



## Water Resources Division SUMMARY OF FISCAL YEAR 2011 ACCOMPLISHMENTS

# Water Resources Division

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National Park Service  
U.S. Department of the Interior

Natural Resource Stewardship and Science  
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**Cover: Parks Climate Challenge participants snorkel on Ross Lake to conduct a fish survey, North Cascades National Park Complex (Washington).** NORTH CASCADES INSTITUTE/BENJ DRUMMOND



*If there is magic on this planet,  
it is contained in water.*

Loren Eiseley

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The Water Resources Division (WRD) is one of eight divisions that make up the NPS Natural Resource Stewardship and Science Directorate and was established to provide servicewide program management and specialized advice and assistance to parks in the protection and management of natural resources.

The mission of WRD is to provide leadership and senior-level technical, scientific, policy, and resource management expertise in the protection, preservation, and restoration of water

resources and water-dependent environments within the National Park System. WRD provides its services directly to parks through a broad range of programs in the areas of hydrology, water quality, wetlands, fisheries, marine resources, water rights, information management, watershed condition assessments, and planning.

The primary focus of WRD is, as it always has been, to provide the highest level of support possible to parks in addressing their water and aquatic resource-related issues.



# A Message from the Division Chief

*Gary W. Rosenlieb, Acting Division Chief*

**American white pelicans, Missouri National Recreational River (Nebraska).** NPS COLLECTION

THIS REPORT PROVIDES A SUMMARY of the accomplishments and an accounting of the budget for the Water Resources Division (WRD) of the National Park Service in Fiscal Year (FY) 2011. As you review the reports that have been contributed by the WRD staff, I believe you will see that we have endeavored to provide the highest level of support to park units on wide variety of water and aquatic resources-related issues.

In 2011 WRD continued to provide management and support for the water resources component of the Natural Resource Challenge. Water quality monitoring was supported in 32 networks; Natural Resource Condition Assessments were completed in 19 parks; fifteen aquatic resources professionals were funded with a vacant position filled in the National Capital Region; and the Water Rights Branch supported the protection of park water rights at many parks.

The Ocean and Coastal Resources Branch is in its second operating year and continued implementing the Ocean Park Stewardship Action Plan. In 2011 the branch completed and published Reference Manual 39-1, NPS Ocean and Coastal Park Jurisdiction Handbook; completed benthic habitat maps for two parks; and provided support for the Deepwater Horizon Oil Spill Natural Resource Damage Assessment by co-chairing the Vegetation Technical Working Group for the Deepwater Horizon oil spill.

High-profile restoration projects were the focus of WRD's hydrologists and wetland scientists. After almost 20 years of planning and environmental studies, the physical restoration of the Elwha River in Olympic National Park started in 2011 with the beginning of the removal of the Elwha and Glines Canyon dams. In another project, the result of eight years of hard work by the wetlands staffs of WRD and Channel Islands National Park was realized when the restoration of Prisoners Harbor began in late 2011.

WRD continued to provide high-visibility assistance to the Department of the Interior's renewable and fossil energy initiatives. In conjunction with staffs of the Inventory and Monitoring Program, regions, and parks, WRD continued to support NPS efforts to identify protected areas for the Bureau of Land Management's Supplement to the Draft Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States. The NPS relied on best-available geospatial information for viewsheds, night skies, wetlands, sensitive soils, watersheds, and critical habitat to identify where high potential for resource conflicts might occur with proposed solar energy development near parks in the six-state study area.

With the Geologic Resources Division, WRD continued to track the numerous areas of high geologic potential for shale gas development, also known as shale gas *plays*, throughout the country and in particular



**Mabry Mill in autumn, Blue Ridge Parkway (North Carolina, Virginia).** NPS/JIM EVANS

the expansive Marcellus Shale gas play surrounding Delaware Water Gap National Recreation Area and other parks in the Northeast Region.

WRD continued to support numerous Colorado River issues in 2011. WRD remained active in the Glen Canyon Adaptive Management. The Water Rights Branch completed the draft Arches Water Rights Agreement and provided technical assistance to Dinosaur National Monument and the Intermountain Region to assess the 2011 high flows on the Yampa and Green rivers. WRD continued to provide leadership for the NPS Wild and Scenic Rivers Program by completing the Interagency Wild and Scenic Rivers Coordinating Council's Section 7 flowchart.

The latter part of 2011 brought the implementation of a new organizational structure that will realign WRD beginning in FY 2012 to better address emerging issues in renewable energy, climate change water shortages, and aquatic invasive species. The restructuring established an Aquatic Systems Branch which combines functions of the former Water Operations Branch (floodplain and groundwater management and water quality) with the wetlands, fisheries, and aquatic invasive species functions that were formerly managed in the Planning and Evaluation Branch. The Planning and Evaluation Branch has been reformed as the Planning and Information Branch (PIB) and will receive two programs from the former Water Operations Branch: the Data and Information Management Program and the Natural Resource Condition Assessment Program. PIB will provide assistance for water resource management planning, climate change scenario planning, and resource stewardship strategy planning. The Water Rights Branch and the Ocean and Coastal Resources Branch will largely retain their existing missions and functions.

Finally, 2011 saw the retirement of three key WRD personnel. Dr. Bill Jackson retired from the National Park Service on 1 October 2011 following a 31-year federal career that included 22 years with the National Park Service Water Resources Division, nearly five of those as the chief of the Water Resources Divisions. Bill had substantive roles in establishing servicewide programs in water quality protection and ocean and coastal resources stewardship. He provided leadership to the implementation of elements of the NPS Natural Resource Challenge, including servicewide water quality monitoring, the establishment of the field-based aquatic resource professionals program, implementation of the servicewide natural resource condition assessments, and the establishment of the servicewide Ocean and Coastal Resources Branch. Also retired in 2011 are Sharon Kliwinski, who has been referred to by many as the moral compass for the Natural Resource Stewardship and Science directorate and served as the WRD liaison since 1992, and Dr. Roy Irwin, senior contaminants specialist for the NPS. Sharon retired in March 2011. Roy retired on 31 December 2011. We thank them all for their service.

I am pleased with the accomplishments of WRD this past year. It is indicative of the professionalism of WRD and the ability of our staff to work with management and staff in parks, regions, and the Washington Office to address water resources issues at every level of the organization. I can speak for all of our WRD staff in saying that we enjoy working with the parks on any water resources management issue, and I am extremely proud to provide leadership, if only for a short time, for a dedicated and meticulous group of professionals.

*The harvest that comes from well-directed and thorough scientific research has no fleeting value, but abides through the years, as the greatest agency for the welfare of mankind.*

John Wesley Powell



Heidi Kristenson, Yukon-Charley hydrologic technician, enters field data on the edge of a lake in Kobuk Valley National Park (Alaska). NPS/ERIC SIEH

# Ocean and Coastal Resources Branch Highlights

## *Jeffrey Cross, Branch Chief*

**Sitka Sound from the visitor center at Sitka National Historical Park (Alaska).** NPS/CLARENCE WADKINS

THE OCEAN AND COASTAL RESOURCES Branch (OCRB) is responsible for leadership and coordination of NPS ocean responsibilities, policies, and interests in the Natural Resource Stewardship and Science (NRSS) directorate. The goals of the branch are to acquire broad-based support in ocean and coastal sciences and technologies, develop servicewide ocean policies and programs, and provide technical assistance and support to parks.

The NPS 2006 Ocean Park Stewardship Action Plan called for increasing the organizational and scientific emphasis to manage 11,200 miles (18,021 km) of coast and 2,490,000 acres (1,007,703 ha) of ocean and Great Lakes waters across 22 states and four territories. OCRB provides organizational structure and focus for coordination within the NRSS and with parks, regional offices, the Submerged Resources Center, and other entities to meet servicewide goals for ocean and coastal resources stewardship.

The branch provides leadership in developing short- and long-term strategies for enhancing NPS scientific, technical, and or-

ganizational capacity for ocean and coastal resources stewardship. The branch works closely with the Geologic Resources, Biological Resources Management, and Environmental Quality divisions on critical park science and management needs. The branch also works closely with the National Oceanic and Atmospheric Administration, USGS, EPA, other federal and state agencies, universities, and private partners to further the goals of ocean and coastal stewardship.

During FY 2011 OCRB staff provided a variety of servicewide and park-specific technical assistance, coordinated multiple Coastal Watershed Assessment and Benthic Habitat Mapping Program projects in parks, and provided policy guidance and support to parks and regions. Significant accomplishments under the Ocean Park Stewardship Action Plan include participation on the Department of the Interior's Senior Ocean Policy Team which contributed to the development of the Administration's National Ocean Policy; publication of the jurisdiction handbook for ocean and coastal parks; and participation in the response to the Deepwater Horizon Oil Spill.

**Sheephead and diver, Channel Islands National Park (California).** CALIFORNIA DEPARTMENT OF FISH AND GAME

**OCRB Projects**  
[www.nature.nps.gov/water/oceans.cfm](http://www.nature.nps.gov/water/oceans.cfm)

**Coastal Watershed Assessments**  
[www.nature.nps.gov/water/nrca/coastalreports.cfm](http://www.nature.nps.gov/water/nrca/coastalreports.cfm)



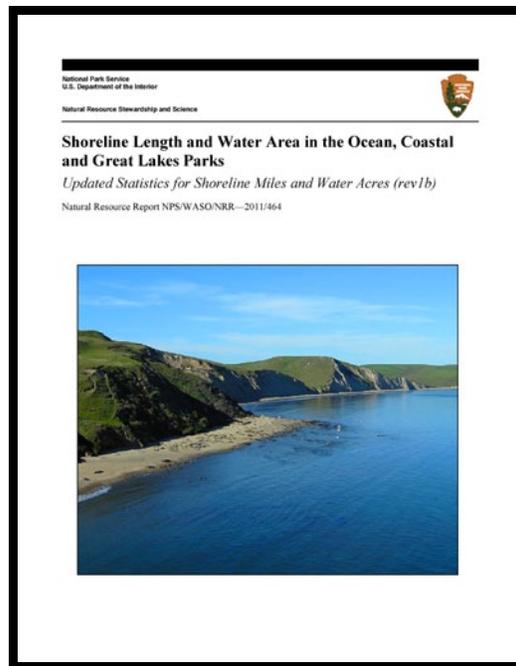
# Estimating Shoreline Length and Water Area in Ocean, Coastal, and Great Lakes Parks

*Thom Curdts, GIS and Remote Sensing Specialist*

WIDELY DIFFERING STATISTICS HAVE been published for total shoreline length and water surface area in ocean and coastal parks. The low-end estimate of shoreline length, and perhaps the most frequently quoted figure, is 5,100 miles (8,206 km). Other estimates put the figure for National Park Service shoreline length over 15,000 miles (24,135 km). Estimates for water surface area range from 2.4 to 3.2 million acres (.97 to 1.3 million ha). The discrepancies are due to multiple factors, including the scale, methodology, accuracy, and timeframe of the source data as well as the specific parks included in an analysis.

In 2010 the Ocean and Coastal Resources Branch began to address these inconsistencies. A clearly defined, well-documented, and repeatable methodology was developed to estimate cumulative shoreline length and water area in marine, estuarine, and Great Lakes park units using a geographic information system (GIS). Many shoreline data sets from a variety of sources were examined park-by-park to identify the ones that most accurately reflected the shoreline as depicted in recent aerial or satellite imagery. Shoreline data included several National Oceanic and Atmospheric Administration (NOAA) data sets, USGS's National Hydrography Dataset, and NPS boundary files. For most parks, reference imagery was obtained from the Esri, Inc., image service.

Report cover with photo of Drakes Bay, Point Reyes National Seashore (California). <https://irma.nps.gov/App/Reference/Profile/2170770>



Due to the dynamic nature of park shorelines and boundaries and the timing and methods of data collection, there will never be a definitive, static set of statistics for NPS shoreline miles and water area. However, this project developed an updated shoreline data set for ocean, coastal, and Great Lakes units; documented the methods; and published the results in an NRSS report. The report and resulting geospatial data sets are available on the Integrated Resource Management Applications (IRMA) Data Store. Statistics for shoreline length and water area will be updated periodically as NPS boundary and shoreline data sets are updated or improved and as resources permit.

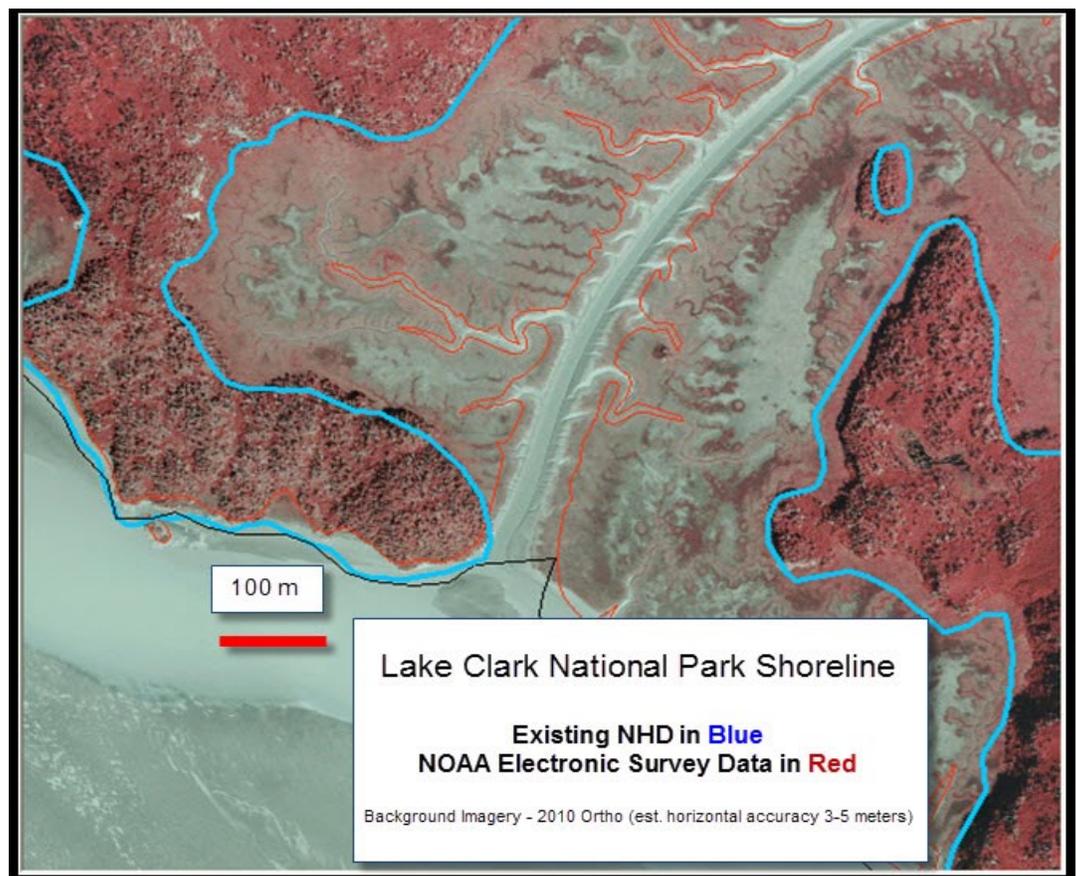
## A New Digital Shoreline for Alaska Coastal Parks

*Joel Cusick, Cartographic Specialist, Alaska Regional Office*

THE NEED FOR ACCURATE DATA AND its synthesis drives much of the work of the Water Resource Division. In FY 2011 WRD funded a project that will provide much-needed shoreline information for five Alaska coastal parks. The digital shoreline project is replacing inaccurate and poorly documented digital coastlines in the National Hydrographic Dataset (NHD) with best available tidal-datum-based shorelines from the NOAA Office of Coast Survey. The pilot phase of the project began in FY 2010 and included data acquisition and protocol development that defined data source preferences and metadata. The Alaska Regional Office worked with GeoSpatial Services of Saint Mary's University of Minnesota (SMUMN) through FY 2011 to place 95% of the approximately 2,000 kilometers (1,243 mi) of new shoreline data into NHD "edit-ready" status. The data can then be integrated into NHD final form.

The NHD shorelines for some remote parks cannot be replaced until NOAA acquires newer and higher quality data. At this time, four of the five parks are in NHD edit-ready status: Aniakchak NM&P, Lake Clark NP&P, Kenai Fjords NP, and Cape Krusenstern NM. Bering Land Bridge NP has approximately 20% of its shoreline in the final verification process. About 186 kilometers (116 mi) of estimated mean high water shoreline at Bering Land Bridge was digitized by a SMUMN staff photo interpreter. The digitizing effort was not anticipated, but due to recent imagery and small localized tidal ranges, the process was a valuable addition to the project. All NHD updates will meet Federal Geographic Data Committee metadata standards for feature level source citations and processes. The USGS will complete GeoEdit tools in early 2012, which will allow the new Alaska park shoreline data to be integrated into NHD.

The differences between old and new mapped shorelines are quite dramatic. For example, marine and marine-influenced vector data for Lake Clark National Park & Preserve increased in length by over 88% in areas of overlapping data sets. The project also discovered greater than 100 meters (328 ft) differences between marine charted shorelines and GPS confirmed shorelines. The NHD shoreline (blue) is a USGS high water line based on 1950s data. The 1986 NOAA shoreline (red) was derived from field surveys. NPS/JOEL CUSICK



# Benthic Habitat Mapping at Point Reyes National Seashore

*Thom Curdts, GIS and Remote Sensing Specialist*

THE OBJECTIVES OF THE BENTHIC Habitat Mapping Project at Point Reyes National Seashore (California) were to compile available regional seafloor mapping data, interpret newly collected data, and construct benthic habitat and geologic maps of the seashore's submerged lands. The habitat maps were constructed using the habitat classification scheme and mapping code used by the California State Mapping Program and used for benthic habitat maps of Golden Gate National Recreational Area. The classification scheme uses a coding system to distinguish benthic habitats based on surface geology.

