National Park Service
U.S. Department of the Interior

Climate Change Response Program

Climate Change Response Program Newsletter

Q2 | 2015

SCIENCE • ADAPTATION • MITIGATION • COMMUNICATION

Point Reyes National Seashore Powers Vehicles By The Sun

Three electric vehicle (EV) charging stations have been installed at the Bear Valley Visitor Center parking lot at Point Reyes National Seashore and they are available and free to the public.

As plug-in hybrid electric vehicle and battery electric vehicle ownership is expanding, the National Park Service seeks to encourage more use and ownership of these vehicles. EV charging stations allow visitors with plug-in electric vehicles to charge a range of up to 60 miles in about 15 to 20 minutes of charging time.

The chargers were installed by Sustainable Solutions Partners coordinated by Adopt-A-Charger, Inc. through financial support from the Transportation Authority of Marin Measure B Fund, County of Marin Community Services Fund, the Craig Matthew Childers memorial fund, the Electric Auto Association, and the Golden Gate Electric Vehicle Association. The chargers are operated on a first-come, first-serve basis. The charger uses solar electricity generated at the Bear Valley Visitor Center via photovoltaic cells.

By "adopting" a charger, the donors agreed to make a donation to Adopt-A-Charger to cover the cost of hardware, installation, maintenance, electrical usage, and administration for three years. After that time, the electrical usage will be paid by the park's non-profit organization, the Point Reyes National Seashore Association.

"The Seashore is committed to sustainability," said Park Superintendent Cicely Muldoon. "Having the ability to utilize new technologies as they become operational and investing in our future by educating the next generation all contribute to our goal of energy conservation and efficiency."

"The National Park Service has always stood for environmental stewardship, and I am grateful that Adopt-A-Charger can help them address climate change," said Kitty Adams, Executive Director of Adopt- A-Charger. "The existing EV chargers at Crissy Field and Muir Woods provide inspiration to visitors who want to reduce their carbon footprint, and provide resources to expand the park's green fleet. I am especially grateful to be honoring my friend Craig Childers, who was very passionate about the environment and a huge advocate for plug-in cars."

Craig Childers was an EV enthusiast, mechanical engineer, and public servant who helped spur the world's auto makers to produce electric vehicles. He passed away suddenly at age 57.

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FIND YOUR PARK

Centennial 2016

The 100th anniversary of the National Park Service in 2016 is all about finding your park and sharing your park stories. The National Park Service tells countless stories about American natural and cultural past, present, and future. One story that is developing in front of our eyes is that of climate change.

World-renowned science communicator, Bill Nye, as one of our Centennial Ambassadors-

"Science is the best idea humans ever had and our national parks, monuments, and historic sites are often called 'America's Best Idea.' We need to preserve and protect them. Let's work together to understand the impact of climate change on our parks and sites, so that we can enjoy them now and well into the future, beyond the centennial of the National Park Service."

Bill found his park and shared his park story. Now it is up to you! What is your park? What is your park story? Visit *findyourpark.com* for more information.

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Forest Vulnerability Assessment Information

Climate, Trees, Pests, and Weeds: Change, Uncertainty, and Biotic Stressors in Eastern National Park Forests.

Eastern forests experienced tremendous changes in recent decades and centuries due to direct and indirect human influences. The coming decades will likely bring continued changes due to multiple global change factors including climate change and nonnative species. Recent research investigated potential forest change in response to climate, differences in projections of change among climate scenarios (uncertainty), and levels of nonnative biotic stressors (tree pests and invasive plants) at 121 national parks in the eastern US (Fisichelli et al. 2014). The journal article, project brief, and individual park-specific briefs are available at the *CCRP Resources Page*.

This research included future climate projections and tree habitat suitability models for 134 tree species (from the USFS Climate Change Atlas), ranges of 81 nonnative tree pests (from the USFS Alien Forest Pest Explorer Database), and nonnative vascular plant presence data (from NPSpecies) for each park. Climate and forest projections are for parks and surrounding landscapes (~6000 mi²).

