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SCIENCE • ADAPTATION • MITIGATION • COMMUNICATION

Climate Change Workshop Imagines Future Of Sandy Hook Region

Although not directly attributable to climate change, Hurricane Sandy provided a wake up call to coastal communities of New York and New Jersey, which are increasingly moving from repair projects to long term planning for adaptation. Two years after Sandy flattened sand dunes and flooded New Jersey coastline, Gateway National Recreation Area’s Sandy Hook Unit recently hosted a workshop to prepare for the next storm and other problems coastal areas will face related to climate change.

Educators, environmentalists, representatives from nonprofit organizations, and employees of federal, state, and local government considered a wide range of adaptation strategies at the “Communities and Sandy Hook Workshop: Partnering to Build Resilience to Climate Change,” held October 2 at the Sandy Hook Chapel. The workshop was made possible by a grant from the National Science Foundation to the National Parks Conservation Association, the organizers of the event. Partners included the National Oceanic and Atmospheric Agency, Rutgers University, Virginia Tech, Sandy Hook Foundation, and the National Park Service.

A morning panel discussion highlighted the

many ways that climate change will affect coastal residents. Eighty years of data at Sandy Hook (compiled by the U.S. Coast Guard), documented a relative sea-level rise rate of 16-17 inches per century, a rate that is now rising exponentially. As panelist Norbert P. Psuty, author of “Coastal Hazard Management: Lessons and Future Directions From New Jersey” (2002) stated, “The rising sea level is driving the shoreline and its associated beach-dune system inland. All of the coastal ecological systems are likewise being displaced inland, but only where there is space to accommodate their shifts. Otherwise, they are being lost.”

Humans will see losses as well. Rising sea levels will leave roads, buildings and other fixed structures more vulnerable to flooding because each storm occurs on an ever higher base flood elevation. Economic impacts will be severe.

The problems are daunting, but what are the solutions? Discussion moved incrementally from what attendees valued about Sandy Hook, through consideration of overarching projects and strategies such as the development of a center to support community engagement or the

implementation of specific demonstration projects to improve understanding of climate adaptation issues. Individual attendees volunteered for work groups to tackle specific projects.

Gerard Glaser, retired from the National Science Foundation, felt optimistic about the results. “This meeting offered an unprecedented opportunity to engage the community in dialogue about how to use their national park to improve understanding of how to adapt to a changing climate,” he observed. Glaser added that he has not seen a better example of assembling the pieces of this complex puzzle into a coherent strategic plan, with contributions from the NPS and other federal agencies.

“This workshop brought local people into the park for an energetic conversation about what is most valuable and meaningful to them about their home,” said Tim Watkins, Science and Education Coordinator with the NPS Climate Change Response Program. “They were so excited to explore how they and the park are connected to each other, and how that connection can help them and the park adapt to the effects of climate change.”

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Planning Community and CCRP

The CCRP and various planning and compliance specialists in the NPS are collaborating to begin developing guidance for consideration of climate change during NPS planning processes. A working group is developing a suite of resources to help park and regional planners. Guidance for Foundations and for ongoing General Management Plans has been released, and other planning-related tools are currently being developed, such as a list of web-based resources for planners to use.

In September 2014, more than a dozen NPS planners, among many other park and program staff, attended training session in Fort Collins, CO – “Climate Smart Conservation” – to learn about addressing climate change as a routine part of planning. The group provided feedback on the training that will be instrumental in revising it for NPS-specific audiences. CCRP and NPS planners are continuing to develop better ways to have conversations about climate change with managers, staff, partners, and the public, in order to improve planning and decision-making across the NPS. Additional products will be available in 2015.