Six map sheets (1:48,000) and one perspective view sheet of specific areas of interest were constructed for Point Reyes. They depict bathymetry, geology, and benthic habitats. Thirty-nine benthic habitat types covering 429 square kilometers (166 mi<sup>2</sup>) were defined from the interpreted data; 11 are located in estuaries and 28 on the continental shelf. Of the habitat types mapped on the continental shelf, 80% are unconsolidated sediment (greens, yellow-greens, khakis, and light browns on the map below); 16% are hard substrate (deep pink and browns);

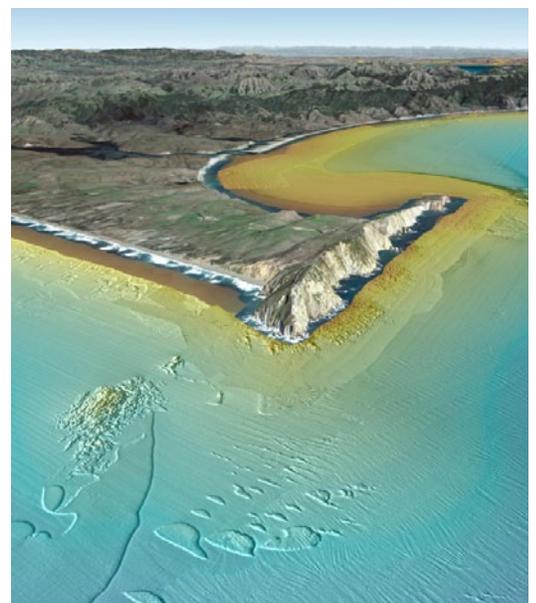
and 4% are a mixture of hard and soft substrates (blues and violets). In the estuaries, 99.7% of the habitat is soft, unconsolidated sediment and 0.3% is hard substrate.

The seashore's submerged lands are a diverse and dynamic environment. The region is relatively unaffected by urban and industrial activity and inputs—with the exception of past and declining agricultural activities. The maps show two rock seafloor exposures on the continental shelf with textural complexity (rugosity) that provides suitable habitat for rockfish and lingcod. Granitic rocks are the predominant hard substrate along the southern margin of Point Reyes Headlands. These exposed rocks extend offshore of the eastern point of the headland where they are kept clean of sediments by strong bottom currents sweeping past the point into Drakes Bay. This area is also a promising location for rockfish and lingcod.

This work is the most comprehensive, deep-water benthic habitat interpretation to date of Point Reyes submerged lands and the continental shelf. The maps create a good foundation for future ecologic, geologic, and oceanographic studies.

**Near right: Map sheet, Point Reyes National Seashore (California).** H. GARY GREENE

**Far right: 3-D Point Reyes bathymetry shows mobile sand bedforms and dunes that are swept by bottom currents around Point Reyes Headlands (Drakes Bay in the background). The bedrock outcrop on seafloor is an extension of the headlands. The striations on the seafloor are artifacts from the roll of the survey vessel.** MOSS LANDING MARINE LABORATORIES CENTER FOR HABITAT STUDIES



# Marine Recreational Fisheries of Fire Island National Seashore

*Karl Brookins, Marine Fisheries Scientist*

NUMEROUS SPECIES OF FISH HAVE been recorded in the waters around Fire Island National Seashore (New York), and sport fishing is a popular activity among seashore visitors. Fire Island finfish (true fish, unlike shellfish or jellyfish) include transients like striped bass, menhaden, eels, and weakfish, and fish that use Fire Island as nursery grounds and as adults, such as summer flounder (fluke), winter flounder, and tautog. The rich ecological value of Fire Island fish habitat likely exceeds its proportional contribution to coastline (Conover, Cerrato, and Wise 2005).

Recreational finfish fisheries occurring around the seashore were determined using 2007–2009 angler interview data from NOAA’s Marine Recreational Information Program (MRIP) (NOAA 2011). Most interviews occurred at boat ramps near—but outside—the boundaries of the national seashore; interviews were conducted at one location within the seashore. Atlantic States Marine Fisheries Commission (ASMFC) stock assessments were reviewed to determine the status of each species.

Three hook-and-line fisheries were identified: (1) ocean striped bass and bluefish shore fishery west of Fire Island; (2) bay

shore fishery for bluefish, striped bass, and summer flounder in eastern Fire Island; and (3) inland vessel-based fisheries, including private and party boats. Anglers caught striped bass, summer flounder, bluefish, winter flounder, tautog, menhaden, scup, weakfish, black sea bass, herring, harlequin bass, and skates.

The frequency of recent MRIP sampling within the seashore is inadequate to monitor, assess, and manage Fire Island fisheries. Sampling at marinas adjacent to the seashore is also inadequate due to limited inland sampling and the inability to distinguish fishing inside the seashore boundary from fishing that takes place outside.

The ASMFC identifies weakfish as depleted, winter flounder as overfished, and tautog as overfished with overfishing occurring. Bluefish, black sea bass, striped bass, and summer flounder are rebuilt to optimum harvest levels, although older age classes may not have had time to recover.

WRD analysis of MRIP data supports: (1) discussions with party, charter, rental, and private boat operators about documenting fishing location; (2) monitoring and managing angling use along ocean and inland shores; (3) listing weakfish, winter flounder, and tautog as recovering populations; and (4) developing a fishery management plan and regulations for striped bass, summer flounder, bluefish, menhaden, scup, black sea bass, herring, harlequin bass, and skate.

**Above: Aerial view of Watch Hill Marina from the bay side of Fire Island.**

**Below: Boats docked at Sailors Haven Marina. Fire Island National Seashore (New York). NPS COLLECTION**



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National Oceanic and Atmospheric Administration. 2011. Marine recreation information program. [www.countmyfish.noaa.gov/index.html](http://www.countmyfish.noaa.gov/index.html)

# A Database for Aquatic Invasive Species in Ocean, Coastal, and Great Lakes Parks

*Eva DiDonato, Marine Pollution Specialist  
Andrew Maguire, Chicago Botanic Garden*

THE NATIONAL PARK SERVICE defines an invasive species as any species that is introduced or non-indigenous to an ecosystem, and whose presence does or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112, 1999). The abundance of marine invasive species in ocean, coastal, and Great Lakes parks is poorly documented. The NPS has taken this first step of data compilation and website development to assess these invasive species.

WRD partnered with the Biological Resources Management Division Invasive Spe-

cies Program to develop an aquatic invasive species database and website. With the help of three interns from Chicago Botanic Garden, a database was developed that houses data on confirmed and potential aquatic invasive species for 84 ocean, coastal, and Great Lakes parks.

The database allows queries by park, species, or taxa; data on life histories, distribution, and threats can be downloaded from the website. The species in the database were determined from available data; updates to the list will occur with cooperation from individual parks and external agencies. The database will enhance communication among natural resource managers, park staff, and the public and contribute to effective management of invasive species.

The Great Lakes database profiles 331 species, and 654 species are profiled in the marine invasive species database. You can discover many additional facts about aquatic invasives in the databases through the NPS [Intranet website](#) and through the public [NPS website](#):

- The Asian clam (*Corbicula fluminea*) was the most widely distributed marine species; it was found in 38 parks.
- World War II Valor in the Pacific National Monument (Hawaii, Alaska, California) had the most documented invasive marine species: 218.
- Indiana Dunes National Lakeshore (Indiana) had the most documented invasive species in the Great Lakes: 125.
- Twenty-one aquatic species were documented in all five Great Lakes parks.

**A sea lamprey captured at Pictured Rocks National Lakeshore (Michigan).** NPS COLLECTION

**A boat propeller covered with Quagga mussels at Lake Mead National Recreation Area (Nevada, Arizona).** NPS COLLECTION

**For more information on aquatic invasive species in our marine and Great Lakes parks, please visit our website at [www.nature.nps.gov/water/oceancoastal/index.cfm](http://www.nature.nps.gov/water/oceancoastal/index.cfm)**



## NPS Responds to a Marine Invader

*Cliff McCreedy, Marine Fisheries Scientist*

DIVERS AND SNORKELERS VISITING coral reefs in national parks in south Florida and the Virgin Islands are likely to encounter a beautiful occupant with red stripes and long, quill-like fins. Despite its enchanting appearance, the lionfish (*Pterois volitans*) is a dangerous, uninvited guest. They are native to the western Pacific and probably entered our waters from an aquarium release in south Florida in the 1980s. The consequences are potentially severe, including impacts to park resources and values and threats to visitor safety and experience.

Lionfish are voracious predators on native fishes and invertebrates, and competitors with them for food. Lionfish threaten herbivorous fishes that maintain optimal conditions for coral recruitment and growth. These impacts will likely exacerbate the stresses of pollution, overfishing, and climate change, which undermine the ecological integrity of coral reefs. The venomous spines of the lionfish also pose a threat of injury and illness to visitors.

Efforts to monitor and control lionfish have increased as they expand their range in the Atlantic Ocean and Caribbean Sea. Biscayne National Park (Florida) established a lionfish monitoring program in 2008; the first lionfish was sighted in 2009. Since then, over 1,000 individuals have been removed by divers. Lionfish have been detected at Virgin Islands National Park and Buck Island Reef



National Monument in the Virgin Islands and Dry Tortugas and Everglades national parks in Florida.

WRD and the Southeast Region held a workshop in Miami in September 2011 to develop a lionfish response plan for parks in the Caribbean, Gulf of Mexico, and southern states along the Atlantic Ocean. It was attended by resource managers, interpreters, and risk managers from NPS units, regional offices, and Washington D.C., as well as experts in lionfish biology and control. Although participants agreed that eradication is impossible, a plan emerged that park managers can use to develop local actions. Targeted actions include (1) evaluating and prioritizing areas for lionfish control and setting numeric targets for reducing populations; (2) reporting lionfish presence and using available tools and resources for removal; (3) monitoring lionfish and native species populations and using adaptive management approaches; (4) interpreting the lionfish invasion, communicating the impacts, and engaging the public in park stewardship and invasive species response; and (5) reducing and communicating risks, ensuring safety of visitors, park staff, and volunteers, and providing training in safe lionfish handling.

**Above right: Snorklers at Buck Island Reef National Monument (Virgin Islands).** NPS COLLECTION

**Lionfish.** USGS/DON DEMARIA

Read more from *Lionfish Response Plan: A Systematic Approach to Managing Impacts from the Lionfish, an Invasive Species, in Units of the National Park System* at [www.nature.nps.gov/publications/nrpm](http://www.nature.nps.gov/publications/nrpm)



# Planning and Evaluation Branch Highlights

*Patrick Mangan, Branch Chief*



**Lewis River, Yellowstone National Park (Montana, Wyoming, Idaho).** NPS/JOHN APEL

THE PLANNING AND EVALUATION Branch (PEB) provides technical assistance and program management for water resources planning, wetland protection and restoration, and fisheries management. In 2011 the branch was renamed and reassigned programs as part of a larger reorganization of the Water Resources Division. Two of the restructuring goals were to strengthen water quality technical assistance and broaden the division's planning function in order to provide directorate-wide leadership. To that end PEB was renamed the Planning and Information Branch (PIB), and acquired the Natural Resource Challenge, Natural Resource Condition Assessment, and Water Resources Information Management programs. PEB's fisheries management, wetland protection, and restoration functions were reassigned to the Aquatic Systems Branch.

The WRD Planning Program focused on the integration of Resource Stewardship Strategy (RSS) into parks' planning processes, assistance to the Climate Change Response Program, and the review of General Management Plans. The outcomes have resulted in consideration of climate change on park resources and quantifying goals for resource management.

The Wetlands Program provided extensive support on wetlands regulatory issues, wetland condition and functional assessments, and wetlands restoration to 57 parks throughout the system. Technical assistance for wetland restoration at Great Basin National Park and Riparian Condition Evalua-

tions to support a Natural Resource Condition Assessment and RSS at Pecos National Historical Park are featured in the following pages of this report. The Wetlands Program also served as the servicewide expert in determining federal jurisdiction of "waters of the United States" and reviewing the Clean Water Cooperative Federalism Act.

In FY 2011 Fisheries Program staff assisted parks on issues such as fish community composition and health, impacts associated with hatchery operations and hatchery-produced fish, fishing regulations, lead fishing tackle, aquatic nuisance species prevention, and aquatic habitat degradation. Program staff also edited Proceedings of the Fourth Interagency Conference on Research in the Watershed; a Field Manual for the Use of Fintrol (Antimycin A) for Restoration of Native Fish Populations; and the Devils Hole Ecosystem Monitoring Plan. In addition, program staff represented NPS in a wide range of multi-interest groups such as the Aquatic Nuisance Species Task Force, the National Fish Habitat Partnership (NFHP), and several regional fish habitat partnerships under NFHP.

As part of our Emeritus Program, retired PEB Chief Mark Flora has taken the lead in a partnership with Project WET, a non-governmental organization that provides water education for teachers and their students. Mark also provided technical assistance to the Kingdom of Jordan through the International Technical Assistance Program.

# Gearing Up for the New Challenge: Climate Change

*Don Weeks, Climate Change Resource Planner*

WE ARE WATCHING A CHANGING climate unfold in front of our eyes; rising temperatures are influencing many aspects of Earth's hydrologic systems, such as precipitation, snow, ice, and permafrost. Considering climate change in park planning is now required, and in response, WRD added a new climate change resource planner position in 2011.

One of the FY 2011 projects supported by this new position was the development of the Foundation Document for Hot Springs National Park in Arkansas. The purpose of Hot Springs National Park is to protect its unique geothermal spring water and associated lands for a range of experiences and uses, making the hot springs a fundamental park resource. These geothermal springs are recharged by rainwater infiltrating through higher-elevation rock exposures of chert and novaculite. Any changes in the recharge/runoff ratio within the recharge area could affect the discharge and temperature of the hot springs (Kresse and Hays 2009). Discharge from the springs includes a small but important shallow component of cold-water recharge (Bell and Hays 2007).

The climate change projected for the Hot Springs region could influence both discharge and temperature of the park's hot springs. Based on climate models for the region, air temperature is projected to

increase between 2.6°C and 4.4°C (4.7°F and 7.9°F) and precipitation is projected to decrease between 2% and 8% between 1990 and 2100 (Gonzalez et al. 2010, IPCC 2007, Mitchell and Jones 2005). Under this projected climate future, one would expect less shallow groundwater mixing resulting in less spring discharge with warmer temperatures.

This projected climate future and the potential influences to Hot Springs National Park's fundamental resources have been incorporated into the park's Foundation Document. The basic understanding of potential climate futures can now be further developed in the more comprehensive planning efforts that tier off the Foundation Document, such as the Resource Stewardship Strategy (RSS). The NPS Park Planning and Special Studies Program, with support from Hot Springs National Park, is now funding a USGS watershed modeling effort for analysis of future scenarios of development within the Hot Springs recharge area, along with plausible climate futures.

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**Hot Springs National Park (Arkansas) geothermal area.** NPS/  
DON WEEKS



# Bear Creek Campground Wetland Restoration

*Kevin F. Noon, Wetlands Specialist*

PARK MANAGERS AT GREAT BASIN National Park (Nevada) are developing a plan, based on a solid understanding of the geology and hydrology of the area, to remove fill from Bear Creek Campground in order to re-establish pre-disturbance hydrologic conditions across a three-acre (1.2-ha) wetland area. Water Resources Division staff are working with park staff to determine the best course of action for removing a 1,215-foot (370-m) campground loop road, associated camping spaces, and a vault toilet.

WRD staff reviewed specific hydrologic conditions and discussed numerous treatment options around the entire length of the loop road. For example, park and WRD staff discussed the treatment of a ditch and culvert system that was put in place by the engineers that designed the campground road. Rather than maintain the function of a ditch, which essentially channels water and drains the hydric condition of the wetland, staff agreed to fill the ditch and recreate surface water, sheet-flow conditions.

WRD also recommends removal of two culverts that direct the flow of channels under the main campground access road. These channels transmit infrequent flows from severe local storms or snow melt from an area just above the restoration site. The culverts direct these flows under the access road and into the emergent wetland in the restoration area. Instead of culverts, WRD recom-



mends the road be re-graded and fitted with concrete pads or low-flow structures.

Part of the restoration will include removing a deep-vault toilet. WRD staff believe that part of the vault is below the groundwater table during the spring wet season. Burying the vault in place will be the least disruptive and cheapest solution once it has been cleansed of contaminants. Using a jack hammer attachment on a back hoe, the top one-third of the vault walls will be broken off and placed inside the vault along with large boulders. Then the vault cavity can be backfilled up to the surface or finish grade with appropriate soil material. This process will weigh the vault down, eliminate any movement from groundwater pressure, and provide a gap above the vault walls to allow for an uninterrupted root zone for plant growth. The Bear Creek Campground restoration is scheduled for completion in 2012.

**Above right: Plan view of the Bear Creek restoration area.**  
NPS/K. NOON

**A campground parking space on the fill. Note the concrete pad and table also in the wetland with groundwater exposed in the firepit.** Great Basin National Park (Nevada). NPS/K. NOON



## Riparian Condition Evaluations Support Park Assessment and Planning Efforts

*Joel Wagner, Wetlands Program Lead*  
*Michael Martin, Hydrologist*



Riparian areas along the Pecos River were rated as being in “proper functioning condition.” This photo from the southernmost assessment reach shows a large and topographically complex riparian zone with a diverse riparian/wetland vegetation community. NPS/MICHAEL MARTIN

PECOS NATIONAL HISTORICAL PARK (New Mexico) preserves 12,000 years of history including Pecos Pueblo and Spanish Mission ruins, the Santa Fe Trail, and the site of the Civil War Battle of Glorieta Pass. These cultural resources lie amidst piñon, juniper, and pine woodlands; the Pecos River; Glorieta Creek; and other natural resource features of the park.