Potential forest change, uncertainty, and nonnative pests and plants are positively correlated in eastern parks, illustrating the broad scope of future changes and potential compounding effects in many forests. Adaptation to ongoing climate change requires revising existing strategies to meet traditional goals and will increasingly require revising goals and developing novel strategies as conditions shift beyond the range of variability experienced in the past. Managers can incorporate this vulnerability information into adaptation strategies within routine management actions such as fire and nonnative plant management. This project is part of ongoing work of the NPS Climate Change Response Program to support park adaptation to changing conditions. For more information for managers please visit the *CCRP intranet site*, and for public inquiries please visit the *public site*.

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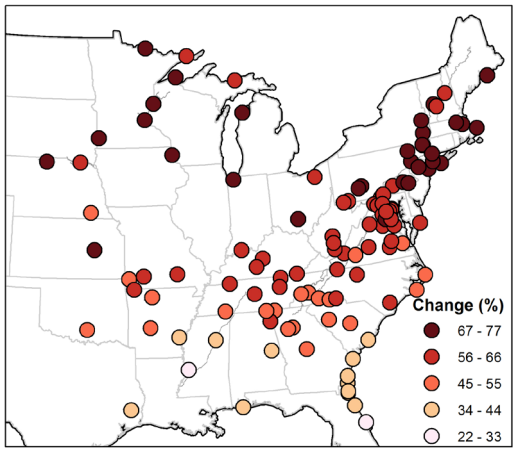

Potential forest change: average percentage of modeled tree species per park with projected large change in potential habitat suitability by 2100 (i.e., > 50% decrease or > 100% increase).

Executive Order 13693

On March 19, 2015, President Obama signed executive order 13693: *Planning for Federal Stability in the Next Decade*. In an effort to build a clean energy economy that will sustain our environment for future generations to come, it is imperative that federal leadership in energy, environmental water, fleet, buildings and acquisition management continue to drive greenhouse gas reductions and support preparations for the impacts of climate change.

Through a combination of more efficient federal operations, we have the opportunity to reduce agency direct greenhouse gas emissions by at least 40 percent over the next decade while at the same time fostering innovation, reducing spending, and strengthening the communities in which our federal facilities operate.

The Department of Interior and the National Park Service stand poised to increase efficiency and improve environmental performance, which will help us protect the planet for future generations and save taxpayer dollars through avoided energy costs and increased efficiency, while also making Federal facilities more resilient.

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Climate Changes, Shifting Ranges

What could the impending realities of climate change mean for threatened and endangered species in south Florida? Over the past several years, partners from the University of Florida, US Geological Survey, US Fish and Wildlife Service, and the National Park Service have used models to explore that very question.

The geographic ranges of most plant and animal species are limited by climatic factors, including temperature, precipitation, soil moisture, humidity and wind. Plant and animal species that can move with a shift in habitat are more likely to survive than those species that cannot adjust to a shifting habitat.

Climate change poses a significant problem for the national parks of south Florida and Everglades National Park in particular. The majority of the park's 1.5 million acres lie below three feet of elevation and are exposed to the sea. Predictions of a 21st-century sea-level rise of more than three feet pose a significant risk to the park and the species therein.

Using long-term temperature and precipitation data and global 2060 projections, researchers developed a suite of climate envelope models for imperiled species. A *unigrid visitor publication* was recently released to discuss the findings of this work.

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Piecing Together A Changing Planet

Art has always been used as an alternative way to experience the world. In our national parks it is easy to feel one with nature, even at Biscayne National Park, with the Miami city skyline on the horizon. Artists have employed a variety of mediums throughout history to accomplish their vision of the outside world, everything from painting, to sculpting, to quilting.

A traveling quilt exhibit recently adorned the Dante Fascell Visitor Center in Biscayne National Park. The quilts made with cloth and paint, displaying different textures and colors that represent the vibrancy and fragility of the watery world of Biscayne, were on display through February. The 26 quilts on display are part of the, "Piecing Together a Changing Planet," exhibit by Florida artists. The quilts represent Florida's past, present, and future and address issues like climate change, pollution, and sea level rise.