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Climate Exposure of National Parks in a New Era of Change; Park-Specific Briefs Available

Climate change is ongoing across the national park system; an overwhelming majority of parks are already at the extreme warm end of their historical conditions. This is a core finding from recently published research by NPS scientists (Monahan & Fisichelli 2014; <http://dx.plos.org/10.1371/journal.pone.0101302>). This study updates the basic climate inventories of 289 national park units. Two-page resource briefs summarizing key findings for each park are available: <http://science.nature.nps.gov/im/inventory/climate/recent.cfm>

The findings from this research can inform climate change adaptation by helping park managers, planners, and interpreters understand how recent climates compare to past conditions. For example, these findings may be used to characterize park exposure to recent climate change in a vulnerability assessment; develop plausible and divergent futures for use in a climate change scenario planning workshop; and synthesize desired future conditions (i.e., reference conditions) for use in management plans.

Here, as summary, we present results on which parks experienced “extreme” recent conditions (past 10, 20, and 30 year intervals) relative to the 1901–2012 historical range of variability for seven temperature variables (annual mean, maximum of the warmest month, minimum of the coldest month,

mean of the wettest quarter, mean of the driest quarter, mean of the warmest quarter, and mean of the coldest quarter) and seven precipitation variables (annual total, wettest month, driest month, wettest quarter, driest quarter, warmest quarter, coldest quarter). Parks were categorized as “extreme” for temperature or precipitation if the most recent 10, 20, and 30 year intervals, on average, exceeded 95% of the historical range of conditions for any of the seven associated climate variables (see figure below). As an example, at Everglades National Park, annual mean temperature measured over the past 10, 20, and 30 year intervals has on average been warmer than 97% of all periods of equal length since 1901. Analyses for each park included areas within 30-km (18.6-mi) of the park’s boundary to evaluate recent climate changes in a landscape context.

Results for “extreme” temperature:

- 235 of 289 parks (81%) were categorized as “extreme warm”, 2 parks (1%) as “extreme cold”, 1 park (<1%) was both “extreme warm and cold”, and 51 parks (17%) did not have any recent extreme temperature variables.
- The two most common extreme warm variables for parks were mean temperature of the warmest quarter (170 parks, 59%) and annual mean temperature (158 parks, 55%).

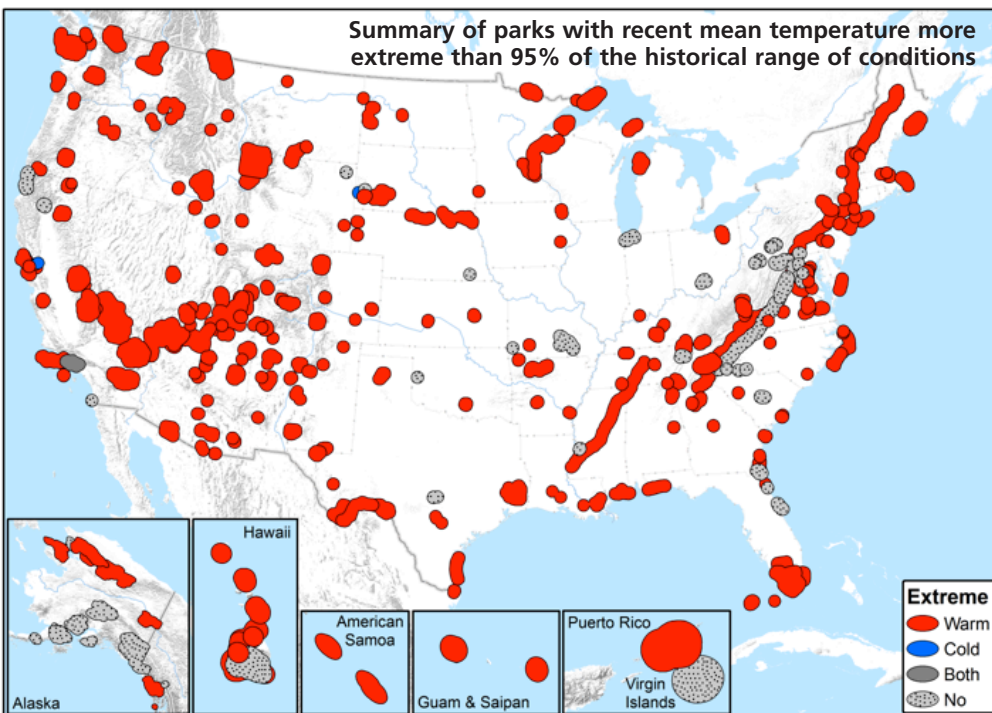
Results for “extreme” precipitation:

- 78 parks (27%) were “extreme wet”, 43 parks (15%) were “extreme dry”, 2 parks (2%) were both “extreme wet and dry”, and 166 parks (57%) did not have any recent extreme precipitation variables.
- The most common extreme wet variables were annual precipitation (44 parks, 15%) and precipitation of the wettest quarter (44 parks, 15%), while the most common extreme dry variables were precipitation of the driest quarter (17 parks, 6%).

These results show how recent climatic conditions are already shifting beyond the historical range of variability at many parks. Ongoing and future climate change will likely affect all aspects of park management, including natural and cultural resource protection, park operations, and visitor experience. Research such as this can help parks develop effective management plans grounded in comprehension of past dynamics, present conditions, and projected future change.

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Summary of parks with recent mean temperature more extreme than 95% of the historical range of conditions



New Climate Change Wayside in Saguaro

In revisiting the series of wayside exhibits on Saguaro National Park’s Cactus Forest Drive, it was decided to add an exhibit on climate change at the final stop, incorporating tips on climate-friendly living. In seeking a background image, Saguaro staff decided to use some reverse psychology. Although the outlook for the American Southwest reflects a hotter and drier climate, they incorporated a spectacular, but unusual, view of the desert covered in snow. As noted on the sign, warm, dry winters are making this an even rarer sight. Paradoxically, cactus-killing freezes (unaccompanied by snow) may happen more frequently in the future due to the “polar vortex” phenomenon experienced in the Northeast last winter, and at Saguaro in 2011.

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Coping With Change

Hotter. Drier. That’s the climate forecast for the American Southwest. Over the past thousands of years, desert plants and animals have adapted to these harsh conditions -- and thrived!

But now the desert faces human-caused changes at faster rates and wider scales than ever before. We can lessen our impact, individually and together.

In seeking a sustainable future let’s learn from those who call Saguaro National Park their home.

Warmer and more arid winters may make desert snowfall a rare sight.

Lessons in Desert Adaptation ...

The coyote eats a varied diet that includes cactus fruit, insects, birds, and mammals from its desert grocery. Shop at local farm markets to reduce fuel use and add diversity to your diet. Have you ever eaten tuna?

A Gila monster is inactive 90% of the time, storing energy in its tail and resting underground. Save gas, combine trips, recycle resources, and vacation close to home at a nearby national park!

When it rains the spiny leaves of the agave funnel life-giving water to the roots at the center of the plant. Install a rain water catchment at home or just save water in little ways that add up!

Assessing Aquatic Community Vulnerability to Climate Change and Land Use Disturbance in Heartland Network Parks

Climate change is one of the leading threats facing ecosystems worldwide, and is of particular concern for river ecosystems. It is more important now than ever to prioritize locations that will be impacted most by these changes. Data collected as part of the aquatics monitoring from seven parks (Pipestone National Monument, Tallgrass Prairie National Preserve, Homestead National Monument of America, George Washington Carver National Monument, Wilsons Creek National Battlefield, Ozark National Scenic Riverways, and Buffalo National River) in the Heartland I&M Network are being used in a collaborative project between the NPS, USGS Missouri Cooperative Fish and Wildlife Research Unit, and the University of Missouri to assess stream community (fish and aquatic

invertebrate) stability and vulnerability to land use and climate change. Preliminary results reveal that aquatic invertebrate communities within small streams are more spatially stable, while fish in all streams and aquatic invertebrates in large streams are more temporally stable. Stream community vulnerability to land use and climate change will be assessed and results will be used to investigate areas or stream attributes that are linked to heightened vulnerability. These findings will ultimately be used as a prioritization tool so that time and resources may be allocated according to need.