In 2010 and 2011 the NPS and cooperators conducted a Natural Resource Condition Assessment (NRCA) for the park. An NRCA evaluates current conditions, critical data gaps, and threat and stressor influences on important park natural resources, including riparian areas. Although previous park studies mapped riparian vegetation communities and collected vegetation data suitable for evaluating change over time, they weren’t designed to evaluate riparian functional condition or ecological health. Therefore park managers asked WRD to conduct riparian condition assessments for the Pecos River and lower Glorieta Creek in support of the NRCA study.

We used Bureau of Land Management “proper functioning condition” (PFC) procedures for our riparian assessments. All Pecos River reaches were determined to be in PFC (highest possible rating). However, the lower Glorieta Creek reach was

rated “functional—at risk with a downward trend” due to a manufactured levee adjacent to the stream channel. The levee constrains the channel to an artificially narrow riparian corridor, which limits its potential size, structural complexity, and habitat value. In addition, floods have the potential to erode through the levee and deposit excessive sediment into adjacent, recently restored wetlands and downstream aquatic habitats. We published our findings in an NRSS report titled “Riparian Condition Assessments for the Pecos River and Lower Glorieta Creek, Pecos National Historical Park, NM” (NPS/NRSS/WRD/NRR—2011/422). The report recommends removal of the levee to connect the restored wetland area to the stream corridor, allow the riparian system to reach its full ecological potential, and eliminate the threat of excessive sediment deposition in aquatic environments.

Using information from the NRCA and other sources, park managers are now developing a Resource Stewardship Strategy (RSS). An RSS is a planning process and document that serves as a planning link between the desired conditions identified in a park’s GMP and the actions needed to achieve them. The WRD riparian assessments provided essential resource condition information to help park managers develop a successful RSS.

A manufactured levee (center) separates recently restored riparian/wetland habitat (left) from Glorieta Creek (right, hidden by vegetation). The levee constrains natural biological and hydrologic processes in the riparian corridor and is a potential source of excess sediment deposition into nearby aquatic systems. Pecos National Historical Park (New Mexico). NPS/JOEL WAGNER



## Monitoring an Endangered Tallgrass Prairie Fish

*Nic Medley, Fisheries Biologist*

THE FEDERALLY ENDANGERED Topeka shiner (*Notropis topeka*) is a small minnow that inhabits small, cool, headwater streams within the tallgrass prairie ecosystem of the American Midwest. The fish was once abundant and widely distributed, but development and agriculture have degraded stream habitat and caused the local extinction (extirpation) of many populations.

The Topeka shiner has been documented within the Tallgrass Prairie National Preserve located in the Flint Hills Region of Kansas. Because the fish is endangered, the NPS is required to protect and recover this species. The preserve is owned almost entirely by The Nature Conservancy but administered cooperatively with the NPS. The purpose of Tallgrass Prairie is to preserve, protect, and interpret an example of a tallgrass prairie ecosystem and the cultural features that tell the story of human interaction with the prairie environment. Much of the preserve is managed as a working cattle ranch. Park managers seek a healthy balance between the seemingly contradictory goals of preserving the ranching heritage while preserving unimpaired the small streams within this unique ecosystem.

NPS inventory and monitoring data suggest that the Topeka shiner population within the preserve has declined in the last decade. While the data suggests a possible change in the status of the fish, the monitoring program was not designed to provide accurate data on the status of a species so rare and difficult to detect or to understand cause and effect relationships between the species' status and management activities. At this time, the true status of the Topeka shiner populations within Tallgrass Prairie is uncertain. Preserve managers need to better understand the population status and distribution of the fish so that management actions can be taken to protect the fish and its habitat.

WRD staff are working with the preserve to develop a monitoring plan. The objectives are to conduct detailed presence/absence surveys to document the spatial and temporal occupancy of sites within Tallgrass Prairie and to conduct population estimates. A better understanding of Topeka shiner populations will provide important data to test specific hypotheses regarding the fish's status and its response to environmental change and management activities.

**Near right: An ungrazed stream within Tallgrass Prairie National Preserve. Far right: A grazed stream within Tallgrass Prairie National Preserve (Kansas). NPS/NIC MEDLEY**



## Restoration of Aimakapa Fishpond

*Kevin F. Noon, Wetlands Specialist*  
*John Wullschleger, Fisheries Program Leader*

AIMAKAPA FISHPOND IN KALOKO-Honokōhau National Historical Park (Hawaii) is a *loko pu'uone*, a large natural water body trapped behind sand dunes. Historically it was connected to the ocean by a stone-lined channel and used by native Hawaiians for aquaculture. In addition to its historic and cultural values, the 30-acre (12-ha) pond provides mud flat foraging and upland nesting habitat for the endangered Hawaiian stilt (*Himantopus mexicanus knudseni*) and Hawaiian coot (*Fulica alai*). The contiguous complex supports the native sedges kaluha and makaloa (*Bolboschoenus maritimus* and *Cyperus laevigatus*) as well the Hawaiian o'pae ula (the shrimp *Metabetaeus lohena*) and a damselfly (*Megalagrion xanthomelas*), which are candidates for listing under the Endangered Species Act.

The challenge facing Aimakapa Fishpond is the spread of two invasive plants, pickleweed (*Batis maritima*) and paspalum (*Paspalum* sp.). These invasives threaten the ecologically important mud flats, reducing the open water area of the pond to 15 acres (6 ha). This has altered the abundance, composition, and diversity of soil microbe and animal communities, resulting in a shift from a detritus-based to an algae-based food web and reducing food for endemic fish and shorebirds. In addition, the shift from open tidal flat to vegetated marsh has resulted in physical conditions that limit the access of most foraging birds and fish species to food sources.



The restoration of the Aimakapa Fishpond system is a priority for Kaloko-Honokōhau and WRD. Contractors from the University of California Davis Cooperative Ecosystem Studies Unit are developing a vegetation management plan that will guide eradication of the invasive plants and restore the mud flat wetlands.

Since this effort began, WRD staff has recognized that tilapia, an invasive fish established in the pond, needs to be addressed as a component of restoration. One possibility is that removal of non-native vegetation could actually allow the tilapia population to expand. Thus, WRD High Priority funds are supporting a separate environmental assessment (EA) that will be developed by the USGS Southeast Ecological Science Center. This will include a literature review, field assessments, characterization of the fish community, and the evaluation of alternative eradication methods for tilapia. As time permits this effort may also consider non-native fish in waters of nearby NPS units such as Pu'uhonua o Hōnaunau National Historical Park.

**Above: Hawaiian coot and Hawaiian stilt in Aimakapa Fishpond. Right: Aerial view of Aimakapa Fishpond, Kaloko-Honokōhau National Historical Park (Hawaii). NPS COLLECTION**

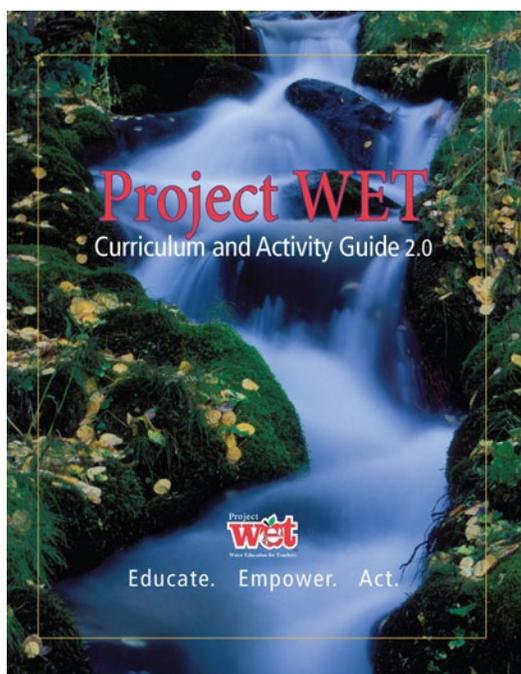


## A Partnership with Project WET to Enhance Water Education

Mark Flora, Emeritus Volunteer

IN A CALL TO ACTION, THE NPS identifies “Advancing the NPS Education Mission” as one of four priority actions to lead the bureau into its second century. In 2011 WRD entered a partnership with the Project WET Foundation, an award-winning and internationally recognized water education program, to develop products that educate youth and other park visitors about aquatic resources and issues within the National Park System.

Linda Drees, NRSS partnership manager, and Dennis Nelson, Project WET president, announced the partnership project at *Sustaining the Blue Planet—Global Water Education Conference*. PROJECT WET/HALE THOMAS-HILBURN



The *Discover the Waters of our National Parks* partnership will use national and state curriculum standards in conjunction with park-specific resource information to create materials that tell the stories of a park’s water. Specially designed workshops will engage park staff, teachers, informal educators (including youth mentors), and other environmental education advocates for the purpose of teaching water resource concepts applicable to their home environments. Both partners will work cooperatively in the development and implementation of hands-on, science-based activities that serve to protect the resource, provide high-quality education, and appeal to multiple generations. Products will make use of diverse media (including publications, training, film, and internet) and will be available to the park’s local communities and classrooms across the country.

The *Discover the Waters of our National Parks* partnership was announced at the *Sustaining the Blue Planet—Global Water Education Conference* in September 2011. This conference attracted over 200 participants interested in water-related environmental education from more than 40 countries. The first phase of the partnership has been completed with a collaborative lesson included in *Project WET Curriculum and Activity Guide 2.0*, published in 2011. Currently, fundraising efforts are underway for the next phase—working with five pilot parks to create and implement site-specific education projects. The pilot parks will each represent one of five different aquatic environment categories: montane (top of mountain), Great Lakes, big river, coastal/estuarine, and urban river. A selection of the five pilot parks and an alternative in each category will be made early in 2012. As the project develops, more parks will be included in this exciting collaborative endeavor.

## Thinking Globally, Sharing Locally

*Mark Flora, Emeritus Volunteer*

IN 2011 THE WATER RESOURCES Division supported the International Technical Assistance Program in developing and leading two study tours that paired visiting park officials from the Kingdom of Jordan with National Park Service counterparts to share knowledge, ideas, and best management practices for the preservation of natural and cultural resources.

The “Mediterranean Forest Management Study Tour” in May was developed as part of the USAID-funded Jordan Parks Project under the auspices of the U.S. Department of the Interior Office of International Affairs. The purpose of this study tour was to provide Jordanian NGOs whose responsibilities include managing protected Mediterranean forest habitats with an opportunity to observe and discuss management protocols used within similar Mediterranean ecosystem protected areas managed by the U.S. Department of the Interior. With input from the NPS Pacific West Regional Office, we decided to focus this tour on Santa Monica Mountains National Recreation Area and Pinnacles National Monument in California. Study tour participants had the opportunity to interact with their U.S.

counterparts and share expertise in natural resource management disciplines including habitat fragmentation, altered fire regime, non-native invasive species management, and the implementation of effective inventory and monitoring techniques.



The “Petra Park Managers Study Tour” in September provided mid-level managers from Petra Archaeological Park in Jordan with an opportunity to meet with their U.S. counterparts and observe and discuss management protocols used in the protection and preservation of cultural resources in the United States. Park managers from Jordan, including a cultural resource management specialist and park operations specialist, met and interacted with peers at Grand Canyon National Park (Arizona), Mesa Verde National Park (Colorado), and Pecos National Historical Park (New Mexico), as well as discussing topics of mutual interest with program managers with NPS Vanishing Treasures Program, NPS Western Archaeological and Conservation Center, and State of New Mexico Office of Cultural Affairs. In addition, broader topics related to protected area management were included relating to visitor use and services, concessions management, interpretation and environmental education, and developing effective partnerships in with local communities and interest groups.

**Above right: Vegetation Program Lead John Tizler reviewing park boundary and management zoning in Santa Monica Mountains National Recreation Area (California) with Loay Al Azzam (Dibeen Forest Reserve), Yaseen Ananbeh (RSCN Biological Inventories and Field Studies Program), and Sameh Al Khatatbeh (Ajloun Forest Reserve). NPS/MARK FLORA**

**Near right: Tahani al-Salhi (Petra Archaeological Park) and Victor Ortiz (historic mason) discuss restoration and maintenance techniques used in the preservation of free-standing adobe structures at Pecos National Historical Park (Texas). NPS/MARK FLORA**



# Water Operations Branch Highlights

*Gary M. Smillie, Acting Branch Chief*



**Kayaking on Jackson Lake, Grand Teton National Park (Wyoming).** NPS COLLECTION

FISCAL YEAR 2011 WAS ANOTHER eventful and successful year for the staff of the Water Operations Branch (WOB). Staff members contributed in many and varied ways to the management, protection, and restoration of the waters and related habitats of numerous National Park Service units. WOB has been a part of the Water Resources Division for over 20 years, providing technical assistance and funding project oversight in the areas of surface water and groundwater hydrology, water quality, contaminant transport, natural resource condition assessment, information management, erosion and sedimentation, floodplain management, hydraulic modeling, and fluvial and wetland restoration. This assistance has been provided at the park level as well as regional and WASO levels and includes servicewide programs such as the Natural Resource Condition Assessment (NRCA) Program, Vital Signs Water Quality Monitoring, and the USGS–NPS Water Quality Partnership.

WOB staff contributed significantly to an exciting milestone achieved by the NPS in FY 2011—the start of the removal of two dams on the Elwha River on the Olympic Peninsula in Washington State. Also during FY 2011 WOB water quality staff, in conjunction with the Geologic Resources Division, provided critical reviews of a number of documents dealing with potential threats and impacts to parks from Marcellus Shale development. Other achievements for the water quality program for FY 2011 included working with Yellowstone National Park staff and Montana Department of Environ-

mental Quality to coordinate various monitoring activities at the McLaren tailings site, providing Indiana Dunes National Lakeshore assistance in conducting a comprehensive review of the Baseline Environment Risk Assessment of the Bailly Generating Plant RCRA site, and playing an instrumental role in having a responsible party undertake active remediation of a Leaking Underground Storage Tank (LUST) site at Mesa Verde National Park.

Other important branch projects included continuing NPSTORET development with increased functionality and a growing servicewide database. The NRCA Program funded project starts at 25 park units in FY 2011 and provided technical support to a number of ongoing projects. The hydrology program carried a heavy technical assistance load in FY 2011 as is the norm and provided coordination and support on several funded projects including such issues as climate change, wells and public water supplies, wetlands restorations, and hydraulic modeling of park rivers.

As of FY 2012 a new branch structure has been adopted by the WRD, and the WOB will no longer exist as an entity. Staff members from the former WOB and other WRD branches have been realigned into a new branch structure that conforms more closely to evolving agency needs. Parks, regions, and WASO offices can rest assured, however, that all former functions provided by the Water Operations Branch will continue to be effectively addressed by the new organizational structure.

## Dam Removals on the Elwha River Began in FY 2011

*Gary M. Smillie, Hydrologist*

FOLLOWING NEARLY TWO DECADES of planning by NPS and other federal agencies, deconstruction of two dams on the Elwha River in Washington State—the Elwha and Glines Canyon Dams—began near the end of FY 2011. The larger of the two dams, Glines Canyon, and its reservoir, Lake Mills, are entirely within the boundaries of Olympic National Park. Elwha Dam impounds Lake Aldwell, downstream from the park, and is located about five miles (8 km) upstream from the sea. Removal of these dams is part of a project to restore an anadromous fishery and related ecosystem in Olympic National Park and to restore, to the extent possible, natural geomorphology and vegetation in the former lake beds. Once removed, the length of river and tributaries available to anadromous fish, those that spend most of their lives at sea but spawn in fresh water, will increase from about five miles (8 km) to about 80 miles (129 km).

The removal of these dams is a high-profile project in the National Park Service. These are the largest dams to date to be removed in North America, and the restoration effort will be the second-largest ever undertaken by the NPS (second only to the Everglades restoration). In attendance at the 17 September 2011 Ground Breaking Ceremony were Secretary of the Interior Ken Salazar,

NPS Director Jon Jarvis, Washington State Governor Chris Gregoire, and a host of other national, local, and tribal dignitaries.

Water Operations Branch staff have been involved with the Elwha Project since the early 1990s and have assisted in the development of sediment management aspects of the project. The contract to deconstruct the two dams was awarded to Barnard Construction of Bozeman, Montana, and is being administered by the Denver Service Center. The project is expected to take about three years and includes periods of dam removal “pauses” to lessen sediment impacts to the river downstream during critical fish life-stages. The structures are being incrementally removed from the top down. Initially, only turbidity impacts are anticipated downstream, but eventually coarse sediments eroded from the reservoir deltas will be released downstream. The release of coarse sediment is not anticipated until at least late 2012.

Because of the scale of the project and its scientific opportunities, professional interest in the project is high and many agencies and other institutions are collaborating in various studies. “The restoration project is a testament to what can happen when diverse groups find a way to work together and achieve shared goals of restoration for a river, a people, an ecosystem, and a national park,” said Director Jarvis.

