



SCIENCE • ADAPTATION • MITIGATION • COMMUNICATION

Renewable Energy Development and Impacts to Parks

It is hard to open a newspaper or webpage today without seeing an article about a new solar or wind project on public lands. The American Recovery and Reinvestment Act of 2009, commonly known as the “Stimulus Bill,” included grant and loan opportunities for developers able to get renewable energy projects under construction by the close of 2010; this funding has now been extended through 2011. These opportunities serve a few main functions: creating American jobs through investing in development; creating home grown clean energy; and getting a still fledgling industry off the ground that was struggling to find enough financial backing from cautious lenders.

The result has been a rush to find available space and the accompanying development rights on public lands managed by the Bureau of Land Management (BLM). In the last two years, the BLM has sifted through hundreds of applications to build renewable energy projects. The BLM approved 12 projects in 2010, and has identified an additional 20 projects that are fast tracked for approval in 2011. Most of these fast track projects are large, utility-scale operations that will result in a single use of the public lands. In addition, the newly created Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) is also seeing a renewed interest in off-shore wind development along the Atlantic coast.

Bolstering our clean energy production is a worthy effort, supported by President Obama and mandated by Secretary of the Interior Salazar

through various executive orders. Moreover, reducing greenhouse gas emissions to curb the effects of climate change is a critical mission if we are to continue to enjoy the scenery and wildlife we know and love in our national parks. But at what cost?

A number of the proposed renewable energy projects are in close proximity to units of the National Park System and other special areas under National Park Service (NPS) management. These utility-scale operations may cover multiple square miles, and have the potential to impact scenic vistas, soundscapes, night skies, water resources, air quality, and wildlife populations and movement within parks. For the foreseeable future, many of these impacts are permanent alterations to the landscape and are not easily mitigated. As the BLM, BOEMRE, and other agencies have moved forward with approving applications to allow for this development, the NPS has become increasingly concerned about the potential toll on park resources and visitor enjoyment.

The NPS Natural Resource Stewardship and Science Directorate, in collaboration with regions and parks, is leading the effort within the Service to engage our sister bureaus and other stakeholders on external renewable energy development. Nationwide, there are multiple planning initiatives, programmatic environmental analyses, and project-specific proposals in which the NPS

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Above: Illinois wind farm along I-39. Photo courtesy of Gregg Bruff.

Monthly Climate Change Webinar Series

2nd Thursday of every month
2:00 pm - 3:30 pm EST

Next Webinar: Aug 11th, 2011

August's presentation will feature Dr. Maria Honeycutt, who has been with the National Park Service Climate Change Response Program for nearly a year as a Coastal Adaptation Specialist on detail from NOAA's Coastal Services Center.

Her presentation will provide an overview of the array of current NPS activities aimed at improving understanding of the impacts of sea-level rise on park resources and assets, and actions that can and are being taken to mitigate them. Specific scientific and decision-support resources, available from Federal agencies and other entities, will be highlighted.

Follow this link to register for this month's webinar:
<https://www1.gotomeeting.com/register/119235096>

Upcoming Webinar

Sept 8th, 2011

Robert Guralnick of the University of Colorado, Boulder will discuss his work engaging the public in citizen science efforts to monitor American Pika activities in the Rocky Mountains.

Follow this link to register for September's webinar:
<https://www1.gotomeeting.com/register/800465361>

Renewable Energy Development and Impacts *Cont'd*

has a stake. There is an identified need to provide policy, guidance, consistency, and best management practices to regions and parks to aid them in influencing planning and permitting decisions. Furthermore, these projects are under agency and public review through the National Environmental Policy Act (NEPA) process, and it is important for the NPS to provide the data, analyses, and overall expertise to help others understand, avoid and mitigate potential impacts to park resources and values.



The NPS has the challenging task of finding the balance between supporting renewable energy to lessen greenhouse gas emissions and climate change while still meeting its mission of protecting park resources and values in perpetuity. Finding this balance will be difficult, but the Service's involvement can help ensure these projects are sited, designed, and implemented in a manner that reduces impacts on parks and helps the public better understand the implications of its energy use. Contact: Sarah_Quinn@nps.gov



Climate Change Publications

The spring 2011 special edition of *Park Science* magazine is devoted to climate change adaptation and communication. This is the first of two editions that will focus on climate change. The next

issue will address climate science. This issue is available online at: <http://www.nature.nps.gov/ParkScience/> or for a hardcopy contact the CCRP or the *Park Science* editor.