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Typical beach scene at Cape Hatteras National Seashore in the Southeast Region. NPS photo.

Southeast Region Climate Change Newsletter

The value of our coastal heritage is priceless. In the Southeast Region, we feel the same way about our mountain top spruce/fir forest, the quality of the water, and the presence of special plants and animals like sea turtles and Indiana Bats. We’re hoarders—we want to keep all of it—but things are changing and some of the science tells us we’re either going to have to work hard to resist, monitor and watch it happen, or facilitate some transitions. We’ve been working to sort out what approaches work best and have some great examples of adaptation. In order to share what we’re learning along the way, keep the lines of communication open, and broadcast opportunities for training and events, we’ve begun a regional climate change newsletter. If you’re interested in learning more about the Southeast Region, climate change adaptation, or receiving the newsletter, contact Janet Cakir.

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Please Share Your Climate Change Adaptation Example With Us!

The Climate Change Response Program is assembling a database of adaptation actions in parks, and is seeking submissions. Actions can range from those still in the planning stages to fully implemented projects. Please provide a short description using the following example as a model (photos are always appreciated), and we will contact you for more info as necessary. Email Gregor_Schuurman@nps.gov with your submissions.

EXAMPLE SUBMISSION

Title: Relocating Visitor Resources Threatened by Accelerated Erosion at Assateague Island National Seashore

Park or Parks: ASIS

Climate impacts/Need for response: Assateague Island National Seashore is at risk from global climate change impacts and under most climate change projections Assateague's natural environment is projected to become less stable over time. Driven by a rising sea level and storm surge events, the island will experience an increased likelihood for erosion, overwash, inlet breaching, shoreline retreat, and island narrowing. The park manages a recreational beach in Virginia that is the primary local economic driver. The beach is in one of the island's most dynamic locations, and has experienced accelerated shoreline erosion, increased storm impacts, and frequent overwash since the 1980s. Annual repair and relocation

of roads and visitor parking lots in this area continue to be high-maintenance, expensive, time-consuming, and stressful for staff who must rush to complete months-long repairs before each summer tourist season.

NPS adaptation response: Relocating the recreational beach is not only the most reasonable solution but also may be considered essential at this point. To determine suitable parking lot locations and configurations, the park has used shoreline monitoring data to forecast future shoreline erosion rates, and has worked with USFWS to identify appropriate areas for relocation. The park and USFWS will also use forthcoming results of a USGS model indicating the impacts of sea level rise and storm intensity along the island. Due to its ongoing success, the portable infrastructure would likely be used in the new location, along with the Visitors' Center, which has been moved twice already. Portable infrastructure such as readily removable bathrooms are one of several important solutions to improve sustainability because they can be relocated off-island in advance of NOAA-forecasted storms and in response to erosion. Another approach to improve sustainability is the park's construction of roads and parking lots in this area from island-compatible materials - a clay base with clam shell - which can be dug up and reused when the lot is moved, and which also avoid introduction of foreign debris such as asphalt on post-storm beaches.



Bayside Picnic Area in Assateague Island National Seashore after Hurricane Sandy. NPS photo.

Upcoming Webinar

The Climate Change in America's National Parks Webinar Series takes place at 2:00 PM EST every second Thursday of the month.

December 11, 2014

The Role of Traditional and Local Knowledge in Understanding Climate Change.

Colleen Strawhacker, Exchange for Local Observations and Knowledge of the Arctic.

Register at <https://www1.gotomeeting.com/register/291947825>

More Information

This newsletter is a regular forum to share the latest actions relating to NPS efforts to manage our parks in a changing climate.

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CCRP websites:

Public: <http://www.nps.gov/climatechange>

Internal: <http://www1.nrintra.nps.gov/climatechange>

Facebook: <http://www.facebook.com/NPSClimateChange>

Youtube: <http://www.youtube.com/user/NPSClimateChange>

Cover photo: Looking west from Sandy Hook Lighthouse across Fort Hancock in Gateway National Recreation Area. NPS photo.