Updates to the project can be found at [www.nps.gov/olym](http://www.nps.gov/olym), and dam removal progress and fluvial processes on the deltas can be observed in essentially real time at: [www.video-monitoring.com/construction/olympic/js.htm](http://www.video-monitoring.com/construction/olympic/js.htm)

**Elwha Dam from downstream with Lake Aldwell impounded in the background, taken from the webcam on 24 August 2011. Olympic National Park (Washington). NPS COLLECTION**



*"I may not see the abundance of fish come back in my lifetime, but I would like to see it come back for my grandchildren, my great-grandchildren, and the rest of my people, the following generations to come. It was a gift from our creator, it was our culture and heritage.*

Beatrice Charles, Klallam tribal elder

# The Real Threats from Hydraulic Fracturing and Natural Gas Development

*Pete Penoyer, Hydrogeologist*

IN SUPPORT OF THE NORTHEAST Region parks, WRD staff conducted research on threats posed by deep underground hydraulic fracturing (fracking) from Marcellus Shale gas development. The primary concern was the threat of fracking chemicals contaminating potable aquifers and drinking water supplies. Research consisted of a review of literature; discussions with state regulators and industry representatives; and participation in several hydraulic fracturing symposiums, forums, conferences, and an EPA workshop on migration of hydraulic fracturing chemicals.

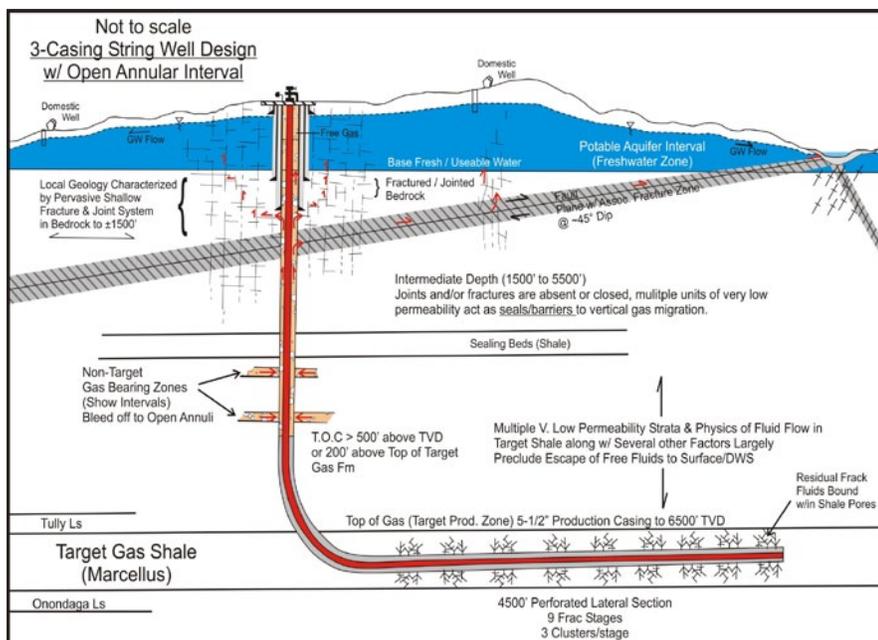
Among subject matter experts there appears to be a strong consensus that risk of chemical migration to drinking water supplies and potable aquifers when hydraulic fracturing is conducted deep underground is extremely remote. This is largely due to the absence of viable migration pathways, the isolated conditions and physical constraints under which deep hydraulic fracturing in lateral boreholes occurs, and the monitoring mea-

asures taken by industry to detect and limit the potential for fracking chemicals to extend beyond the Marcellus Shale formation. Surface chemical spills are also a concern, but these are largely localized and manageable in operations of this scale.

The problem that staff did discover in its analysis is the potential for stray gas migration via the annulus, the space between the borehole wall, and the casing, or production string, which carries the gas to the surface. This more common phenomenon can impact a drinking water supply through poor well design or when significant sections of the annulus are left open or uncemented. When a well is drilled, the borehole cuts through many rock layers to reach the targeted Marcellus Shale. If natural fractures in these shallow bedrock layers occur, the annular path coupled with migration through shallow fractures can allow non-target gas to reach the shallow aquifer thereby circumventing the intended protections of the surface casing (steel and cement) to isolate drinking water supplies. Risks include overpressurized gas in the annulus contributing to levels of methane in drinking water supplies sufficient to cause an explosive hazard.

WRD staff concluded that stray gas migration from gas-bearing intervals above the target formation is a more significant long-term threat to drinking water supplies than the actual release of chemicals used in the fracking process. These chemicals are well isolated during the fracking and production phases of Marcellus Shale development. Instead, parks should focus on the consequence of stray gas migration as the most significant and potentially more widespread threat to drinking water supplies from natural gas development.

**Hydraulic fracturing schematic of Marcellus Shale gas development illustrating stray gas migration pathways.** NPS/PETE PENOYER



## NPS Hydrographic and Impairment Statistics

*Dean Tucker, Information Management Program Leader  
Jia Ling, Impaired Waters Database Manager*

HAVE YOU EVER WONDERED HOW many miles of streams or acres of lakes exist in a particular park or within the entire National Park System; or how many miles of streams or acres of lakes are considered “impaired” by states under the Clean Water Act? Using WRD’s recently updated Hydrographic and Impairments Statistics (HIS) database ([www.nature.nps.gov/water/HIS](http://www.nature.nps.gov/water/HIS)) you can find the answers to these and other hydrographic questions.

The HIS database unites data from three sources: (1) USGS’s high-resolution National Hydrography Dataset (NHD); (2) NPS Administrative Park Boundaries Data-

set; and (3) the latest state Clean Water Act reports. The HIS database is dynamic. Calculated statistics will change as larger scale hydrography slowly replace the 1:24,000 (1:63,360 for Alaska) scale hydrography that currently comprise the lion’s share of the NHD; park boundaries are revised by the Land Resources Division or new parks are added; and states report their impairment lists to the EPA biennially.

During FY 2012 the HIS will be enhanced to allow users to obtain lists of parks impaired by specific pollutants and to view impairments on a map.

According to the latest statistics, the National Park System contains approximately 168,250 miles (270,714 km) of perennial, intermittent, and ephemeral streams/rivers and canals (waterways). Of these miles, approximately 7,940 miles (12,775 km) are considered impaired by states under section 303(d) of the Clean Water Act. The most common waterway impairments are mercury, impaired biota, salinity, PCBs, and metals.

**Table 1. Top 10 national park units arrayed for waterway mileage and impaired waterway mileage according to HIS**

#	Park Unit	Total Waterway		#	Park Unit	Impaired Waterway	
		Miles	Kilometers			Miles	Kilometers
1	Gates of the Arctic	16,227	26,109	1	Everglades	1,741	2,801
2	Wrangell–St. Elias	13,765	22,148	2	Great Smoky Mnts.	1,111	1,788
3	Death Valley	12,972	20,872	3	Capitol Reef	682	1,097
4	Noatak	12,182	19,601	4	C & O Canal	404	650
5	Denali	10,100	16,251	5	Zion	302	486
6	Yellowstone	6,540	10,523	6	Rocky Mountain	298	479
7	Mojave	6,133	9,868	7	Big Cypress	274	441
8	Lake Clark	6,080	9,783	8	Timucuan	269	433
9	Katmai	5,800	9,332	9	Cuyahoga Valley	228	367
10	Big Bend	5,253	8,452	10	Rio Grande	184	296

The National Park System also contains approximately 4,410,200 acres (1,784,807 ha) of lakes, reservoirs, and oceans (waterbodies) of which approximately 1,471,622 acres (595,582 ha) are impaired. The most common waterbody impairments are mercury, PCBs, pesticides, and dioxins.

**Table 2. Top 10 national park units arrayed for waterbody acreage and impaired waterbody acreage according to HIS**

#	Park Unit	Total Waterbody		#	Park Unit	Impaired Waterbody	
		Acres	Hectares			Acres	Hectares
1	Glacier Bay	629,522	254,768	1	Everglades	578,261	234,022
2	Everglades	588,013	237,969	2	Isle Royale	412,273	166,847
3	Isle Royale	417,103	168,802	3	Voyageurs	84,344	34,134
4	Katmai	327,017	132,344	4	Padre Island	70,522	28,540
5	Bering Land Bridge	221,662	89,707	5	Lake Roosevelt	69,988	28,324
6	Biscayne	165,111	66,820	6	Dry Tortugas	65,476	26,498
7	Lake Mead	161,965	65,547	7	Canaveral	31,798	12,869
8	Glen Canyon	157,318	63,667	8	Apostle Islands	27,125	10,977
9	Lake Clark	143,861	58,221	9	Cape Lookout	16,574	6,707
10	Channel Islands	119,167	48,227	10	Lake Meredith	16,321	6,605

# Restoration of Quitobaquito Pond

Larry Martin, Hydrologist

THE POND AT QUITOBAQUITO Springs in Organ Pipe Cactus National Monument (Arizona) is a refuge for the Rio Sonoyta pupfish (*Cyprinodon eremus*) and Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*). Water flows into the pond from several local springs. In the mid-1990s, park staff noticed that the pond was not being maintained at its full level. Beginning in 2005, and through 2006–2009, the surface elevation of Quitobaquito Pond fell to extremely low levels, unprecedented since it was dredged and deepened in 1962. Normally averaging about 25 to 40 inches (64 to 102 cm) deep and about 27,000 ft<sup>2</sup> (2,508 m<sup>2</sup>) in surface area, by 2008 the pond averaged 1.5 inches (4 cm) deep and 40% of its normal surface area. This loss of surface area and total water volume presented imminent threats to the Rio Sonoyta pupfish and the Sonoyta mud turtle. At first, the loss of water was attributed to drought conditions causing a decrease of flow from the springs. Investigations at the site eventually identified excessive leakage from the pond as the primary cause of water level decline.

the threats to Quitobaquito Pond included (1) evacuating pupfish and mud turtles to temporary holding facilities; (2) calculating a water budget for the system; (3) trucking over 83,000 gallons of water to the pond in mid-summer 2008; (4) clearing vegetation from strategic areas including the manual removal of bulrush; (5) making physical repairs to the pond’s infrastructure including relining the bottom, rehabilitating the berm, and repairing the channel; and (7) ensuring regulatory compliance.

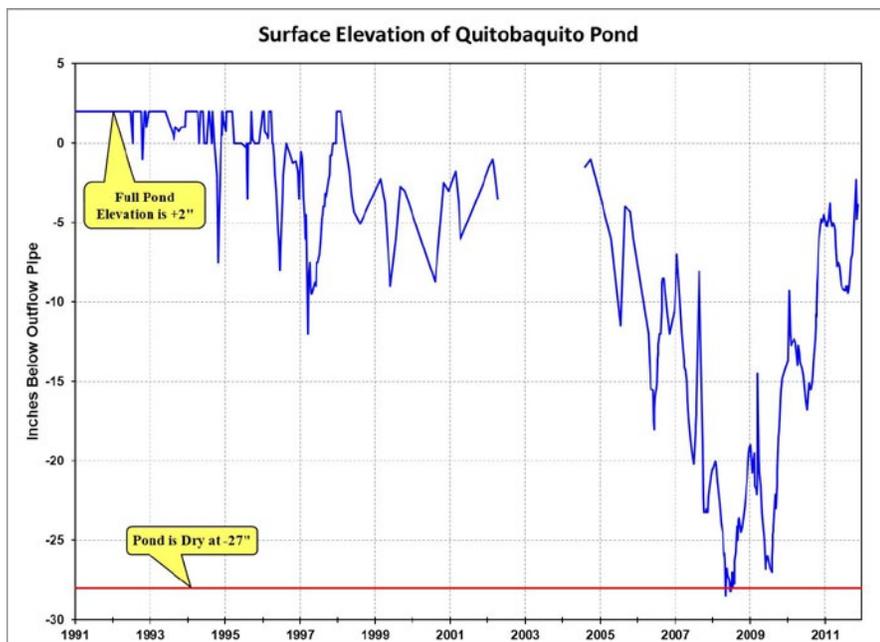
It appears that these actions have stopped the leak. The pond is currently holding at about the “minus 5 inches” level or higher, which is the highest stable level since 2005 or earlier. The pond was essentially dead and gone in midsummer 2008 and 2009. We regained 24 inches (61 cm) of water depth (so far), which is 85% or more of the maximum pond volume.

Quitobaquito Pond is 70 meters (230 ft) north of the U.S.–Mexico border, and about two hundred meters (656 ft) north of Mexico Highway 2. The Quitobaquito area has been closed to the public for seven years, and all NPS work parties must be accompanied by NPS law enforcement. Work at the site entails considerable logistical challenges and employee security issues.

Right: Quitobaquito Pond near its lowest point on 26 July 2008 (above) and at minus 5 pond level on 13 December 2010 (below). Organ Pipe Cactus National Monument (Arizona). NPS COLLECTION

Pond data from 1991–2011. NPS/LARRY MARTIN

Actions taken during 2007–2010 to mitigate



# Hydraulic Modeling of the Stehekin River

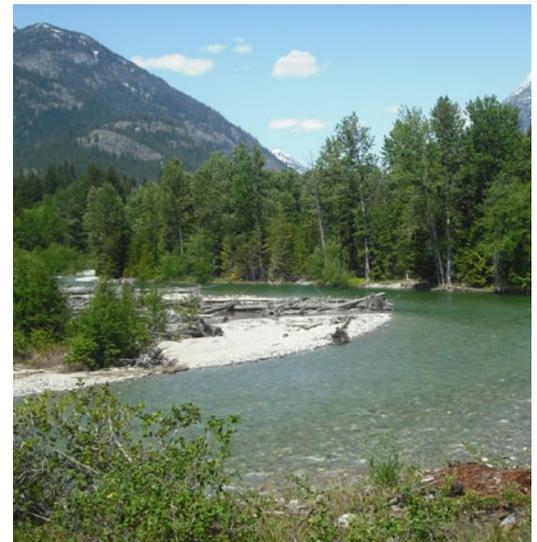
*Michael Martin, Hydrologist*

*Katherine Converse, Hydrology SCEP*

*Jon Riedle, Geologist, North Cascades National Park Complex*

IN RESPONSE TO SEVERAL SEVERE flood events over the past 15 years, North Cascades National Park Complex (Washington) is developing the Stehekin River Corridor Implementation Plan. The plan is intended to protect natural riparian values, facilitate park operations, and foster cooperation between the park and local residents along the river. In support of the plan, WRD and park staff completed a multi-phase data compilation exercise to create a hydraulic model and analyze a variety of flows along the Stehekin River. The topographic information was derived from two different ground surveys and a digital elevation model (DEM) based on LIDAR data. Merging these three data sets presented several challenges as the two ground surveys used different datums and the DEM required post-processing of the raw LIDAR data to achieve desired accuracy. We projected these three data sets into a common datum and then extracted 56 individual channel and floodplain cross sections to complete a HEC-RAS model representing over 3,000 feet (914 m) of the Stehekin River.

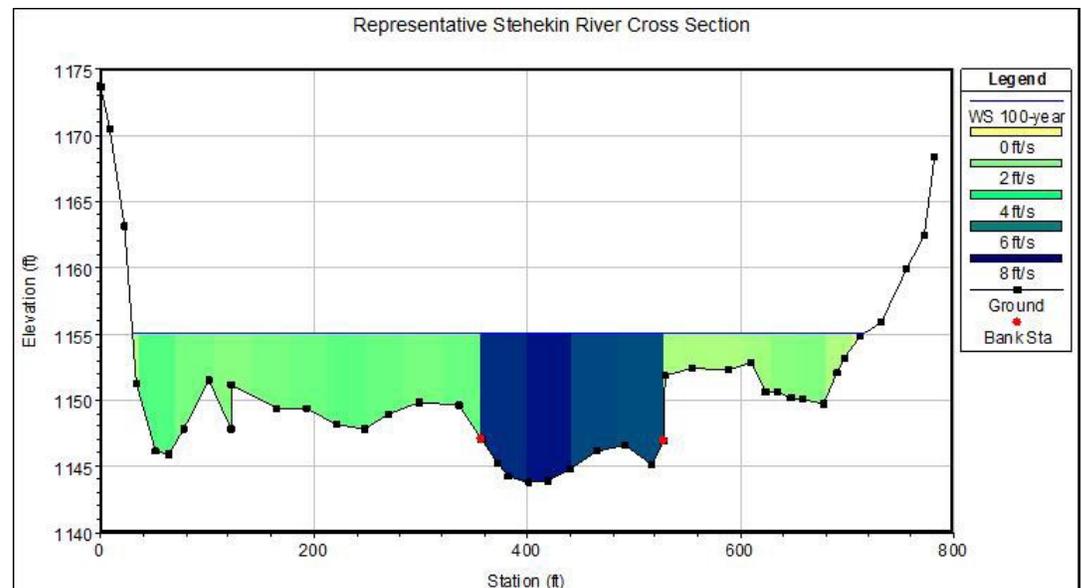
plain may have changed over the last few decades as a result of several substantial flow events and geomorphic evolution of the channel. Additionally, park staff is interested in using output from the model to understand how hydraulic parameters such as velocity and stream power affect the sediment dynamics of the river, especially the large woody debris that forms extensive logjams and may cause dramatic shifts in channel morphology. Answers to these questions are expected in FY 2012, while continued application of this model to other hydrologic questions will be ongoing.



The overall purpose of the modeling exercise is to evaluate how the 100-year flood-

**Above right: View of the Stehekin River along a prominent meander bend. Note the presence of large woody debris on the overbank area. North Cascades National Park Complex (Washington). NPS/MICHAEL MARTIN**

**Output from HEC-RAS model showing a representative channel and floodplain cross section for the Stehekin River with the modeled 100-year flow water surface and the calculated velocity profile. NPS/MICHAEL MARTIN**





# Water Rights Branch Highlights

*Bill Hansen, Branch Chief*

**Obed Wild and Scenic River in Tennessee.** NPS COLLECTION

THE WATER RIGHTS BRANCH (WRB) completed a period of transition in FY 2011, and I was honored to be selected as the fourth branch chief in our 25-year history. I look forward to leading a very talented group of professionals that are well suited to continue our tradition of using sound science and creative solutions to protect water resources in national parks.