Other publications available in hardcopy are the NPS Climate Change Response Strategy and the Climate Change in National Parks glossy unigrid brochure. For copies of any of the above mentioned, contact: Sarah_Mosman@nps.gov

Director Jarvis in the News on Climate Change

As new scientific studies are published about climate change impacts to park resources, the media is increasingly curious about how the National Park Service is addressing climate change. In the months of June and July, Director Jarvis gave two outstanding interviews that are available for viewing at the following links. For an overview of NPS response to climate change: http://www.youtube.com/watch?v=fPf4v3mZudo&safety_mode=true&persist_safety_mode=1

A mitigation effort that is visible to the public is the new geothermal system at George Washington Birthplace NM. The Director gives an overview of this system and how it relates to our response to climate change in this interview: <http://www.energynow.com/video/2011/07/11/jon-jarvis-geothermal-conversion-and-energy-efficiency>

CCRP Featured Staff

Sarah Mosman

CCRP is pleased to have Sarah Mosman join our team as a student employee under the STEP program. Sarah will perform a variety of admin/support duties, communication support, and will assist with climate change issues related to cultural resources. She has a background in museum studies, archaeology, and anthropology. She has worked with NPS since 2006, first as an SCA archaeology intern at Cumberland Island National Seashore in GA, then as a museum aide at Fort Laramie National Historic Site in southeastern WY. She received her BS in history from SUNY Brockport in her home-state of NY. She is currently working toward her second BA in anthropology at Colorado State University (CSU), in preparation for graduate study, also in anthropology at CSU. Her hobbies include digging around in the dirt, photography, yoga, cooking, dancing, traveling and eating.



Applying Climate Change Science to Resource Management

Climate change poses a fundamental challenge for natural resource management—climate patterns are shifting in space and time, but national parks, national forests, and other natural areas remain at fixed locations. In *Issues in Science and Technology*, the public policy magazine of the National Academy of Sciences, Dr. Patrick Gonzalez recently

published an article outlining NPS strategies for climate change adaptation. For the pdf file, contact: Patrick_Gonzalez@nps.gov

Citation: Gonzalez, P. 2011. Science for natural resource management under climate change. *Issues in Science and Technology* 27(4): 65-74.

Indonesia Welcomes NPS Climate Change Scientist

The tropical rainforest and coral reef ecosystems of Indonesia host globally unique biodiversity and provide essential services for human well-being. Recognizing that climate change threatens ecosystems and people in Indonesia, the U.S. National Academy of Sciences and Indonesian Academy of Sciences held the Kavli Frontiers of Science symposium, July 9-11, 2011 in Bogor, Java, Indonesia. Patrick Gonzalez, NPS Climate Change Scientist was invited to present the latest developments in climate change science for protected areas.

The Frontiers of Science symposium series is the premiere activity of the National Academy of Sciences for distinguished young scientists. At this year's symposium, 18 speakers covered new scientific advances in alternative energy, biodegradable plastics, climate change, infectious diseases, marine microbial diversity, and rice genomics.

In his presentation *Discovering Ways to Help Vulnerable Ecosystems Adapt to Climate Change*, Patrick discussed recent research by him and other scientists in three key areas: quantification of greenhouse gas emissions and forest carbon storage, detection of ecological changes and attribution of causes, and vulnerability analyses of species and ecosystems. Research in these areas is quantifying how energy conservation and forest management can reduce the greenhouse gas emissions that cause climate change, determining what ecological changes we can attribute to climate change, and identifying vulnerable areas and potential refugia to help prioritize future adaptation measures.

Patrick interacted with scientists from a range of Indonesian and U.S. universities. He also visited scientists at the Center for International Forestry Research and exchanged ideas for advancing climate change research in national parks.