"Biscayne National Park is 95 percent covered by water, almost all of the 173,000 acres," said Park Ranger Gary Breman. "One of the biggest threats to our national parks is climate change."

This exhibit will travel to 10 NPS sites through 2017 and will be on display for the entire Centennial Celebration.

April 1 through June 30, 2015, "*Piecing Together a Changing Planet*" will be on display at Point Reyes National Seashore.

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Preparing For Change

The Northern Rockies Adaptation Partnership (NRAP) is a science-management collaboration with the goals of: assessing the vulnerability of natural resources and ecosystem services to climate change and developing science based adaptation strategies that can be used by national forests and national parks to understand and mitigate the negative effects of climate change.

NRAP hosted five two-day science-management workshops in Bozeman, MT; Bismarck, ND; Missoula, MT; Coeur d'Alene, ID; and Helena, MT in October and November 2014. The workshops brought together scientists and resource managers from federal and state agencies, and non-profit organizations. Glacier National Park participated in the workshop in Missoula.

In each workshop, participants downscaled information from the region-wide vulnerability assessment to identify the most significant vulnerabilities to climate change for priority resources in each sub-region. Participants then used the assessment as the basis for developing adaptation strategies and tactics to reduce resource vulnerabilities. Opportunities, barriers, and specific applications of adaptation tactics were identified in each sub-region.

The workshops were a great success, with 250 people and 30 different organizations participating. Over the next month, resource management decision makers and the workshop attendees will review and synthesize the down-scaled information and adaptation worksheets from each workshop into a draft report to be peer reviewed and published as a Forest Service General Technical Report.

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Pipiwai Trail, Haleakala National Park.

Building Capacity in Rare and Endangered Plants

Global climate change projections indicate a 10-20% reduction in winter rains and a 5% increase in summer rainfall in Hawaii due to changes in the trade wind patterns. These changes are predicted to cause dramatic shifts in some habitats making many currently suitable areas no longer hospitable for rare species. In response, rare plant populations need to be increased and expanded across their ecological ranges to increase their capacity to respond to habitat shifts/reductions and more frequent stochastic events (fire, hurricane, etc.) predicted by current climate change models.

The National Park Service at Haleakalá National Park and Hawai'i Volcanoes National Park have combined resources and know-how to give three dozen species a fighting chance to remain on the planet in the midst of climate change. Current models based on predicted changes in temperature and moisture regimes over the next decades forecast dramatic range shift and/or reduction for many native plant species. This creates a perilous situation for species with small population sizes within a limited geographic range. The focus of this project is to establish satellite populations of 36 rare and endangered species within their modeled ecological ranges.

Previously established propagation and planting projects were centered on stabilizing existing rare plant populations in localized areas. Still, many of the selected species number less than 50 individuals and remain geographically isolated. Park resource managers conducted planting efforts to boost their numbers and restore biodiversity in both parks. These parks have worked with 135 species to date. Much of the effort has centered on locating individuals or populations, collecting plant material, and developing effective propagation techniques. Plant establishment focused primarily on fenced, ungulate-free areas nearby remnant populations or in adjacent areas containing similar habitats.

Locations of past plantings are limited to sites near documented occurrences (current and historical) and do not necessarily reflect the actual ecological range that these plants could occupy now or in the future.

This project builds upon earlier work by expanding rare plant populations across a wider ecological range thereby "building capacity" for these species to survive. Recent habitat modeling combines information on historical plant occurrences with habitat type (soil/substrate type, elevation/temperature, and moisture conditions) to identify the most suitable ecological ranges for rare species. Establishing rare plant populations in favorable micro-site conditions across this broader ecological range will build greater capacity for these species to persist in the wake of climate change. This is a proactive effort to keep these species alive.

Efforts at both parks focus on expanding rare plant populations in subalpine, dry ʻōhiʻa woodlands, and mesic/wet montane zones where climate change is most likely to cause dramatic habitat shifts. The species selected for expanding populations were those for which successful propagation and planting techniques have already been developed and plant survivorship has been found to be strong.