WRB manages the servicewide program to secure and protect NPS water and water rights through all available mechanisms. Challenges such as water allocation shortages, energy development, and climate change continue to make our work interesting and complex. WRB is becoming more involved in other processes (environmental assessments, federal agency permitting, Wild and Scenic River management, and state rule development) to protect flows and groundwater levels, particularly in the Midwest and Eastern United States.

During 2011 WRB continued to represent the NPS as a cooperator on the BLM Solar Programmatic Environmental Impact Statement; the BLM Draft EIS for the Southern Nevada Water Authority's pipeline right-of-way in Clark, Lincoln, and White Pine counties; and Indian water right negotiation teams for the Blackfoot Nation, the Navajo Nation-Hopi Tribe, the Hualapai Tribe, the Havasupai Tribe, and the Yavapai-Apache Nation. These efforts required closely working with parks, other NRSS divisions, the directorate, and the Department of the Interior to develop and recommend park protection strategies. The branch also con-

tinued to provide leadership of the NPS Wild and Scenic Rivers Program, including providing technical and policy guidance to Saint Croix National Scenic Riverway, the directorate, and the department regarding the controversial Stillwater Bridge crossing. In addition, WRB staff helped facilitate three Outstandingly Remarkable Value workshops and continued to provide technical support in conducting water resource project evaluations.

WRB continued to develop high-quality science products including the completion of 16 gauge station folders (Death Valley NP, Grand Teton NP, and Montezuma Castle NM); the Upper Great Salt Lake Desert Groundwater System Model (Great Basin NP); vegetation monitoring of reservoir releases on the Gunnison River (Black Canyon of the Gunnison NP); gain/loss investigation on the Niobrara and Rio Grande Rivers (Niobrara NSR and Big Bend NP); and a numerical groundwater model to simulate effects of groundwater withdrawals near Kaloko-Honokōhau National Historical Park. WRB staff describe some of our efforts to protect water in Chickasaw National Recreation Area, Dinosaur National Monument, Grand Teton National Park, Point Reyes National Seashore, White Sands National Monument, and Wind Cave National Park in the following articles.

WRB wants to thank dedicated park and regional staff for supporting our efforts in 2011, and we encourage you to call on WRB whenever water resources or water rights are at risk.

## Arbuckle Simpson Hydrologic Study Completed

*Jennifer Back, Hydrologist*

THE LANDS THAT ENCOMPASS THE Historic Travertine District in Chickasaw National Recreation Area in south-central Oklahoma were set aside in 1902 to protect the flow of springs and streams. Since that time, many of the smallest springs have been lost. The two largest remaining springs, Antelope and Buffalo springs, obtain their discharge from the Arbuckle Simpson aquifer.

In 2003 efforts to construct a pipeline to convey water from the Arbuckle Simpson aquifer to communities 50 miles (80 km) away near Oklahoma City generated concern from local citizens. The project proposed to withdraw as much as 80,000 acre-feet (98.6 million m<sup>3</sup>) of water per year, more than fifteen times the reported average annual use at that time. Local citizens—neighbors of Chickasaw—responded by creating a local aquifer protection group and successfully lobbying for the passage of new state legislation. This precedent-setting legislation was the first in Oklahoma to recognize the connection between groundwater and surface water.

Senate Bill 288 imposed a moratorium on the issuance of groundwater permits for use outside the counties that overlay the

aquifer until such time as a hydrologic study was completed. The goal of the mandated hydrologic study was to determine a maximum annual yield for the aquifer that would not reduce the flow of water from springs or streams, including springs in the recreation area. The Water Rights Branch has represented Chickasaw throughout the multi-year hydrologic study by attending numerous stakeholder meetings, participating on technical advisory panels, and providing formal comments at public meetings. Results from the recently completed study indicate that the amount of water allocated in temporary permits prior to the legislation was not sustainable and the amount available for appropriation is much less than originally thought.

The final determination of maximum annual yield will have important implications for Chickasaw managers and their efforts to protect remaining spring flows. The Oklahoma Water Resources Board is expected to issue management recommendations and a determination of maximum annual yield in 2012. WRB will continue to work on behalf of the recreation area to support a determination of maximum annual yield that maintains the springs at Chickasaw.

**Antelope Spring, Chickasaw National Recreation Area (Oklahoma).** NPS/JENNIFER BACK



## 2011 Flood Flows on the Green and Yampa Rivers

*Mark Wondzell, Hydrologist*

THE WINTER OF 2010/2011 BROUGHT near-record snowpack to southwest Wyoming and northwest Colorado, producing the largest flood events in recent history on the Green and Yampa rivers in Dinosaur National Monument (Colorado, Utah).

On 9 June 2011 the Yampa River peaked at 27,400 cubic feet per second (cfs, 776 m<sup>3</sup>/s), more than twice the average annual peak and second only to the 18 May 1984 record flood of 32,300 cfs (915 m<sup>3</sup>/s). Flows on the Yampa remained above 15,000 cfs (425 m<sup>3</sup>/s) for more than 50 days (compared to only 35 days in 1984). Similarly, the Green River—although controlled upstream by Flaming Gorge Dam—experienced its fourth-highest peak flow in over 100 years.

These near-record high flows lasting for weeks or even months are rare hydrologic events and have unmatched potential to (1) scour the stream channel and adjacent banks, (2) transport and deposit sediments, (3) remove trees and/or create surfaces for establishment of new trees, and (4) create new secondary channels or back channels and fill others. In late 2011 scientists and staff from the USGS, Utah State University, and the NPS (Dinosaur National Monument, Northern Colorado Plateau Inven-

tory and Monitoring Network, and WRD) joined forces to document post-flood channel topography and riparian vegetation conditions along the combined 105-mile (169 km) river corridor. On-the-ground topographic surveys and vegetation sampling, coupled with airborne remote sensing that used both downward-looking Light Detection And Ranging (LIDAR) and multispectral image technology, were used to capture and define local channel conditions and vegetative cover along the banks and floodplains.

This 2011 data set will define “baseline” conditions for long-term monitoring against which future channel and vegetation change/response will be gauged. This data set will also allow immediate comparison to pre-flood LIDAR and multispectral imagery acquired in 2008 and 2010 and channel topographies and vegetation conditions captured in earlier sampling trips.

Long-term monitoring will allow park managers to document resource response to, and recovery from, these rare disturbance events, better inform reservoir management decisions, and illustrate the role of natural flows in maintaining the unique resources of Dinosaur National Monument.

**Yampa River, 2010, in Dinosaur National Monument (Colorado, Utah).** NPS/BILL HANSEN



# The Feasibility of Restoring Streamflow to the Lower Gros Ventre River

*Gwen Gerber, Hydrologist*

THE GROS VENTRE RIVER (GVR) IS A major tributary of the Snake River and forms part of the southern boundary of Grand Teton National Park (Wyoming). Park resource managers are concerned that water diversions are potentially impacting natural resources along the lower GVR. Historically, the lower GVR has been seasonally dry from just downstream of the Highway 89/191 bridge to the Spring Gulch Road bridge, a short distance upstream from where the GVR enters the Snake. Grand Teton National Park requested assistance from WRD to determine the feasibility of restoring and/or maintaining perennial

flow in this seasonally dry reach. In 2006 WRD initiated a study to evaluate water rights, inventory and measure diversions, conduct a seepage run, and develop a water budget for the lower GVR.

Twenty-four ditches existed along the lower GVR dating back to the 1890s. Only eight ditches conveyed water during the 2006 to 2009 study period due to ditch consolidation, non-use, source changes, or changes in points of diversion. Direct flow and supplemental water rights for these ditches total approximately 221 cubic feet per second (cfs, 6.3 m<sup>3</sup>/s); 44% are owned by the United States and 56% are privately owned. A total of 147 discharge measurements were collected on these ditches with 54% exceeding total adjudicated direct and supplemental water rights and 28% exceeding direct, surplus, excess, and supplemental water rights.

WRD conducted a seepage run on 22 October 2008 to measure natural gains and losses. Natural gains of 43 cfs (1.2 m<sup>3</sup>/s) occurred between the upstream park boundary and Kelly, Wyoming, and 42 cfs (1.2 m<sup>3</sup>/s) occurred between the Spring Gulch Road bridge and the Snake River confluence. Natural losses of 120 cfs (3.4 m<sup>3</sup>/s) occurred between Kelly and the Spring Gulch Road bridge.

An initial water budget, considering diversions and natural gains and losses, indicates that flows of about 220 cfs (6.2 m<sup>3</sup>/s) are required at Kelly to meet total direct flow water rights and maintain perennial flow in the seasonally dry reach (364 cfs [10.3 m<sup>3</sup>/s] for direct flow, surplus, excess, and supplemental). Based on these findings it appears that opportunities exist to manage water use on the lower GVR to restore perennial flows and protect valuable park resources.

**Discharge measurement on the lower Gros Ventre River, Grand Teton National Park (Wyoming).**  
NPS/GWEN GERBER



# Returning Water Rights to Nature at Point Reyes National Seashore

*Eric Lord, Water Rights Specialist*

THE ENABLING LEGISLATION OF Point Reyes National Seashore (California) in 1962 authorized the park unit to continue to acquire land as it became available, and as funding allowed, within described boundaries. The acquired lands often came with state appropriative water rights. Some of these rights are licensed for consumptive uses—including dairy operations, irrigation, livestock, and domestic purposes—on historic ranches that operate within park boundaries. As a general policy, park managers do not continue such consumptive uses since doing so may be contrary to park purposes. In accordance with state law, an existing right can be changed from a consumptive use to an instream use to enhance flow for the benefit of fish and wildlife.

In 2000 the National Park Service acquired the Waldo Giacomini Ranch at the south end of Tomales Bay. What was once a large tidal marsh complex had been degraded,

and the hydrological and ecological function was reduced. Park staff and partners are now engaged in a multi-year and multi-faceted wetlands restoration project.

In 2010, as an essential part of the restoration project, the Water Rights Branch (WRB) filed petitions to amend four water rights licenses held by Point Reyes National Seashore from consumptive use to instream use. In total, approximately 2.5 cubic feet per second (.07 m<sup>3</sup>/s) of water flow were returned to three streams—Olema, Lagunitas, and Fish Hatchery creeks—within and adjacent to the former ranch property. This change was the first of its kind accomplished by WRB in California. A number of national park units in California face similar state law-based water rights situations. WRB hopes to build on this success to change such water rights into a form more beneficial to the fish, wildlife, and natural ecosystems in the parks.

**Above: Lagunitas Creek point of diversion. Below: Olema Creek point of diversion. Point Reyes National Seashore (California).**  
NPS/ERIC LORD



# Groundwater Studies Help Protect Largest Gypsum Dunefield in the World

*James Harte, Hydrologist*

IN THE HEART OF THE TULAROSA Basin of south-central New Mexico sits the world's largest gypsum dunefield covering 275 square miles (712 km<sup>2</sup>) of the Chihuahuan Desert. White Sands National Monument was established in 1933 to preserve and protect the most impressive portion of the dunefield along with the plant and animal species that have developed special adaptations to live in the gypsum dune environment, including the evolution of a white coloration that provides camouflage in the dunes. The dunes are underlain by a shallow water table which is essential to the functioning and maintenance of the dunefield and its associated ecosystem.

The Tularosa Basin is also home to Holloman Air Force Base, the city of Alamogordo, and the village of Tularosa, located on the east side of the basin at the foot of the Sacramento Mountains. Municipalities and the military rely on surface water from the Sacramento Mountains and groundwater pumped from shallow aquifers located along the east side of the basin. As the basin's population has grown, groundwater development in the Alamogordo-Tularosa area has increased to the extent that the state engineer declared the basin a "mined

basin" and established the Alamogordo-Tularosa Administrative Area with limits on allowable aquifer water level decline.

White Sands, 15 miles (24 km) west of Alamogordo, is concerned that declining groundwater levels in the Alamogordo area could lower the shallow water table beneath the dunefield, destabilizing the dunes and associated ecosystem. WRD hydrologists helped park managers develop a scope of work and facilitated a cooperative agreement between the monument and the New Mexico Institute of Mining and Technology to investigate the source of water in the shallow aquifer underlying the dunefield.

Over the next two years ongoing studies will investigate whether the source of shallow groundwater is local precipitation, upwelling of deep groundwater, shallow groundwater flow from the east side of the Tularosa basin, or some combination. Results will give monument managers a better understanding of how a declining water table on the east side of the Tularosa Basin might affect shallow groundwater levels at White Sands and assist them in making management decisions that protect and preserve the largest gypsum dunefield in the world.

**USGS Central Region Research Drilling Project crew completes a deep groundwater monitoring well at White Sands National Monument (New Mexico). NPS/ JAMES HARTE**



## Preliminary Results of Microbial Organism Study at Calcite Lake

*Jeff Hughes, Hydrologist*

THE WATER RIGHTS BRANCH IS working with Wind Cave National Park (South Dakota) to address proposed groundwater development concerns. As part of a continuing effort to determine the role that groundwater plays in cave evolution within Wind Cave National Park, a study was conducted to identify microbial life forms found in groundwater in the Wind Cave area. It is thought that microbes initiate many of the formations found within the cave. This information will be used as part of NPS efforts to describe groundwater flow-dependent processes in Wind Cave.

Dr. Hazel Barton, associate professor of biology at the University of Akron, collected water samples to be filtered for microbial analysis from several wells and springs within and in the vicinity of the park. Samples were also collected from Calcite Lake, an underground lake found approximately 500 feet (152 m) below the ground surface,

formed where the groundwater table intersects the cave. The lake is located within the Pahasapa (or Madison) geologic formation, a limestone aquifer that is increasingly being considered for groundwater development.

Collecting water samples at Calcite Lake was challenging; accessing the lake required a strenuous, several-hour trip that included carrying all the sampling equipment. This included a pump and specially designed filtration system that was small enough to fit through several narrow cave passages, able to operate for hours on battery power, and powerful enough to filter approximately 200 liters (53 gal) of water through a 0.22-micron membrane without clogging.

Preliminary results present unique discoveries. Microbial cell counts for Calcite Lake groundwater suggest this water contains one of the lowest cell concentrations ever recorded on earth (on the order of  $1.47$  to  $3.48 \times 10^3$  cells/mL [ $5.56$  to  $13.2 \times 10^6$  cells/gal]). Also, the DNA extracted from these samples may document previously undiscovered genus, species, and possibly phyla. Overall study results suggest that microbial interaction with the rocks is an ongoing and important process in the creation of Wind Cave's world renowned cave formations.

**Juan Giarrizzo prepares the pump and filter to collect a sample for microbial analysis in Calcite Lake, Wind Cave National Park (South Dakota). NPS COLLECTION**



# Technical Assistance Highlights

## *WRD Staff and Aquatic Field Professionals*



**Dwarf arctic char captured during a feeding ecology study, Lake Clark National Park & Preserve.** NPS/DAN YOUNG

**FUNDING FROM THE NATURAL Resource Challenge** once again helped support 15 field-based aquatic resource professional positions in FY 2011. The aquatic resource professional positions were developed to provide the National Park Service with both an extension and an expansion of the functions and capabilities provided by the Water Resources Division and the handful of water and aquatic resource professional positions base-funded in parks and regions.

The work of these field professionals and the day-to-day support that WRD staff provide to park units are described in the Technical Assistance Highlights. Technical assistance is the bread and butter of WRD operations. In the following pages, you can read a few selections that represent our work in the field. To find a comprehensive list of our technical assistance for FY 2011, please see [Appendix B](#). You can also find a list of WRD staff and aquatic field professionals in [Appendix D](#).