Afterwards, Patrick was able to take leave to travel to Taman Nasional Gunung Leuser (National Park) on Sumatra. This 11,000 km² (4200 sq. mi.) park protects tropical rainforest that provides habitat for the Sumatran orangutan (*Pongo abelii*), Sumatran tiger (*Panthera tigris sumatrae*), and over 8000 plant species, including meranti trees (*Shorea leprosula*), and clean water for neighboring communities. Patrick spent a day with an Indonesia park ranger hiking in the rainforest and exchanging information on forest ecology, climate change, and park management.

Patrick then visited Taman Nasional Tanjung Puting (National Park) on Kalimantan. This 4,200 km² (1600 sq. mi.) park protects tropical mangrove and peat swamp rainforest that provides habitat for Borneo orangutans (*Pongo satyrus*), ketiau trees (*Ganua mottleyana*), and other unique species. Deforestation for palm oil plantations threatens both parks. Climate change may exacerbate those threats through upslope vegetation shifts, inundation of coastal ecosystems from sea-level rise, and increases in wildfire. Through his trip, Patrick sought to exchange ideas with Indonesian colleagues on how to respond to climate change.

Contact: Patrick_Gonzalez@nps.gov

Below: Rainforest mists rise over Taman Nasional Gunung Leuser (National Park). Photo courtesy of Patrick Gonzalez.



Mark Your Calendars



Following the very successful pilot course on Climate Change Vulnerability Assessment in May, the first public course will commence at the National Conservation Training Center (Shepherdstown, WV) on August 16-18, 2011. The August course is already full, but additional courses will be held at regional locations. Planning is underway for courses in Alaska, Seattle, and Florida. For information on upcoming courses or to discuss organizing a course at another location, contact: donna_brewer@fws.gov

September 26-29, 2011

Earth to Sky V, will be held at NCTC in Shepherdstown, WV. This course will draw upon the expertise of NASA, FWS and NPS to examine the effects of climate change on natural and cultural resources in parks and refuges; and will explore effective techniques in communicating about climate change with the public. <http://earthtosky.org/>

October 12, 2011

Natural Resource Stewardship and Science will host Cat Hawkins-Hoffman for a webinar to give an update on the National Fish, Wildlife and Plant Adaptation Strategy at 3pm ET. This is part of a new monthly webinar series on a variety of resource topics. Tom_Flanagan@nps.gov

October 31 - November 2, 2011

The second annual GreenGov Symposium will be held in Washington, DC. This is hosted by the White House Council on Environmental Quality, and will bring in experts to explore how to green the federal government. <http://www.whitehouse.gov/greengov/symposium>



Climate Change in the Great Lakes Region

On July 13th, a report entitled *Great Lakes Parks in Peril: The Threats of Climate Disruption* was released by the Rocky Mountain Climate Organization (RMCO) and the Natural Resources Defense Council (NRDC) and received considerable media coverage.

This report summarizes climate change science information for the Great Lakes region and for the five largest NPS units in the Great Lakes – Apostle Islands and Pictured Rocks National Lakeshores and Isle Royale National Park on Lake Superior, and Indiana Dunes and Sleeping Bear Dunes National Lakeshores on Lake Michigan. To read about key findings or for the entire report, go to: http://www.rockymountainclimate.org/programs_13.htm

In addition, NPR flagship station WBEZ in Chicago aired an 11 minute story on climate change in the Great Lakes, focusing primarily on Lake Superior and the Apostle Islands National Lakeshore, as well as its gateway community. The story reads well, but listening is even better, especially to the 95 year old fishermen who are seeing the impact of climate change first-hand: <http://www.wbez.org/frontandcenter/2011-07-13/climate-change-hits-mightiest-great-lakes-89058#>

Also note that the recently approved General Management Plan for Apostle Islands explicitly includes climate change. For more information, contact: Bob_Krumenaker@nps.gov

Pacific West Region – C⁴

The Pacific West Region (PWR) continues to lead efforts to understand, mitigate and respond to climate change in national parks. To promote coordination, integration and collaboration among the many activities now underway across PWR, and to ensure alignment with the national Climate Change Response Strategy, the region has established the PWR Climate Change Coordination Committee (PWR C⁴). The multi-divisional representation of PWR C⁴ allows broad-scale facilitation and communication across program areas that are currently involved with various elements of climate change response.