Seeds or cuttings have already been collected for all of the 36 target species, and thousands of seedlings are being propagated in park greenhouses. In 2014, both Hawaii parks made significant progress by planting nearly 3000 seedlings of 32 species at multiple sites and the project is on track to accomplish its goals by the autumn of 2015.

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ʻOha wai

Kaleahala beggarticks

Kohala false lobelia

Some of the rare plant species being conserved at Haleakalá and Hawai'i Volcanoes National Parks.

Expanding Refugia for Bull Trout in Glacier National Park

Bull trout require the coldest water temperatures of any salmonid species found in the US. This seems like a fairly straight-forward link to climate change concerns, and it is. But increasing water temperatures are only part of the concern for bull trout. A changing climate brings with it predicted changes in not only water temperature, but changes in the amount and timing of precipitation, form of precipitation (i.e. rain versus snow), and runoff patterns. Other habitat stressors are also increasingly putting pressure on native fish populations (e.g. invasive fish species such as lake trout). Each of these changes will require an adaptation response by bull trout if they are to persist on the landscape.

Glacier National Park has outstanding physical habitat for bull trout. Deep, cold, glacially carved lakes coupled with clean, cold, complex, and connected stream networks. However, invasive lake trout have compromised many of these systems, severely limiting, if not eliminating, their potential to serve as climate refugia for bull trout. In systems where they occur together, invasive lake trout consistently replace native bull trout as the top-level aquatic predator. Because lake trout spawn, and juveniles rear, in lakes they are not susceptible to the same environmental disturbances as bull trout, which spawn and rear in streams. The synergy between climate change and invasive species impacts means we will have to think out of the box in developing strategies to help native fish cope with these pressures.

One approach to consider is translocation or "assisted migration" into new habitats that are secure from the combined pressures of both climate change and invasive species. Reducing one pressure, in this case a population of invasive lake trout, will help provide the needed space and time for resiliency to develop and adaptation to occur in bull trout. Glacier has recently taken such an approach to rescue a critically imperiled bull trout population in Logging Lake. Invasive lake trout were introduced into the Flathead basin around the turn of the 20th century. Sometime between 1977 and 2000, lake trout swam upstream from Flathead Lake and colonized Logging Lake. Recent monitoring data indicate that bull trout in Logging Lake are nearing local extinction. Using a combination of lake trout suppression and bull trout translocation, the NPS and its partners are attempting to prevent the local extinction of bull trout from the Logging Lake system. Grace Lake is a smaller natural lake located upstream of Logging Lake and is separated from Logging Lake by an impassable waterfall. Grace Lake offers the potential to provide a secure climate change refuge for bull trout. The only fish species present in Grace Lake are non-native Yellowstone cutthroat trout, an outstanding potential food source for a newly established bull trout population. Prior to project implementation, the NPS partnered with the U.S. Geological Survey (USGS), U.S. Fish and Wildlife Service, and Montana State University to evaluate the habitat suitability of Grace Lake to support bull trout. The NPS prepared an environmental assessment for the project and a finding of "No Significant Impact," for the project which was signed in 2014.

In 2014, fisheries staff from both the NPS and USGS worked together to collect as many of the remaining bull trout in the system as possible. Crews used electrofishing to collect the juveniles from the habitat in Logging Creek. Each fish was weighed and measured, fin clipped for genetic "fingerprinting", and prepared for transport. A total of 112 juvenile bull trout were moved into the Grace Lake system in 2014. The park will continue the capture and translocation project in 2015.

Glacier has a suite of historically fishless lakes that now contain only non-native fish species. Some of these are isolated by downstream waterfalls and offer the potential to provide climate change refugia for native fish species. Decisions about whether to translocate or otherwise "assist" native species in adapting to a changing climate will seldom be straightforward and will require thoughtful consideration of potential impacts to other resources, risk, and benefit. However, it's clear that ecologically intact protected areas, like Glacier National Park, have a critical role to play in providing climate change refugia for vulnerable

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Waterfall separating Logging Lake (downstream) from Grace Lake (upstream).