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### SERVICEWIDE

Represented the NPS on the BLM Solar Energy Programmatic Environmental Impact Statement. ▫ Represented the NPS on the Navajo Nation-Hopi Tribe, Hualapai Tribe, Havasupai Tribe, and Yavapai-Apache Nation Indian Federal Water Rights Negotiation and Assessment Teams. ▫ Served as the co-lead for the NPS Wild and Scenic Rivers (WSR) Program and member of the NPS WSR Steering Committee and Interagency WSR Coordinating Council. ▫ Represented NRSS on NPS Dive Control Board. ▫ Updated the website for Vital Signs Water Quality Data Management and Archiving at [www.nature.nps.gov/water/vitalsigns/vitalsignsmgt.cfm](http://www.nature.nps.gov/water/vitalsigns/vitalsignsmgt.cfm). ▫ Set up WRD's WetNet mailing list as a true self-maintaining list-serve rather than a series of Lotus Notes

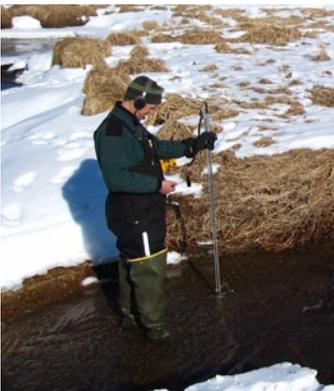
email groups. ▫ Provided ongoing support for a collaborative project with Nature-Serve, the National Interagency Fire Center, and the NPS Biological Resource Management Division to develop and pilot a set of landscape-scale interpretive products (resource condition narratives and maps) for use in NRCA projects. ▫ Worked with the Geologic Resources Division staff in advising Northeast Region development on the possible collateral effects of Marcellus Shale gas development and participated in bi-weekly conference calls. ▫ Participated in Climate Change Response Program meetings related to floodplain management and was project coordinator for Climate Change funded project. ▫ Reviewed Floodplain Statements of Findings for projects at many parks. ▫ Uploaded data from many parks to STORET. ▫

National Park Service Alaska Region: 54.65 million acres (gross area), 23 units\*



\* Regional acreage and unit totals from "Listing of Acreage as of 12/31/2011," NPS Land Resources Division

**ALASKA REGION**



**Top:** NPS volunteer Helen Keeling holding a lake trout captured for contaminants analysis, Lake Clark National Park & Preserve (Alaska). NPS/DAN YOUNG

**Bottom:** USGS employee Charlie Couvillion measuring discharge in the Chulitna River drainage, Lake Clark National Park & Preserve (Alaska). NPS/DAN YOUNG

**Alaska Region** Collaborated with USFS, FSWCD, and USFWS on *Elodea nuttallii* infestation on Chena Slough, Fairbanks; acquired aerial photography for Elodea infestation along Chena Slough; Elodea steering committee member. □

**Katmai National Park & Preserve** Participated on the NPS Resource Management Team regarding the Pebble Mine, a proposed copper and gold mine in southwest Alaska; attended meetings, reviewed study plans, and commented on fisheries resource issues. □

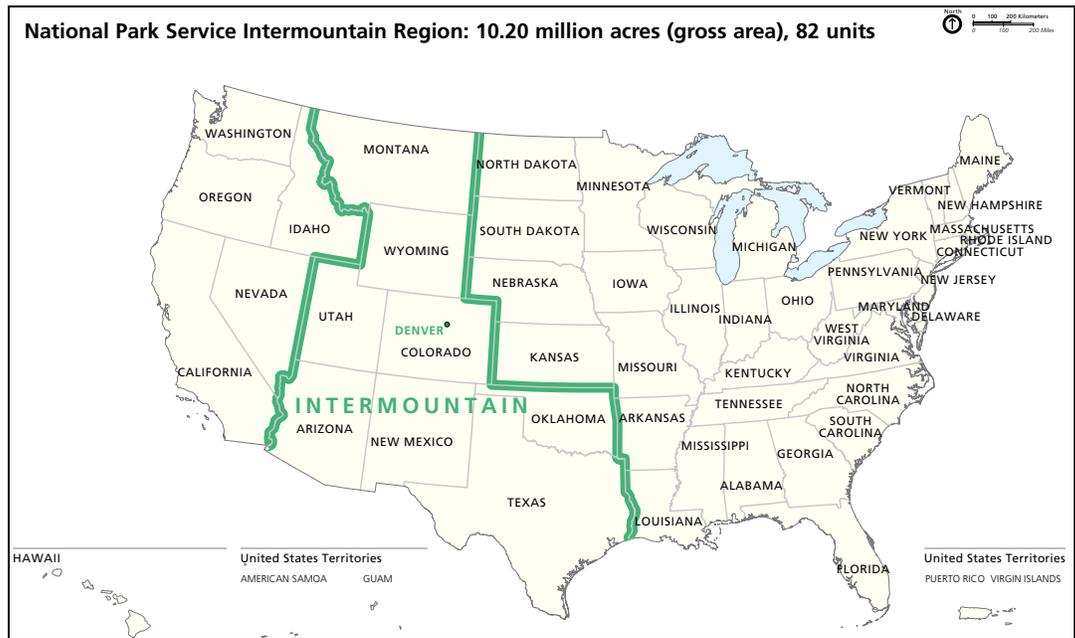
**Lake Clark National Park & Preserve** Provided project oversight, completed data analysis, and wrote an annual report for a monitoring project estimating the number of sockeye salmon returning to Lake Clark. □ Worked cooperatively with the Alaska Department of Fish and Game to coordinate logistics, hiring, and implementation of a sockeye salmon escapement project in the Kuskokwim River drainage in southwest Alaska. □ Coordinated logistics and sampling for a study assessing the feeding ecology of Arctic char in Lower Tazimina Lake. □

**Sitka National Historic Site** Provided guidance regarding protection of instream flows and the validity of non-NPS water rights on the Indian River. □

**Yukon-Charley Rivers National Preserve and Gates of the Arctic National Park & Preserve** Provided input on objectives for resource condition assessment. □ Provided input on Gates of the Arctic General Management Plan. □

**Arctic Network** Continued investigating the mechanisms of lake drainage in Kobuk Valley and helped develop a vulnerability model for lake drainage. Maintained contract with ABR Inc. □ Continued development of interactive geodatabase for observing large scale lake drying and thermokarst events in network parks. □

**Southwest Alaska Network** Planned and facilitated collection of bathymetry data for Upper and Lower Twin Lakes, Upper and Lower Tazimina Lakes, and Lachbuna Lake. □



**NPS Hydrologist Jalyn Cummings identifies mussel species in Village Creek for mussel survey, Big Thicket National Preserve (Texas).** NPS COLLECTION

**INTERMOUNTAIN REGION**

**Intermountain Region Served as NPS Hydrologist on Intermountain Regional Burned Area Emergency Response (BAER) Team for Horseshoe 2 fire in Coronado National Forest and Chiricahua National Monument.** □ Served as chair of the Biology Committee/Management Committee representative of the Upper Colorado River Endangered Fish Recovery Program from January 2011 to December 2011. □

**Arches National Park (Utah) Prepared Scope of Work for “A Hydrologic Evaluation of Waters of the Entrada and Navajo Aquifers in the Courthouse Wash Area, Arches National Park, Grand County, Utah.”** □

**Bandelier National Park (New Mexico)** Provided advice on best ways to prepare for flooding after very large fires occurred this year; planned trip to park in autumn to get a better idea of conditions and will help in future planning-related activities. □

**Big Bend National Park/Rio Grande Wild & Scenic River (Texas)** Participated in gain/loss study to quantify groundwater contributions via spring flows to the mainstem of the Rio Grande River. □ Facilitated

the Outstandingly Remarkable Values workshop for the Rio Grande River. □

**Big Thicket National Preserve (Texas)** Provided hydrologic oversight for the Chevron pipe removal project at the preserve, requiring multiple site visits and coordination of multiple stakeholders. □

**Black Canyon of the Gunnison National Park (Colorado)** Participated in the design/implementation of a long-term monitoring program to document changes in riparian vegetation as a function of upstream reservoir releases. □

**Bryce Canyon National Park (Utah)** Conducted analyses of radius of groundwater travel time to the water-supply wells in the East Creek wellfield. □

**Chiricahua National Monument (Arizona)** Coordinated planning and installation of an ALERT precipitation gauge in the upper Bonita and Rhyolite Creeks watershed area with state and county early flood warning programs and park resource staff. □

**Jeanette Haegele (USGS) checks a minnow trap in Iceberg Canyon, Glen Canyon National Recreation Area (Arizona, Utah).**  
NPS/MELISSA TRAMMELL



**Fort Bowie National Historic Site (Arizona)** Developed scope of work and shepherded contracting documents for Southwest Conservation Corps crew to implement erosion control treatments in upper Apache Spring watershed; worked with park staff to develop treatment plans and purchase supplies for project. □

**Grand Canyon National Park (Arizona)** Removed nonnative fish from Bright Angel Creek by electrofishing, and operated and maintained fish weir to block upstream movement and remove nonnative trout; the project is funded by the Bureau of Reclamation and NPS and conducted in cooperation with the University of Missouri and Grand Canyon Trust. This multi-agency group is working together to restore the native fish community in Bright Angel Creek with help from many volunteers. □

**Mesa Verde National Park (Colorado)** Initiated wetlands restoration project to rehabilitate an abandoned sewage lagoon. □

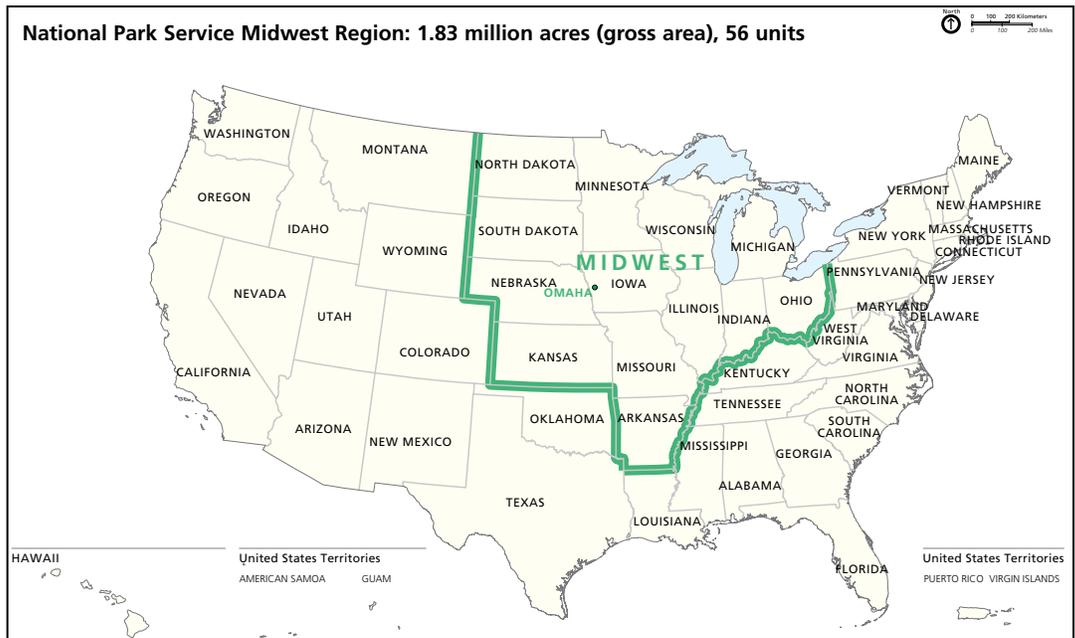
**Montezuma Castle National Monument (Arizona)** Monitored USGS investigation to determine source and flowpaths of groundwater in Montezuma Well. □

**Organ Pipe Cactus National Monument (Arizona)** Assessed causes of pictograph deterioration at Wild Horse Tanks site, identified measures to reduce water-related impacts to the pictographs. Submitted trip report with management recommendations to park resource staff; the recommendations were subsequently acted on by the park. □

**Tonto National Monument (Arizona)** Provided technical support to ongoing study of soil moisture dynamics and groundwater percolation at the unique Hidden Ridge woodland site. □

**Tuzigoot National Monument (Arizona)** Provided technical review and comments on the Environmental Assessment for the Tavasci Marsh Management and Habitat Enhancement Plan. □

**Northern Colorado Plateau Network** Conducted a training for Arches and Northern Colorado Plateau Network staff regarding detailed survey methods and riparian monitoring techniques. □



Swimmers in the sunset light at Indiana Dunes National Lakeshore (Indiana). NPS/CHRISTOPHER LIGHT

## MIDWEST REGION

**Midwest Region** Developed a successful proposal to the NPS Air Resources Division to investigate nitrogen deposition histories for Great Lakes Network lakes, using archived sediment core material; prepared related agreement documents. □ Worked with NPS staff, Minnesota Department of Natural Resources staff, and Michigan Technological University to coordinate data analysis and reporting aspects of the multi-park spiny water flea project. □

**Cuyahoga Valley National Park (Ohio)** Reviewed the results of additional sampling requested by WRD staff to ensure that appropriate due diligence was performed prior to land acquisition by NPS where potential existed for historic dumping of hazardous wastes. Further sampling recommendations were made after completing reviews of Phase I and Phase II site pre-acquisition assessment reports, and these results were favorable toward continuing the acquisition process. □

**Grand Portage National Monument (Minnesota)** Conducted simple hydraulic modeling assessment of proposed road crossing and provided advice on low-water crossing design. □

**Indiana Dunes National Lakeshore (Indiana)** Provided baseline water quality data inventory and analysis report data and advised on its use and interpretation. □ Provided review of the Baseline Environmental Risk Assessment (BERA) for the Bailly Generating Plant RCRA site. □

**Isle Royale National Park (Michigan)** Provided technical and logistical assistance to university cooperators conducting the Isle Royale/Acadia nitrogen critical loads project. □ Worked with staff to finalize revised northern pike regulations for inland lakes of Isle Royale. □

**Knife River Indian Villages National Historic Site (North Dakota)** Investigated extent and implications of river erosion at Knife River, developed and implemented an erosion monitoring plan for park staff, and made recommendations to park management on watershed management solutions. □ Reviewed and commented on technical memo regarding streambank erosion. □



**Niobrara National Scenic River (Nebraska, South Dakota)** Provided advice to support hydrologic, economic, and fish and wildlife studies to support state-based in-stream flows on the Niobrara River. □

**Ozark National Scenic Riverways (Missouri)** Investigated potential impacts from a proposed large-scale dairy within the recharge area of Big Spring. □

**Pictured Rocks National Lakeshore (Michigan)** Coordinated field sampling for native mussel and fish host investigations. Purchased fisheries field equipment for park's use on project. □

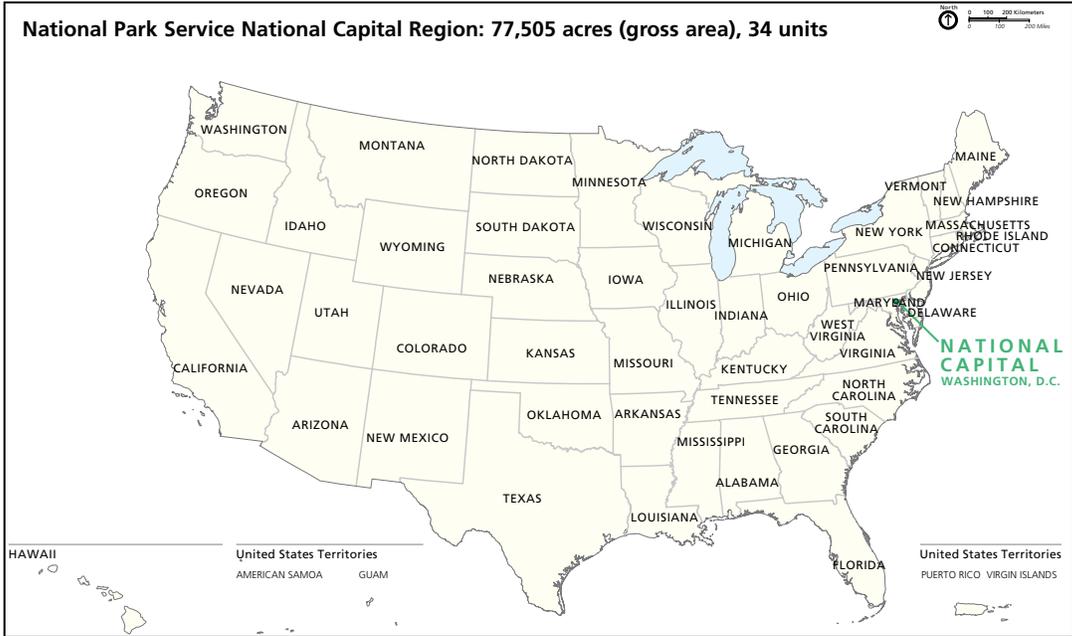
**Saint Croix National Scenic Riverway (Minnesota, Wisconsin)** Provided field and analytical assistance for USGS zebra mussel effects study and climate change effects studies. □

**Sleeping Bear Dunes National Lakeshore (Michigan)** Published "Links between type E botulism outbreaks, lake levels, and surface water temperatures in Lake Michigan, 1963–2008" in Journal of Great Lakes

Research. □ Obtained bathymetry and historical aerial imagery and created GIS data of historic shorelines in support of dock relocation analysis on North and South Manitou Islands. □

**Theodore Roosevelt National Park (North Dakota)** Initiated a USGS study to determine drought stress on cottonwood trees on the Little Missouri River. □

**Voyageurs National Park (Minnesota)** Helped plan for collection and mercury analysis of additional native crayfish and invasive rusty crayfish from a recently invaded Voyageurs site. □