PWR C⁴ will build upon and advance the progress made in the region on climate change mitigation (e.g. Green Team successes, Climate Friendly Parks, etc.) and serve to integrate these accomplishments with emerging initiatives in climate change science and adaptation, coupled to climate change communication and outreach.

Initial Priorities for PWR C⁴ include:

- Complete role and function statement.
- Confirm PWR C⁴ structure and representation.
- Enhance existing climate change groups and teams (e.g. Green Team, Advisory Committee activities, LCC representatives, etc.) via coordination, communication, and integration.
- Revisit relevance and applicability of PWR Framework for Climate Action.
- Update framework in light of NPS Climate Change Response Strategy and PWR activities.
- Ensure cross-disciplinary communication and information dissemination on climate change needs, activities, and success stories.

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Or: Laurie_Lee_Jenkins@nps.gov

Plant Responses to Climate Change in CO Plateau Parks

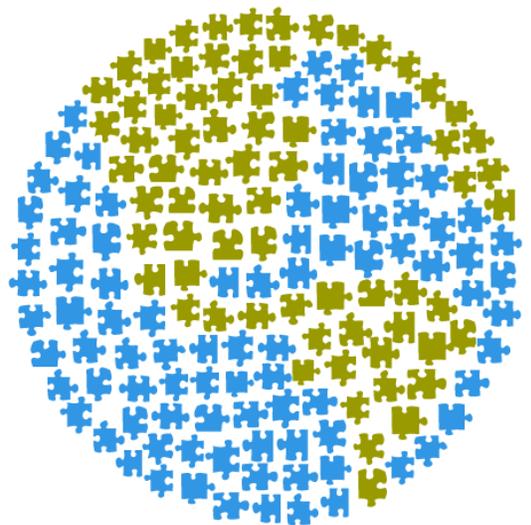
The Colorado Plateau is centrally located in the southwestern U.S. Four Corners region and surrounded by a ring of mountains. Because the Colorado Plateau is in a rain shadow, low elevation areas typically receive low annual precipitation (< 10 inches). However, packrat debris piles (middens) and ancient pollen samples collected from lakes and wetlands throughout the region provide evidence that low elevation areas were much cooler and wetter 10,000-50,000 years ago and supported conifer woodlands. Today these dry areas contain drought-adapted grasslands and shrublands. The Colorado Plateau is warming and drying at much faster rates than it did histori-

cally due to human-induced climate change. This increased aridity is likely to have a large impact on the growth and survival of grassland and shrubland plants that are already vulnerable to water stress. To address how climate change may affect plant species in Colorado Plateau drylands, scientists examined the relationship between climate and vegetation using monitoring data for the last twenty years (1989–2008) from three national parks – Arches, Canyonlands, Natural Bridges. For more information, see the full article in the June issue of *Ecosphere*: <http://www.esajournals.org/doi/pdf/10.1890/ES11-00059.1>
Or contact: smunson@usgs.gov

New Climate Change Training Modules from COMET

The COMET Program, a division of UCAR (University Corporation for Atmospheric Research) in Boulder, CO creates online multimedia training courses on a broad range of the geosciences. This team recently released two climate-related modules: *Coastal Climate Change*, a three-hour module that provides an overview of coastal impacts of climate change; and *Climate Change: Fitting the Pieces Together*, a two-hour module that covers basic climate science.

These and all of COMET's products are free and available online after an initial registration. The modules contain multimedia resources whose copyrights have all been cleared for reuse for educational purposes. To explore these two new climate change modules, go to: <http://www.meted.ucar.edu/climate/coastalclimate/>
<http://www.meted.ucar.edu/broadcastmet/climate/>



©The COMET Program

Climate Change Teacher Workshop at Great Smoky

The Appalachian Highlands Science Learning Center in Great Smoky Mountains National Park, in partnership with the Great Smoky Mountains Institute at Tremont and the National Park Foundation (NPF), hosted a week-long climate change workshop for educators. Teachers learned about climate impacts in the Southern Appalachian Mountains as they assisted the park in collecting data with phenology monitoring studies on salamanders, trees, plants, and insects. Visit the website for more details on the workshop and for teacher projects that will be added this fall as part of a service learning follow-up. This is part of a series of climate change workshops occurring at National Parks across the nation as part of the NPF's Climate Challenge.

