



“Earth’s climate is changing, with global temperature now rising at a rate unprecedented in the experience of modern human society.”

—Arctic Climate Impact Assessment, 2004

Change has always been a powerful force of nature. National parks and the stories they represent help us understand and appreciate how much our lives are influenced by change. They illustrate for us how interconnected we are with our environment whenever change occurs.

Today, we hear more and more about the effects of “climate change.” Scientists tell us there is little doubt that human activities are having a major impact on the atmosphere and ecosystems of our planet.

Glaciers and snow packs are melting, stream temperatures are going up, coastal erosion is increasing, and changes in weather patterns are leading to drought and heat waves both locally and regionally. According to researchers, the magnitude and pace of these changes, as well as additional ones that climatologists believe to be probable, are unprecedented in human history. Many of them have consequences that will affect the resources and

influence the experiences for which the national parks were established. Regardless of their causes, we must do what we can to manage these impacts and adapt to the new circumstances they bring. Perhaps the same wisdom that has preserved our heritage in the past can guide us in making choices for the future.

Local “weather” is often confused with global “climate.” Specific park records may reflect periods of warming or cooling depending on regional circumstances. Global mean temperature, on the other hand, is based on surface and atmospheric temperatures from thousands of locations, and from satellites worldwide. Global mean temperature has risen 0.8 degrees C, since 1880.

Climate Change is Happening

Warmer winters and longer, more intense melt seasons have increased the rate of glacial retreat in Alaska’s Glacier Bay and Kenai Fjords National Parks. It is estimated by scientists with the U.S. Geological Survey that by 2030, many of the glaciers in Montana’s Glacier National Park will be completely gone.



Muir Glacier, 1941 (left) and 2004 (right)
Glacier Bay National Park and Preserve



At parks like Bandelier National Monument, higher temperatures and drought have brought high mortality to the pinon pines as infestations of bark beetles have expanded to higher elevations and new ranges. At Everglades National Park, increasing sea level may overwhelm the mangrove communities that filter out saltwater and maintain the freshwater wetlands. At Canyon de Chelly National Monument, Mesa Verde and Rocky Mountain National Parks, floods and fires have damaged historic structures and are threatening the loss of archeological sites.

Changes have Consequences

Many climate change consequences make it difficult for park managers to preserve the resources unimpaired. Higher temperatures in spring and summer and earlier melting of the snow pack in recent years have contributed to an increase in the frequency and duration of wildland fires. Recent studies have concluded that a changing climate, not previous fire-suppression policies or land-use changes, is the major cause. The 2006 wildfire season has set a 45-year-high in the number of acres burned. Particularly at risk are plant and animal species that are more restricted in their needs for habitat, have limited ability to relocate, or have surrounding development that leaves them few options.

In Yosemite, the pika population is in danger of extinction as warming temperatures occur higher and higher on the mountainsides. With each season, the cool habitat in which they make their homes shifts further upslope. Eventually, if this continues, they may have nowhere higher to go.

Nutrient-rich whitebark pine seeds are a critical food source for the grizzly bears of Yellowstone. Warmer winters have enabled bark beetles to significantly increase mortality of whitebark pines over their entire American range with little sign of relief. Not only does this lower the grizzlies’ survival rates, they are now more likely to experience human conflicts in their search for alternate foods.

Another dilemma for managers is occurring at Joshua Tree National Park. Joshua trees require cool winters and freezing temperatures in order to flower and set their seeds. Researchers have documented substantial mortality of Joshua trees and predict that because of climate warming, the trees will be unable to persist much longer within the park. Soon, Joshua trees may no longer be found in the park bearing their name.