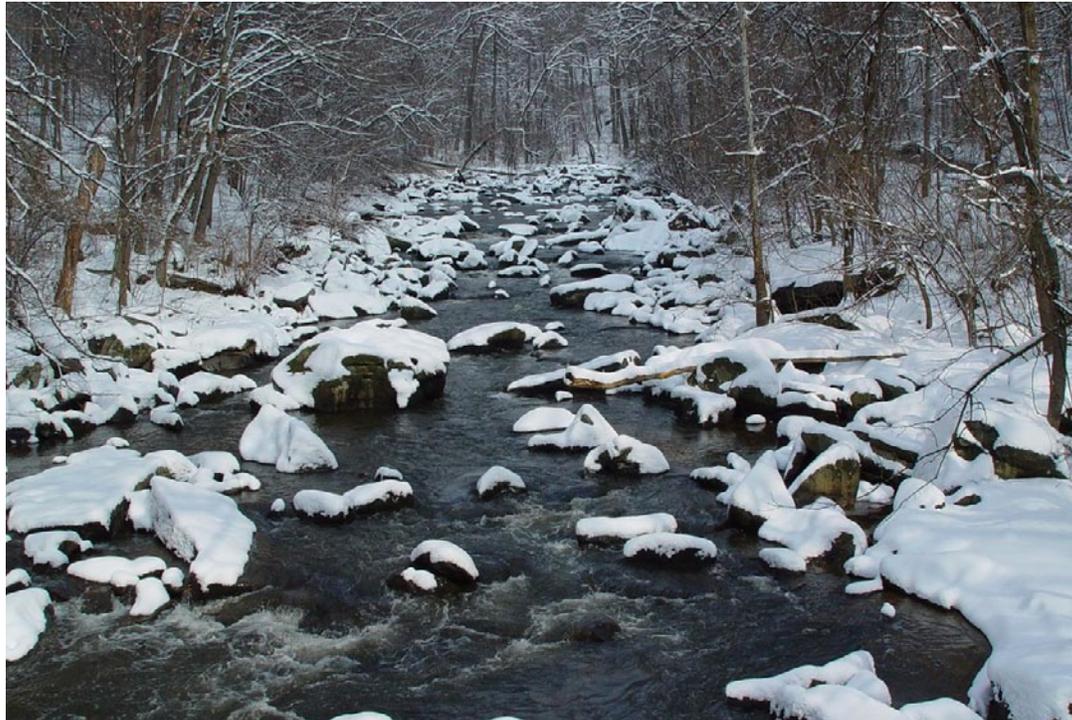
**NATIONAL CAPITAL REGION**

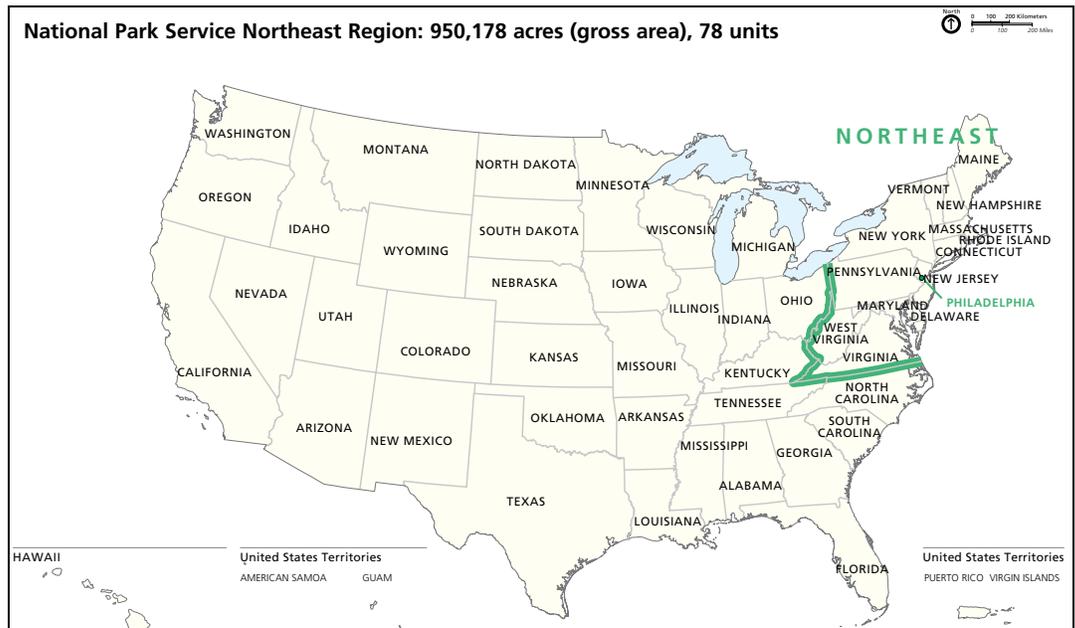
**National Capital Region** The hiring process for an NCR–NER shared Aquatic Ecologist position was completed with the new employee entering on duty on 9 October 2011. Equipment and computers were purchased to establish the aquatic ecology program. Each region will contribute \$25,000 or more to the position, augmenting the WRD base by \$80,000. ▫ Provided support and advice in the use of NPSTORET,

troubleshooting data and coding issues, and retrieving data from the STORET Data Warehouse. ▫

**Rock Creek Park (District of Columbia)** Provided hydrologic and hydraulic support related to the recent compliance and erosion problems associated with a road-widening project in the park. ▫

**Rock Creek Park (Washington, DC)** NPS/DWIGHT MADISON





**A volunteer citizen scientist releases a tagged horseshoe crab into Great South Bay, Fire Island National Seashore (New York).**  
NPS/PATRICIA RAFFERTY

**NORTHEAST REGION**

**Northeast Region** Provided input to Federal Chesapeake Bay Watershed Implementation Plan guide. Evaluated list and provided compliance contacts for National Parks within the watershed.

**Appalachian National Scenic Trail (Maine to Georgia)** Organized first year progress review of the Appalachian Trail Atmospheric Deposition Study; this study includes more than ten independent researchers with various affiliations and examines effects and potential for recovery of air, soil, water, and vegetation along the entire AT. The study serves as an example for using the trail as a MEGA-transect to evaluate environmental change across a sensitive corridor that includes most of the eastern states. Collected water and soil samples to support this research. □

**Boston Harbor Islands National Recreation Area (Massachusetts)** Evaluated wetland condition and potential for restoration with NER team; assisted with development of trip report to describe findings. □

**Cape Cod National Seashore (Massachusetts)** Provided review of municipal water supply projects at Wellfleet and Eastham. □ Funded Woods Hole Oceanographic Institution to investigate the dynamics of anthropogenic nutrient discharges and harmful algal blooms, and to produce tools to assist park managers in developing policy and management for nutrient control and remediation. □

**Delaware Water Gap National Recreation Area (New Jersey, Pennsylvania)** Developed proposal with Delaware Water Gap and State University of New York College of Environmental Science and Forestry as a CESU partner to evaluate historic flows along the river pre-forest harvesting, pre-dam construction, and modern day. □

**Student Conservation Association volunteers assist with nekton sampling adjacent to the Sailors Haven Marina, Fire Island National Seashore (New York).**  
NPS/PATRICIA RAFFERTY



**Gateway National Recreation Area (New Jersey, New York)** Implemented ecological monitoring to evaluate restoration of 69 acres (28 ha) of salt marsh at Elders Point East and West, Jamaica Bay. Monitoring parameters include nekton, vegetation, and avian species composition and abundance; above- and below-ground primary production; and macrobenthic infauna and epifauna. As a result, received Coastal America Spirit Award for exceptional partnering to protect and conserve coastal ecosystems; this award recognized efforts of the multi-agency partnership that worked cooperatively. □

**Hopewell Furnace National Historic Site (Pennsylvania)** Provided written and verbal reviews of Corps of Engineers hydrologic and hydraulic models designed to evaluate alternatives to reduce flooding of park buildings. □

**National Parks of New York Harbor (New Jersey, New York)** Contributed technical knowledge on ecosystem ecology and restoration via participation in the National Parks of New York Harbor: A Strategy to Become America's Premier Urban National Park Planning Charette. □ Worked cooperatively with National Parks of New York Har-

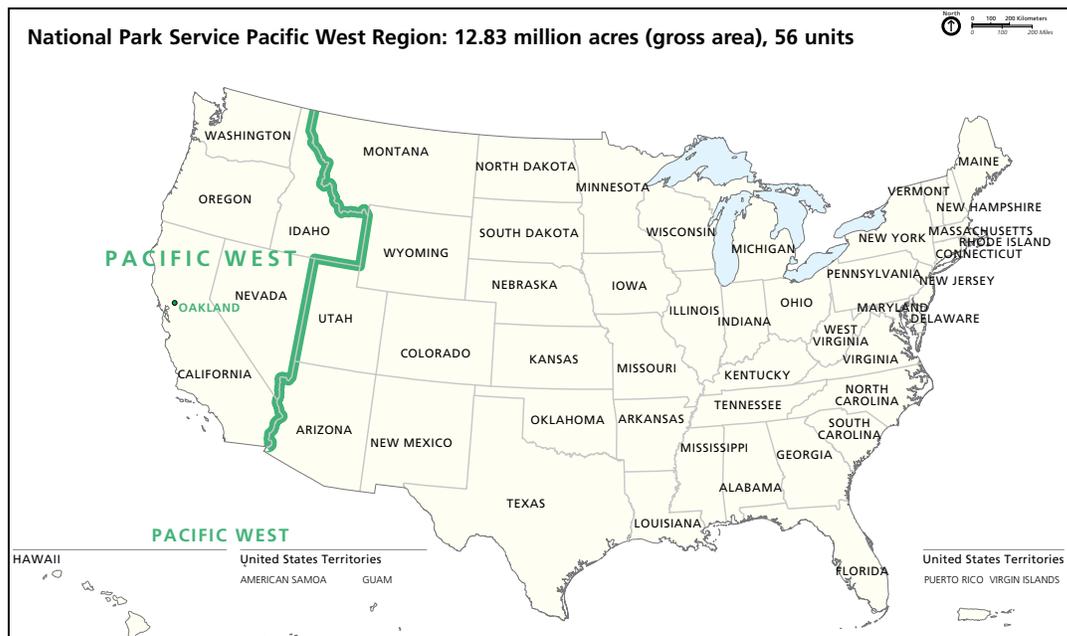
bor Education Center on a Youth-in-Parks application and mentored one YIP participant in July and August 2011. □

**Sagamore Hill National Historic Site (New York)** Assisted University of Rhode Island CESU cooperator in presenting a horseshoe crab interpretive program. □

**Saugus Iron Works National Historic Site (Massachusetts)** Funded project to monitor *E. coli* in the Saugus River. □

**Shenandoah National Park (Virginia)** Provided review and comments on the Shenandoah Watershed Study Monitoring Protocol Narrative and SOPs. □ Provided support to the University of Virginia and the USGS on water quality and fisheries-related databases for the park. □

**Valley Forge National Historical Park (Pennsylvania)** Provided written comments on water resource stewardship strategies for planning. □ Provided written review of Natural Resource Condition Assessment. □



Salt Creek and boardwalk in Death Valley National Park (California). NPS COLLECTION

## PACIFIC WEST REGION

**Pacific West Region** Provided technical assistance for Natural Resource Managers in PWR for reviewing and improving proposals seeking funding for ecological restoration and monitoring projects. □ Served as NPS liaison to National Ocean Policy planning team for water quality and coastal land management practices. □ With interagency government team, facilitated by USFS Hydrologist, co-authored recommendations to California State Water Plan Update regarding protection of wet meadow habitats. □

**Channel Islands National Park (California)** Co-led project to design Prisoners Harbor Coastal Lagoon Restoration Project to restore degraded wetland on Santa Cruz Island; project to benefit migratory birds and archeological resources. In FY 2011 completed needed permits, drafted monitoring plan, completed contracting for earthmoving and plant grow-out, and completed proposals seeking additional funding; project to be completed FY 2012.

## Death Valley National Park (California)

Participated in Amargosa Desert Managers Group meetings, an interagency work group established to discuss water resource concerns in the Amargosa Desert basin—including Devils Hole, a detached unit of Death Valley National Park. □

**Devils Postpile National Monument (California)** Conducted field reconnaissance of Devils Postpile and Mammoth Mountain area to evaluate water resources, the hydrogeologic setting, and evidence of groundwater–surface water interactions. □ Provided comments for the draft Natural Resource Condition Assessment. □

**Grand Canyon–Parashant National Monument (Arizona)** Provided technical oversight on the implementation of a phased reconnaissance-level study conducted by the USGS to evaluate the water source of Tassi Spring and Pakoon Spring. □

**Engineered logjam construction to stop stream bank erosion threatening the Carbon River Entrance Station at Mount Rainier National Park (Washington).** NPS/  
BEN WRIGHT



**Great Basin National Park (Nevada)**

Assisted WRD, Great Basin National Park, and Lake Mead National Recreation Area in developing cooperating agency comments to the administrative draft EIS and the draft EIS for the Clark, Lincoln, and White Pine counties groundwater development pipeline project. □ Assisted the WRD in implementing an interagency supported field program near Great Basin to characterize the potential for impacts to surface water and groundwater resources in and around the park from proposed groundwater development in Snake Valley, Nevada. □

**Minidoka National Historic Site (Idaho)**

Provided assessment of potential impact of a nearby Concentrated Animal Feeding Operation and assisted park in developing a groundwater monitoring plan. □

**Mojave National Preserve (California)**

Formulated and submitted scoping comments outlining NPS concerns with potential impacts to Mojave National Preserve's groundwater resources associated with the resurrected Cadiz Valley Water Conservation, Recovery, and Storage Project. Assisted park with development of a management plan for springs and guzzlers. □

**Mount Rainier National Park (Washington)**

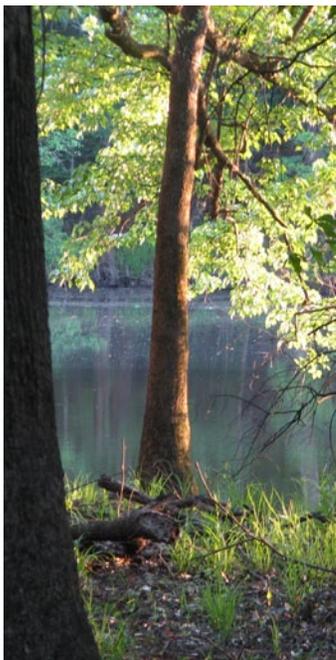
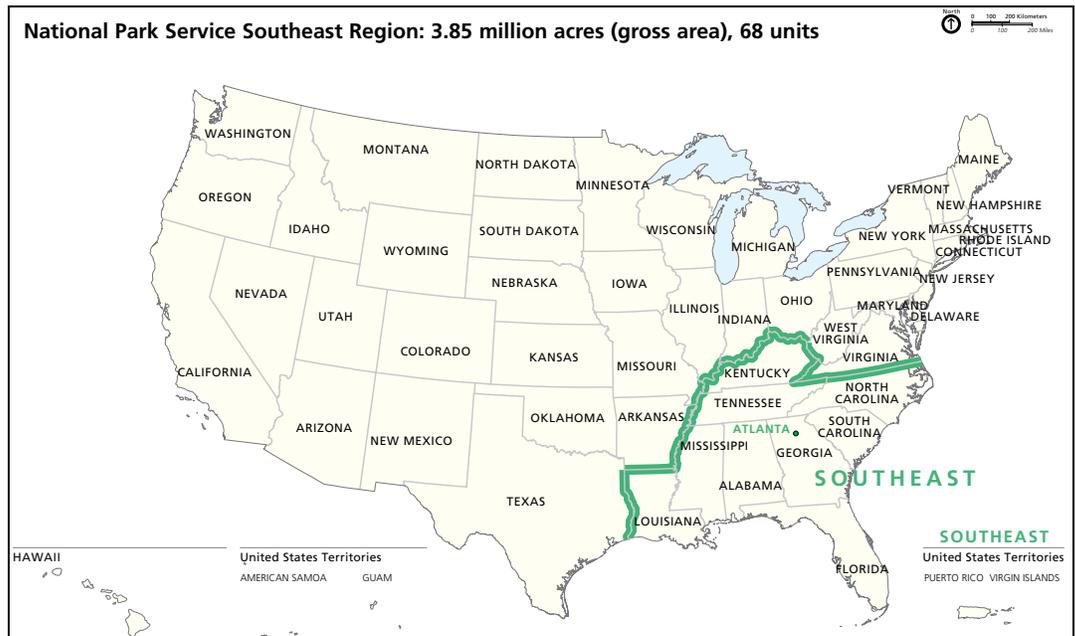
Provided technical assistance on engineered logjam placement locations for the Carbon River and interim barb installation near entrance; engineered logjams provide permanent, superior erosion protection, while minimizing impacts to fish habitat. □

**National Park of American Samoa**

**(American Samoa)** Advised superintendent, PWR, and DOI on proposed expansion of Fagatele Bay National Marine Sanctuary and overlay of national park marine area. □

**Sequoia and Kings Canyon National Parks (California)**

Assisted with developing a scope of work to assess potential impacts of private septic systems in the Mineral King area. □



**Weston Lake at Congaree National Park (South Carolina).** NPS/  
THERESA THOM

## SOUTHEAST REGION

**Southeast Region** Continued to develop a sediment budget for restoration in the northern Gulf of Mexico Coast. Participated in administering the annual Service-wide Combined Call including projects that resulted in protection and/or restoration of wetland habitat. □

**Deepwater Horizon Oil Spill** Participated in DWH Oil Spill NRDA activities. □ Co-chaired Submerged Aquatic Vegetation Technical Working Group (TWG). □ Served as NPS lead on Shoreline TWG; trustee co-lead for Beach Subgroup; hosted TWG meetings at Jean Lafitte National Historical Park and Preserve. □

**Big South Fork National River and Recreation Area (Kentucky, Tennessee)** Assisted park in evaluating potential impacts to aquatic resources associated with the Roberta Landfill. □ Drafted formal determination document regarding potential impacts of Roberta Landfill to the park, and negoti-

ated potential mitigation alternatives. □

**Cane River Creole National Historical Park (Louisiana)** Reviewed and provided comments on the Draft Construction Plans for Emergency Stabilization/Erosion Control on the Bank of Cane River Lake. □ Reviewed and provided comments on Draft Wetlands Statement of Findings (WSOF). □

**Cape Lookout National Seashore (North Carolina)** Provided GIS and remote sensing support (assembled imagery, provided maps, change analysis, etc.) to park staff and Hurricane Irene Incident Management Team. □

**Congaree National Park (South Carolina)** Reviewed and provided comments for Ramsar Convention designation as a wetland of international significance. □

**Dry Tortugas National Park (Florida)** Reviewed and provided comments on Garden Key Cultural Landscape Report. □

**Northern gannet rescued for cleaning, West Ship Island, Gulf Islands National Seashore (Florida, Mississippi).** NPS/KRISTEN MAXWELL