Taking Action on Climate Change Adaptation

In 2014, a project, funded by a *Crown of the Continent Roundtable Adaptive Management Initiative*, began to examine native trout species and the systems they rely upon in the Crown of the Continent ecosystem. This initiative produced a November 2014 workshop in Kalispell, MT, entitled *Taking Action on Climate Change Adaptation: Piloting Adaptation Strategies to Reduce Vulnerability and Increase Resilience for Native Salmonids in the Crown of the Continent Ecosystem*.

Glacier National Park, as part of the *Crown Managers Partnership,* was one of the organizers for this workshop.

This workshop provided an excellent forum for US and Canadian government agencies, tribes and first nations, special interest groups, biologists, managers, ecologists and researchers to:

1. Identify and prioritize a suite of adaptation strategies and demonstration projects for implementation.
2. Confirm opportunities to coordinate strategies at multiple scales to enhance the effectiveness of adaptive management.
3. Identify a couple of on-the-ground projects that could be scaled up and applied more broadly.

Workshop outcomes are available at the *Crown Managers*

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Bull trout
Photo: USGS; Jonny Armstrong

Dr. Jon O'Donnell takes water samples.

Story in A Stream

Recently climate change at high-latitudes is altering watershed hydrology, stream chemistry, and aquatic habitats. For instance, groundwater inputs to river flow have increased in recent decades in response to permafrost thaw.

New research by Jon O'Donnell, Aquatic Ecologist, Arctic Network Inventory and Monitoring Program, and colleagues shows that as permafrost thaws, subsurface flow paths in streams get deeper, modifying the chemical quality of dissolved organic carbon (DOC) transported from soils to streams. Using DOC chemistry, the Arctic Network can detect watershed-scale permafrost thaw. They plan to use this technique, tested in Interior Alaska, to detect permafrost thaw in watersheds of the Arctic Inventory and Monitoring Network in northern Alaska.

For more information about how the NPS monitors permafrost, rivers and streams please visit the *Inventorying and Monitoring website*.

To read the report; *O'Donnell et al. 2014*.

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Will A Changing Climate Allow Saguaros to Move?

Predicting how different plants and animals in national parks might respond to climate change is challenging. In addition to the inherent uncertainty of climate models, scientists rarely know enough about the many specific habitat needs of species within different life stages and across their range.

The saguaro, iconic cactus of the Southwest deserts and namesake of Saguaro National Park, has long been known to be sensitive to climate. Recruitment of saguaros is episodic, meaning in most years very few seedlings survive, but occasionally a very large number will. Good conditions for recruitment are associated with cooler temperatures and high soil moisture. In addition, young saguaros are protected from both summer heat and winter cold by a canopy of "nurse plants' such as mesquite and palo verde trees. Unprotected, they can experience high mortality during rare winter events when temperatures drop below freezing for more than 24 hours. Cold is likely the most important factor in limiting the saguaro's range in the US. In the Rincon Mountain District, which rises nearly 8,700 feet, they are most commonly found at elevations below 4,500 feet. With both observed and predicted temperatures increasing in the Southwest and Saguaro National Park (Monahan and Fisichelli 2014), some recent studies have projected that saguaros may shift their northward range as much as 300 miles and their range in elevation upslope by as much as 2,000 feet.

As part of the park's 2010 "Saguaro Census," a large-scale, citizen science monitoring effort that the park has sponsored every 10 years since 1990, it was decided to evaluate whether saguaros may already be moving upslope in the park. Based on analysis of the shadows of saguaros in high resolution aerial photos, individuals were found in the Rincon Mountains as high in elevation as 5,200 feet. Based on this information, Michael Crimmins from the University of Arizona, randomly established 120 new plots between 3,500 and 5,500 feet to capture the upper limits of the cacti.

On the new plots, high school and college youth crews systematically searched for and temporarily marked saguaros. Plants less than 6.5 feet in height were measured and calculated the height of taller ones using clinometers. Stems and bird cavities were counted, other vegetation noted, and each plot photographed. Each plot was then classified as to whether saguaros were present or not, and used logistic regression to evaluate the effect that different independent variables, known to influence saguaro distribution (elevation, percent slope, fire history, and solar radiation), had on the presence of saguaros.

