irreversible impacts.

However, limiting climate change is not beyond our control. Substantial and sustained reductions in GHG emissions now, along with efforts to adapt to change that is inevitable or already happening, can limit climate change impacts.

The NPS recognizes that human activities—especially fossil fuel use and transportation—are changing the Earth’s climate. Together with our communities, we are taking action to reduce our own GHG emissions and model climate-friendly behaviors through sustainable operations and adaptation efforts.

Both during your visit and at home, you can help limit contributions to climate change. Consider walking or riding a bike to nearby areas. Take advantage of mass transit options, when available, or share a ride with a friend. And if you do have to drive, follow the speed limit and avoid idling your vehicle whenever possible.

Below: Visitor shuttles at Zion National Park and other NPS sites provide convenient visitor access to popular destinations while reducing GHG emissions.

## Inspiration through Innovation

From learning and teaching about climate change to contributing to an ever-growing body of science, the NPS and its partners are committed to inspiring a global solution to climate change.

National parks and their surrounding communities are working to slow the rate of warming. Sustainable practices, such as reducing water use and switching to renewable energy

sources, are local actions that limit future climate change risks.

Recognizing that some change is already underway, the NPS uses flexible planning approaches and facility designs intended to address potential risks. These adaptation techniques can help protect park resources against climate change threats that are beyond our control.



To reduce energy use associated with water treatment, the NPS recently renovated the largest reflection pool at the National Mall and Memorial Parks in Washington D.C. The pool now recirculates water from the nearby Tidal Basin.



Communities neighboring Pictured Rocks National Lakeshore are improving their home energy efficiency through the county-led Alger Energy Savers program. Reductions in energy use saves money and reduces greenhouse gas emissions.



The University of Miami School of Architecture partnered with the NPS to create portable canvas and mesh eco-tents that can be stored during extreme weather events and relocated inland as sea level rises along the coast at Everglades National Park.



Staff at Wind Cave National Park use scenario planning to consider how changes in precipitation will affect the availability of water and grass for free-roaming bison, helping the park prepare for the impacts of climate change on its genetically important bison herd.

## Share Your Story

Today, climate change is as much a part of the national park story as grasslands, glaciers, and grizzly bears. And it is a story we increasingly share in common with all our visitors.

Climate change affects every person in some way. While some along the coast may see greater tidal flooding, others may experience stronger heat waves, persistent droughts, or an increased frequency in wildfires.

Sharing your story is an important first step in bringing about the changes necessary to address climate change.

Start a conversation in your community about how you are affected by a warming world, what you are doing about it personally, and what we can all do to respond.

Below: Students from Chesterland, Ohio investigated climate change at Kenai Fjords and Denali National Parks through the Alaska Climate Change Academy, a partnership between NPS and nonprofit No Barriers.

*“I’m living on the hope of change, but someone has to get the ball rolling and it might as well be me.”*

Katherine Kulp, Alaska Climate Change Academy participant