<http://www.parksclimatechallenge.org/>

Shenandoah Salamander Study Underway

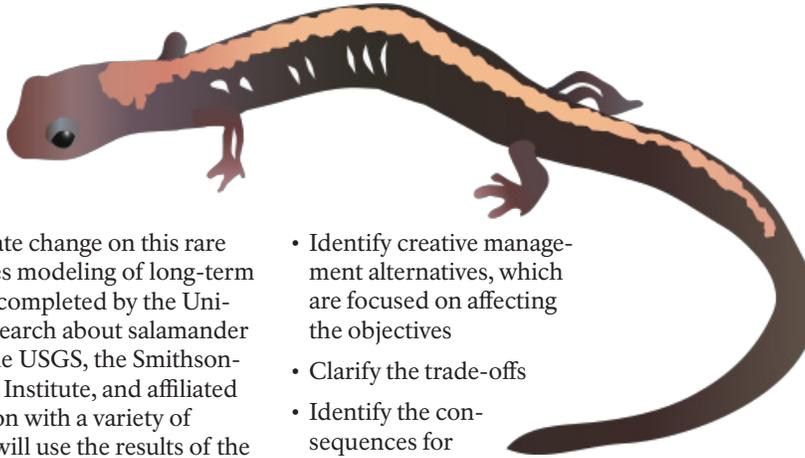
The Shenandoah salamander is a federally listed endangered species found only in Shenandoah National Park. The park is working with a variety of cooperators to study the potential impacts of climate change on this rare animal. The study includes modeling of long-term climate projections to be completed by the University of Virginia and research about salamander response conducted by the USGS, the Smithsonian Conservation Biology Institute, and affiliated universities. In cooperation with a variety of partners, NPS managers will use the results of the study to develop an adaptive management plan for the species. In doing so, a structured decision making (SDM) process will be used to determine the most appropriate management actions for the salamander.

SDM provides a formal process for making complex decisions more manageable and transparent. The process can be summarized as comprised of 6 interrelated parts, which are addressed in succession, and are driven by a focus on values-based objectives. Objectives are articulated by a decision maker, which can represent a single person or entity, or a consortium of parties responsible for implementing a decision. The components of a structured decision making process are:

- Define the problem (identify the trigger, decision maker, legal and regulatory context, and the essential elements of the decision)
- Specify the objective(s) and measurable attributes

Additionally, Great Smoky Mountains has posted two climate change videos, both created by our 2010 George Melendez Wright Climate Change Intern, Keith Hoffman. One of Keith's productions is about the research of a 2010 George Melendez Wright Climate Change Fellowship recipient, Amy Luxbacher, who is studying high elevation salamanders in the Smokies. Both videos can be accessed at: <http://www.nps.gov/grsm/photosmultimedia/multimedia.htm>

For more information on either of these projects, contact: Susan_Sachs@nps.gov



- Identify creative management alternatives, which are focused on affecting the objectives
- Clarify the trade-offs
- Identify the consequences for each alternative (via quantitative or qualitative predictive models)
- Decide on an action(s)

In an adaptive management situation, the process is iterative as monitoring information feeds back into the decision making process. Cooperators on the Shenandoah salamander project met in a workshop this winter to begin the SDM process. The workshop was used to develop a "quick-and-dirty" prototype model of the management decision so that areas identified to be important to the decision and with high uncertainty could be addressed via the ongoing research. Following the completion of the climate research an additional workshop will be held to finalize the decision structure and develop a management plan.