Results, published this year in the *Journal of Arid Environments*, indicate that increasing solar exposure and percent slope increase the odds of saguaros being present. Conversely, a history of fire in combination with increasing elevation, was more important in decreasing the odds of a saguaro being present. The effect of fire was dramatic; exposure to fire decreases the odds of saguaros being present by 78%.

What are the implications? First, although fewer freezes might be expected to occur in the park with warming temperatures, the advantage of this to saguaros may be offset by fires occurring at lower elevations. Saguaros evolved in the desert areas with very low fuel loads and are not fire-tolerant; studies show their mortality after fires can be as high as 80%. Historically, fires are natural at high elevations in Saguaro National Park, but rare in the desert. However, desert fires that are primarily fueled by invasive grasses have increased in recent decades, both in the park and throughout the desert Southwest.

One lesson of the study is that ecological systems, particularly desert systems, respond to changes in environmental conditions in complicated ways that may unfold over long periods of time. A major decline of saguaros that was first observed in the 1930s and alarmed park staff for decades is now attributed, at least in part, to the loss of nurse plants that resulted from extensive wood-cutting in the early 20th century. As the trees grew back, more young saguaros survived and the population surged during favorable climatic conditions in the 1970s and 1980s. Evidence from long-term study plots, some dating back to 1941, now suggests that this recruitment has slowed significantly in the past 20 years, coinciding with drier, warmer conditions. An important effect of changing climate on saguaros may be fewer favorable years with lower temperatures and wetter soils, and therefore less frequent or lower recruitment. Nevertheless, it's tricky to make predictions about a resilient desert plant that may live to more than 150 years, much longer than we humans do.

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Saguaro cactus.

Modeling Northern Lake Responses to Future Climate

Regular water quality monitoring provides snapshots of what is happening in a lake. Collecting sediment cores provides diatoms, a type of algae with cell walls made of silica, that can be identified to the species-level and used to re-construct the composition of a lake's algae communities going back hundreds of years. The species composition of those historic communities lends insights to past environmental conditions in a lake (e.g., temperature, acidity, oxygen levels).

Recent studies have documented potential changes in boreal lakes that include a longer ice-free season, stronger stratification between warm surface waters and cold deeper waters, shifts in algal communities, and increased frequency of harmful algal blooms. In the Great Lakes region, annual water quality monitoring and studies of diatoms from sediment cores collected from park lakes are revealing evidence of changes in algal communities over time. Can the information diatoms provide about how lakes responded to past environmental changes give us an indication of how lakes will respond to future climate changes?

NPS used the program MINLAKE2012 to develop daily temperature models for eight inland lakes in two Great Lakes Network national parks, four lakes in Voyageurs National Park and four in Isle Royale National Park, from 1960 to 2001. Water quality data, including temperature profiles, gathered during routine monitoring by Great Lakes Inventory and Monitoring scientists and park staff since the mid-2000s allowed us to check modeled results against actual in-lake measurements.

Overall, there was good agreement between modeled and observed temperature profiles, especially in the deeper lakes. The shallow lakes at Isle Royale did not fit the model quite as well, possibly due to their smaller volumes and factors related to their size, such as increased sheltering from wind, sunlight reaching the lake sediment and heating it up, and being proportionately more affected by water flowing in and out of the lake.

NPS also used the models to look for trends in shallow, and deep, water temperatures and timing of temperature gradient (thermocline) formation between two time periods (1962–1986 and 1987–2011). The most common significant trend was the increase in shallow-water temperatures across all eight lakes during the summer. We also found an increase in how often and for how long thermoclines in deep lakes equaled or exceeded 2°C–3°C per meter.

Diatom community shifts in the shallow lakes at Voyageurs National Park suggested slight increases in lake pH; in Isle Royale National Park shallow lakes, the shifts suggested an increase in the number of days that the lakes completely mixed. Changes in diatom communities were more pronounced in the deeper lakes and tracked with the modeled increased frequency and duration of a stronger (2°C or 3°C) thermocline.