We Must Do What We Can

While many changes to park resources are inevitable, they can still influence the ways in which visitors use and enjoy the parks. Closures are resulting from increased wildfires. Reduced winter snow pack and, in some cases, more rain, have changed the timing of surface runoff each year which often makes spring and summer water activities difficult or impossible. Salmon and trout populations, popular for fishing, are showing high mortality rates due to warming water and flooding. Indigenous users of these fisheries, especially in Alaska, are at risk to lose not only a food source, but a way of life. And winter seasons are opening later and closing earlier. Although this extends the season for activities like hiking and camping, it reduces opportunities for recreational skiing and other winter sports due to inadequate snow cover. Many of these impacts have economic implications.

Scientists who study climate change agree that human activities are a big part of the current warming trend. As stated in the 2001 report of the Intergovernmental Panel on Climate Change, "there is new and stronger evidence that most of the warming observed over the past 50 years is attributable to human activities." At Mauna Loa in Hawaii and around the world, specific evidence has been gathered of an increase in greenhouse gases in the atmosphere, predominantly carbon dioxide, which are contributing to the warming of the planet. Carbon dioxide levels in the atmosphere today are higher than they've been in over 650,000 years.



"What is the use of a house, if you haven't got a tolerable planet to put it on?"

-Henry David Thoreau

Parks and Scientists Provide Hope for the Future

National parks are helping us figure out how to respond to these changes. Parks across the nation are conducting "Climate Friendly Parks" workshops, co-sponsored by the Environmental Protection Agency, to evaluate energy usage and identify efficiencies that improve park operations. Many are developing alternate energy strategies to reduce their emissions of greenhouse gases. Use of solar and wind energy, fuel cells, electric and hybrid forms of transportation, and mass transportation where high visitation exists, are being developed. Vulnerable resources are being monitored in most parks, and several have researchers who are specifically addressing climate change impacts. And rangers in many parks are being trained and provided the latest reports about climate science in order to answer questions and assist visitors in understanding climate change and its implications.

Many times during our nation's history, citizens have confronted difficult circumstances and found creative solutions. Our parks tell compelling stories about the American Revolution, the abolition of slavery, the fight for civil rights, and about countless inspirational personalities who have made a difference for our nation. Many parks convey stories about people's responses over thousands of years to shifting climate patterns. These stories are now part of a call to action for all visitors in the stewardship of our resources for future generations. It is important that all of us participate in answering that call.

Scientists tell us we already possess the technologies needed to reduce the abundance of CO₂. They've also created strategies to do so within 50 years. Many of these actions involve choices that individuals can make to conserve and reduce energy use. One of the best strategies for coping with climate change on a personal level is to become "carbon neutral." Because we exhale carbon dioxide and need energy for our daily activities, we're unlikely to eliminate all impacts. However, if we

reduce our energy use to a basic level, and offset the emissions we do generate by investing in clean alternatives, we may achieve balance and not further compromise global resources. Changing to energy efficient light bulbs and appliances, unplugging computers and electronic devices when they're not in use, and using public transportation whenever and as often as we can are good examples of conservation practices. There are many more. To find out more about becoming carbon neutral and to become better informed about climate science, here are some helpful references:

The Intergovernmental Panel on Climate Change
<http://www.ipcc.ch/>

The Arctic Climate Impact Assessment
<http://amap.no/lacial/ACIAContent.html>

Understanding and Responding to Climate Change
<http://dels.nas.edu/basc/Climate-HIGH.pdf>

EPA's Global Warming – Actions
<http://yosemite.epa.gov/oar/globalwarming.nsf/content/ActionsIndividualMakeADifference.html>

NPS/NASA Earth-to-Sky Interpretive Training tool
<http://www.earthtosky.org>

Regardless of the causes, taking action to manage the impacts of changing climate will have positive benefits for our resources. In the future, national parks may tell the story of our collective success in dealing with climate change, moving to a way of life in greater harmony with the natural processes that operate on our planet. After all, Earth is the only planet we can call home.

A false-color Landsat 7 satellite image of the Mesa Verde fire scars (in red). The large burn scar on the right is from the 2000 Bircher fire that burned 19,709 acres of NPS land.