Considering the complexity of many climate change associated management issues, the SDM process can prove informative for park managers. Contact: Jeb_Wofford@nps.gov

Climate Change Resources

A recent article in *Science*, and featured on National Public Radio, highlighted research showing that Rocky Mountain snowpack declined more rapidly over the 20th century than at any other period in the past millennium and that human-caused climate change is a major cause. The authors used data from at least nine National Parks, in addition to other sites. You can read a synopsis of the study's findings at: <http://www.nrmcs.usgs.gov/NorthAmerSnowpack> Or listen to the NPR story at: <http://www.npr.org/2011/06/10/137088287/thinning-snows-in-rockies-tied-to-global-warming>



The Union of Concerned Scientists recently updated the *Climate Hot Map*, an online tool allowing users to explore the local impacts of global climate change occurring around the world. With an easy to use google map interface, the site provides provocative, real-world examples of the impacts of climate change on people, cities, ecosystems and wildlife, as well as highlighting possible regional solutions. <http://www.climate-hotmap.org/>

A new website from the Institute of Governmental Studies at UC Berkeley, called Building Resilient Regions, provides a network for individuals, businesses and municipal governments to work together to expand the role metropolitan areas can play in building sustainable and resilient communities in the face of local, national and global challenges like climate change. <http://brr.berkeley.edu/>



Las Vegas Teachers Study Climate Change at Death Valley

A group of 40 middle and high school teachers braved the summer heat at Death Valley National Park to learn about climate change — past and present, natural and anthropogenic on June 20-21. During a two-day workshop, teachers visited, researched and collected data at three sites - Sperry Wash (on BLM land), where they examined a 700 million year old rock outcrop of possible glacial origin; Badwater Basin, where scientists have analyzed a 200,000 year old salt core that records Ice Age lake level fluctuations; and a modern, though potentially ailing, pinyon-juniper forest near Wildrose Peak. At each site, they explored two questions: What is/was the rate of climate change captured here in the geologic/biologic record? What can you learn about global climate change from data collected at a single site?

This workshop leveraged the power of public lands to provoke thought about global change using place-based resource immersion. Through their observations, teachers were confronted with questions like:

- How does a boulder dropped off the bottom of a glacier into the ocean end up in the middle of the hottest, driest desert in North America? (at Sperry Wash)

- Could a barren salt flat once have served as a forested freshwater lake habitat for Pleistocene mega-fauna? (at Badwater)
- Do mistletoe-infested, desiccated trees signal hotter, drier climate conditions in Death Valley's high-elevation forests, or are they the result of some other ecological mystery? (at Wildrose)

The participants learned how to use their field data and others' research to support or refute the various climate change claims they encounter in the media. One goal of the workshop was to get teachers comfortable with evaluating information sources, so they can teach their students to do the same. Another goal was to demonstrate the value of National Parks as outdoor classrooms. Several teachers who participated in the workshop have already contacted the park about scheduling field trips for their classes during the next school year. Additionally, the data collected by the teachers about the health of the pinyon-juniper forest will help the park assess the role climate change may be playing in that ecosystem. The workshop represented a partnership between Death Valley National Park, Clark County School District, and the Southern Nevada Regional Professional Development Program.

Contact: Stephanie_Kyriazis@nps.gov



Daylight Powers Night Lights at Assateague Island NS

Assateague Island National Seashore has recently completed projects installing several new solar powered lighting applications. The new lighting is part of an ongoing effort to reduce the Seashore's carbon footprint and demonstrate the utility of alternative energy sources to the local community.

The most visible of these new improvements is in the parking lot of the new Assateague Island Visitor Center where five solar powered overhead lights illuminate the parking lot. The highly efficient LED lights are powered by batteries which, in turn, are recharged by solar panels. The lights are operable at varying intensities; a feature that allows lighting levels to be adjusted to the actual need rather than maintaining a constant brightness all night long.

In another recent improvement, all of the Seashore's campground and picnic area restrooms

have been fitted with solar powered lights to provide interior illumination. Running electrical lines to each of the restrooms wasn't practical so the use of photovoltaic lights was a perfect solution.

All of the new lighting systems have been designed to prevent light pollution and help protect Assateague's night skies. Much of the Seashore is well removed from major sources of unnatural night lighting and, as a result, has some of the darkest night skies in the region.

In addition to the new lighting, the Seashore will soon add two solar panel arrays in the North Beach Day Use Area. The panels will generate more than 22 kilowatts of electricity for the 'Beach Hut' convenience store, and the new campground office and ranger station, scheduled to open in September.

Contact: Carl_Zimmerman@nps.gov



More Information

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

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Angie_Richman@nps.gov

The Climate Change Response Program can be found on the web at: <http://www.nps.gov/climatechange>