This study is a proof of concept that past meteorological data and lake characteristics can accurately model past physical responses of lakes to weather and climate conditions and predict future responses. The ultimate aim is to use simple lake parameters to predict the sensitivity of different lake types to future climate change. Knowing how sensitive lakes are to change can help park managers identify potential management issues such as determining what lakes are most likely to support a cold-water fishery, or which lakes might be more susceptible to harmful algal blooms.

This work is a cooperative effort of the Great Lakes Inventory and Monitoring Network and the St. Croix Watershed Research Station.

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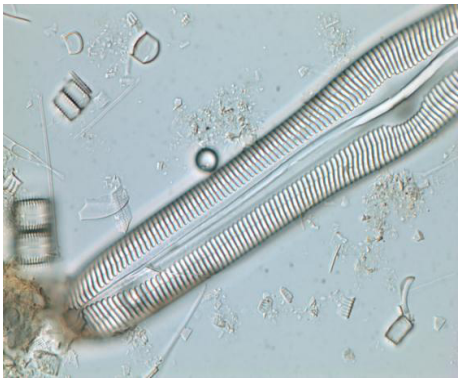
Locations of Voyageurs NP, MN & Isle Royale NP, MI.



Diatom frustules, 875X-1250X magnification.

Paging Dr. Chill

Dr. Chill is better known as Dr. Dave Swanson, the lead scientist monitoring permafrost for the Arctic Network Inventory and Monitoring Program. Year-round, Dave cycles, skis, or walks from his home to the Fairbanks Administrative Office in Alaska, where winter temperatures can reach -40°F!

His human-powered commute, three miles each way, five days a week, exemplifies individual action as a response to climate change. Many times individuals view their personal contributions to mitigating climate change to be too "small to count." However Dr. Chill is a perfect example of how individuals can make a difference by themselves.

Dr. Chill's commute each year can save up to 300 kg (660 lb) of CO2 emissions!

The Dr. Chill alias is used to up his permafrost appeal, especially for younger audiences.

To see how the NPS is monitoring permafrost in Alaska's northern parks, check out his *YouTube page*.

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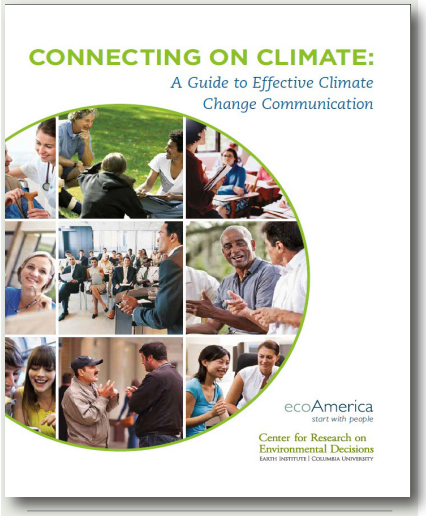
Connecting on Climate

Connecting on Climate: A Guide to Effective Communication leads to a better understanding of American responses to climate change. This guide is designed to aid all communicators in strategies to boost engagement, avoid common mistakes, and successful practices that many have used to meaningfully engage individuals and groups on climate change.

This guide focuses on the 10 principles of Climate Change Communication:

1. Put yourself in your audience's shoes
2. Channel the power of groups
3. Emphasize solutions and benefits
4. Bring climate impacts close to home
5. Connect climate change to issues that matter to your audience
6. Use images and stories to make climate change real
7. Make climate science meaningful
8. Acknowledge uncertainty
9. Approach skepticism carefully
10. Make behavior change easy



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State of Change

An Inuit proverb tells us, "We borrow the earth from our children." That's a challenging legacy for a state in the midst of change. Alaska is a huge state with a wide range of climactic and ecological conditions. It is known for its rainforests, glaciers, boreal forests, tundra, peatlands, and meadows. In addition to the vast differences in habitats, Alaska also contains 70% of all U.S. National Park Service lands! Change is not something new to these parks as Alaska has been in a state of change for the last several thousand years. However in the last 150 years, that speed of change has accelerated.

Will our parks be able to keep up with rapid environmental change?

This guide is part of an on-going conversation with people who visit and work around our national parks. It will help illustrate what we're doing about changing climate. You will find facts about the science, visible evidence you can see, examples of how parks are making a difference, and things you can do to make a difference too. We hope you'll join this dialogue and help us better understand and take action to preserve these parks that we've borrowed from our children.

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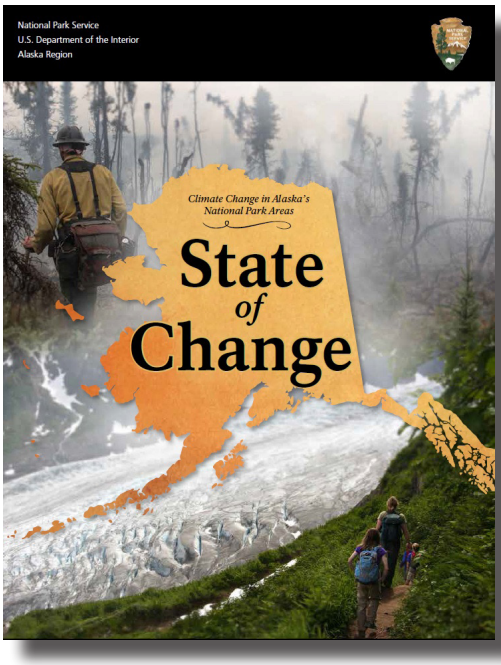

The new "*State of Change*" climate communications guide.

Interpreting Climate Change: Self Study Modules

The Interpreting Climate Change Self-Study Modules are now available *online*. The development of these modules was a joint project between the NPS Interpretive Development Program and Climate Change Response Program.

These free, downloadable tools provide self-paced learning opportunities for NPS interpreters and educators in this critical competency -- or for anyone who is tasked with communicating with the public about this issue. They build upon the instructor-led Interpreting Climate Change Competency, but may also be used as a stand-alone product.

The modules describe skills and successful practices in such areas as addressing controversy, scientific literacy, cultural and historical context, identifying park-specific stories, audience-centered engagement strategies, and much more, and each module includes a list of additional references and resources. Check them out!

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Climate Change Response Program
Natural Resource Stewardship and Science

This quarterly newsletter celebrates the latest initiatives and accomplishments by National Park Service sites and programs in response to climate change.

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NPSClimateChange

New National Climate Change Interpretive Strategy

On December 3, 2014, the White House and the Office of Science and Technology Policy (OSTP) released a fact sheet; *Lifting America's Game in Climate Education, Literacy, and Training*. Within this fact sheet, OSTP stated that the National Park Service (NPS) is developing a National Climate Change Interpretation and Education Strategy to better serve the employees, volunteers, partners, and concessionaires who engage with the more than 270 million individuals who visit the nation's 401 national parks annually.

In December 2014, a multidisciplinary team from an array of parks, regions, programs, and directorates met for three days in Washington DC, to develop the vision, needs, desired outcomes, and goals of this plan. From these meetings a core writing group was assembled and work is currently underway.

To be completed by the end of 2015, the plan will guide NPS in providing interpretive services related to climate change as the nation celebrates the NPS Centennial in 2016. Specifically, the plan will assist NPS interpretive managers and practitioners in the creation and delivery of effective climate change messages in the programs and exhibits across all national parks.

In addition and to complement the National Climate Change Interpretive and Education Strategy, an online toolkit is being developed to provide support for park interpreters, supervisors, and climate change communicators. It will contain resources to help interpreters learn about relevant climate science, park audiences, and appropriate interpretive techniques. Toolkit resources will be aimed at enabling parks to complete the actions identified in the interpretation and education strategy.

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Monthly Webinar Series

Join CCRP for presentations by leading climate change scientists and communicators on the second Tuesday of every month from 2:00 to 3:30 pm EST.

June 11| The Latest Word from the Landscape Conservation Cooperatives: Taking Strategic Steps for National Science and Adaptation Planning featuring Elsa Haubold, National Landscape Conservation Cooperative Coordinator, USFWS

Dr. Elsa Haubold, National Landscape Conservation Cooperative Coordinator, USFWS