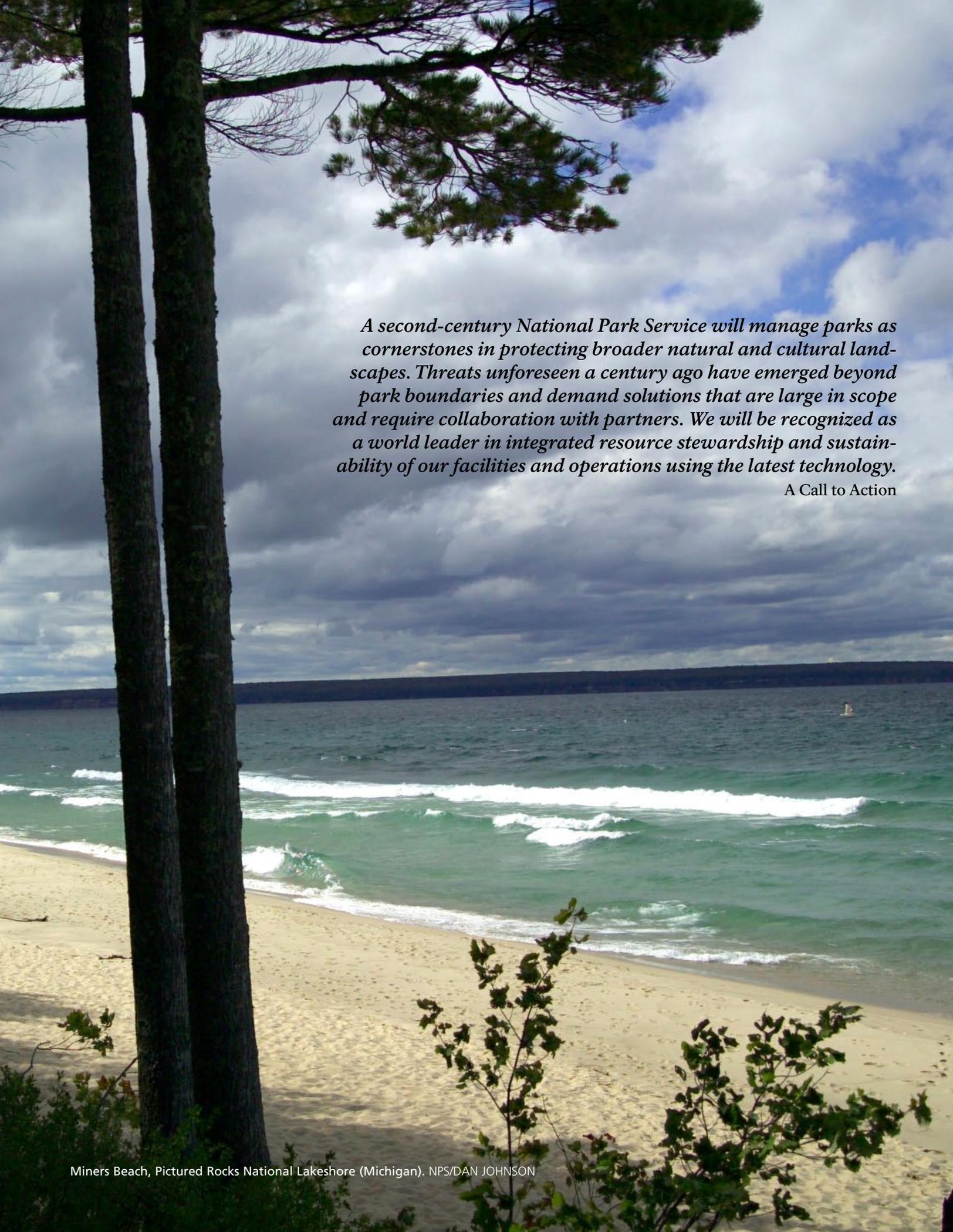
**Fort Pulaski National Monument (Georgia)** Reviewed and provided comments on the Cockspur Island Cultural Landscape Report. □ Reviewed Savannah River Dredging EA for potential impacts to Fort Pulaski for Corps of Engineers. □

**Great Smoky Mountains National Park (North Carolina, Tennessee)** Provided hydrogeological assessment for a new well at Cades Cove. □

**Gulf Islands National Seashore (Florida, Mississippi)** Assisted DOI representatives in evaluating potential restoration alternatives associated with the Deepwater Horizon Incident. □ Served as a Resource Advisor overseeing night cleanup of oil deposited on beaches. □ Reviewed and provided comments on NRCS Gulf of Mexico Initiative which will impact Gulf Islands. □ Funded Dauphin Marine Laboratory to measure the impacts of oil on seagrass beds at Gulf Islands. □

**Jean Lafitte National Historical Park and Preserve (Louisiana)** Assisted staff in obtaining funding for canal restoration project; visited and reviewed the ongoing project as well as data indicating that hydrology is improving and reverting to a natural regime. □

**Obed Wild and Scenic River (Tennessee)** Assisted park in evaluating instream impacts of the proposed Lake Tansi Water Harvesting project. □ Worked with park to determine potential impacts of pesticides to control the hemlock woolly adelgid invasion. □



*A second-century National Park Service will manage parks as cornerstones in protecting broader natural and cultural landscapes. Threats unforeseen a century ago have emerged beyond park boundaries and demand solutions that are large in scope and require collaboration with partners. We will be recognized as a world leader in integrated resource stewardship and sustainability of our facilities and operations using the latest technology.*

A Call to Action

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# Appendix A

## Summary of Water Resources Division Funding

**Table A.1. Water Resources Program FY 2011**

FY 2010 Allocation	\$12,472,000
Classified Pay Increase	148,000
Net FY 2010 Increase/Decrease	1,250,000
<b>Total Available in FY 2010</b>	<b>13,870,000</b>
FY 2011 Allocation	13,870,000
Classified Pay Increase	0
Net FY 2011 Increase/Decrease	-63,000
<b>Total Available in FY 2011</b>	<b>13,807,000</b>
<b>Change from FY 2010</b>	<b>-\$63,000</b>

Trumpeter swans on Boxley Mill Pond at Buffalo National River (Arkansas). NPS/DALE DOMBROWSKI



**Table A.2. Water Resources Program funding by categories FY 2011**

Water Resource Projects	\$1,166,130
Water Resource Protection (table A.3)	658,630
Ocean and Coastal Resources (tables A.9 and A.10)	285,000
Legacy High Priority (table A.4)	222,500
Water Quality Vital Signs Monitoring (table A.5)	2,737,900
Natural Resource Condition Assessment (NRCA) Projects	2,335,700
Natural Resource Condition Assessments (table A.6)	2,015,700
NRCA High Priority Water Resource (table A.7)	320,000
Water Resource Protection—Aquatic Resource Professionals (table A.8)	1,327,400
Ocean and Coastal Resources (tables A.9 and A.10)	965,000
Water Resource Technical Assistance ( <a href="#">Appendix B</a> )	5,274,870
<b>Total</b>	<b>\$13,807,000</b>

# Water Resource Protection

## *Program Summary*

THE NATURAL RESOURCE CHALLENGE resulted in an increase of \$823,000 per year for water resource protection projects beginning in FY 2001. Project funds in FY 2011 were used to collect, process, and analyze streamflow and water level data; monitor post-flooding impacts on sediment and riparian resources; determine environmental flow needs; determine aquifer characteristics; investigate the importance of fresh and brackish water on coral reef ecosystems; and develop engineering data to support a water right application. Results were used to develop water resource protection strategies that were secured through settlement discussions; state or federal regulatory processes (e.g., NEPA, 404 permitting actions, reservoir operations); administrative hearings (e.g., water right protests), and/or state and federal court proceedings (e.g., basin-wide adjudications).

In 2011 the NPS continued to work closely with other federal agencies—including the U.S. Fish and Wildlife Service, the Bureau of Land Management, the Bureau of Reclamation, the U.S. Army Corps of Engineers, and the U.S. Geological Survey—to provide funding and expertise to support water resource investigations that are useful for resolving multi-agency issues in complex water allocation decisions. The NPS also

partnered with state and private entities to increase the effectiveness of its water resource protection funding to improve the likelihood of reaching settlements that protect NPS water resources values while allowing for future water development and economic growth. For example, hydrologic data collected by the NPS for Lake Mead National Recreation Area (Nevada, Arizona); Death Valley National Park (California, Nevada); and Great Basin National Park (Nevada) are shared with the Nevada State Engineer, Nevada water providers, and private developers to develop a better understanding about regional aquifer systems and potential ground water availability in southern Nevada. In addition, data collected at White Sands National Monument (New Mexico) will be shared with military bases and the municipalities of Alamogordo and Tularosa to better understand the potential impacts of groundwater development on the sand dunes.

Results of these investigations must be presented in various legal forums to secure and protect water rights and water-dependent resources. Therefore, a portion of the water resource protection funds supported an attorney from the Office of the Solicitor to provide advice and to represent the NPS in legal proceedings.

Researchers in a spring at Ozark National Scenic Riverways (Missouri). NPS COLLECTION





Exploring Wonder Lake in Denali National Park (Alaska). NPS/KENT MILLER

**Table A.3. Water Resource Protection Project funding FY 2011**

<b>Park</b>	<b>Region</b>	<b>Project Title</b>	<b>FY 2011 Funding</b>
BIBE	IMR	Hydrologic Data Collection for Rio Grande River	\$20,000
BIBE	IMR	Determination of Outstandingly Remarkable Values	28,000
DINO	IMR	Hydrologic Data Collection for Green and Yampa Rivers	93,120
GRTE	IMR	Engineering Services for Water Rights Change Applications on Spread Creek	2,500
WHSA	IMR	Hydrologic Data Collection for Tularosa Aquifer	75,000
WICA	IMR	Lab Analysis for Cave Evolution Study	15,000
DEVA	PWR	Hydrologic Data Analysis for Devils Hole	30,800
GRBA	PWR	Investigation of Hydrogeology and Hydrologic Data Collection	46,600
KAHO	PWR	Investigation of Hydrology and Water Dependent Values	78,800
LAKE	PWR	Hydrologic Data Collection on Virgin River	5,400
Servicewide		Support to the Office of the Solicitor to Protect/Secure NPS Water Resources	192,750
Servicewide		Support to the U.S. Geological Survey to Process Hydrologic Data	23,760
Servicewide		Technical Support and Assistance for All Projects	46,900
<b>Total</b>			<b>\$658,630</b>

**Table A.4. Legacy High Priority Project funding FY 2011**

<b>Park</b>	<b>Region</b>	<b>Project Title</b>	<b>FY 2011 Funding</b>
THRO	IMR	Flow Diversion, Drought Stress, and Cottonwood Sex Ratios	\$13,700
WICA	IMR	Black Hills Groundwater Flow Model	15,000
CHIS	PWR	Prisoners Harbor Supplemental Plant Propagation	40,000
GOGA	PWR	Install Water Level Recorders	9,950
Servicewide		Cooperative Fisheries Program	14,250
Servicewide		Water Quality Partnership Investigations	79,600
Servicewide		Dive Safety Program	50,000
<b>Total</b>			<b>\$222,500</b>

# Water Quality Vital Signs Monitoring Program

## *Program Summary*



David Bustos, a resource staffer at White Sands National Monument (New Mexico), installs a water level sensor at Lake Lucero as part of an ongoing hydrology study. No water was recorded at the lake in summer 2011. NPS/COLLEEN FILIPPONE

THE NATIONAL PARK SERVICE IS committed to a servicewide and DOI strategic goal to significantly reduce the miles of streams and rivers and acres of lakes and marine areas that do not meet water quality standards. As part of this goal, the NPS is also committed to protecting water quality in parks from future impairment, including waters classified as Outstanding National Resource Waters (ONRW) or state-equivalent listed waters. Additionally, the NPS is committed to working with state Clean Water Act programs, as well as taking appropriate management actions to support the restoration of impaired water bodies in parks to an unimpaired condition. Currently about 195 park units have one or more water bodies that do not meet state water quality standards for one or more pollutants on approximately 7,300 miles (11,746 km) of rivers and streams and 1,467,000 acres (593,695 ha) of lakes, reservoirs, estuaries, and marine areas. Planning and design of the program continues to be implemented in full integration with the NPS Park Vital Signs Monitoring Program. This is because water quality is a key vital sign in determining overall aquatic ecosystem health. In addition, by fully integrating the design of these programs, considerable cost efficiencies have been and will continue to be realized in staffing, planning and design, administration, implementation, data management, and reporting.

Full program funding was allocated to all 32 Park Vital Signs Networks in FY 2011 (table A.5). In addition, funds supported the development of an NPS servicewide water quality data management program within the EPA STORET Data Warehouse. While not shown in table A.5, WRD reallocated 10 work-months involving five division staff to support program administration and the development of program technical guidance, technical protocols, detailed study plan and

Quality Control/Quality Assurance Plan guidance, and database management.

**Vital Signs Monitoring Networks In FY 2011**, thirty-two Park Vital Signs Monitoring Networks fully committed their water quality funding to compilation of background information, analysis of issues and threats, performance of detailed program planning, and support of synoptic-level field assessments. Five networks initiated field-level monitoring. Network planning approaches included personnel hiring, in-house allocation of staff, university cooperative agreements, and USGS Interagency Agreements. In addition, equipment acquisitions were made. All 32 networks accomplished one or more of the following activities:

- (1) historic data compilations and analyses;
- (2) information on state-listed impaired waters and park “outstanding” waters;
- (3) documentation of significant water quality stressors/threats;
- (4) synoptic inventory studies in support of detailed statistical design;
- (5) database management and GIS support programs;
- (6) development of water quality monitoring protocols; and
- (7) field monitoring.

**Servicewide Data Management** The Water Resources Division continued to support network water quality monitoring programs by providing national program administration and reporting, establishing baseline inventories and analyses of available water quality data, supporting digitization of legacy data from analog reports and other archival materials, maintaining a servicewide water quality database in the EPA STORET Data Warehouse, and enhancing the transfer of physical, chemical, and biological data from the networks into STORET. Two water quality research associates and a student

worked to support the database development, management, and reporting activities through cooperative agreements with Colorado State University. The servicewide STORET database has served as the starting point for most network water quality data compilation and analysis efforts and also WRD's Baseline Water Quality Data Inventory and Analysis Reports. In addition to data from states and other entities, this archive now hosts approximately 5.9 million results for 5,114 different physical, chemical, or biological characteristics from 48,592 monitoring locations in support of 1,189 different projects conducted in or near 263 units of the National Park System.

Much effort went into enhancing NPSTORET, a series of Microsoft Access-based templates for entering, managing, reporting, and analyzing water quality data (projects, stations, metadata, and results) in a STORET-compatible format. NPSTORET also includes import routines to allow users to import their own data or stations as well as data and stations from the three major national water quality databases. Additional capabilities added to NPSTORET v.1.83 this year included (1) new graphics options on the Reports & Statistics template including scatterplots, frequency bar, frequency line, and catch-per-unit effort graphs; (2) enhancements to water quality standards including screening by filtered fractions, the ability to enter a maximum hardness value for hardness-dependent criteria, and export of the computations used in a standards analysis; (3) improved form resizing/scaling depending on a user's screen resolution; (4) user-customizable logos for forms and

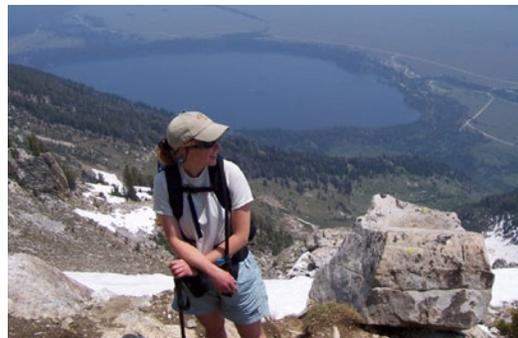
reports; (5) new characteristics, permitted values, activity types, lab remark codes, and statistic types; and (6) functionality in both 32 and 64-bit Access 2010 and Windows 7. Many other minor bells and whistles were added at the request of users.

WRD staff continued to help facilitate stewardship of the National Hydrography Dataset (NHD) in sub-basins containing NPS lands. Staff also continued to enhance the Hydrographic and Impairment Statistics Database which contains hydrographic statistics and Clean Water Act 303(d)-listed water resource impairment data for all parks based on the NHD. The Intranet website for distributing this information was moved to the Internet, underwent servicewide review and comment, and was significantly enhanced.

Continuously monitored water resource data was a significant focus area in 2011. WRD installed a servicewide five-concurrent-user network license for Aquarius Workstation v.2.6 and the Aquarius Database and initiated the development of a schema for documenting and storing water quality and quantity data collected continuously or near-continuously (i.e. hourly or every 15 minutes). This system was subsequently upgraded to the new Aquarius v.3.0 and Aquarius Server. Learning materials were prepared to assist NPS staff on how to access and use the system. Work continues on melding Aquarius with a metabase to document sensors, instruments, service, and calibrations.

A replacement database—EarthSoft's EQuIS system—for WRD's distributed EPA STORET Database was procured. During 2012 the 5.9 million discrete NPS water quality monitoring results will be migrated from distributed STORET to EQuIS, and data flows will be established into EQuIS from NPSTORET and a to-be-specified electronic data deliverable format to allow parks and networks to readily upload their data to EQuIS and have it transferred to the EPA's STORET Data Warehouse.

**Hiker on the Apex Trail, Teewinot, at Grand Teton National Park (Wyoming).** NPS/K. FINCH





Inside the Lens Room of Loggerhead Key Lighthouse, Dry Tortugas National Park (Florida). NPS/ KIMBERLY ROPP

**Table A.5. Allocation of Water Quality Park Vital Signs Monitoring funding FY 2011**

<b>Network</b>	<b>Region</b>	<b>Number of Affected Park Units</b>	<b>FY 2011 Funding</b>
Arctic	Alaska	5	\$144,100
Central Alaska	Alaska	5	94,200
Southeast Alaska	Alaska	3	40,400
Southwest Alaska	Alaska	5	133,600
Chihuahuan	Intermountain	6	70,200
Greater Yellowstone	Intermountain	3	68,200
Northern Colorado Plateau	Intermountain	16	103,700
Rocky Mountain	Intermountain	6	58,600
Sonoran Desert	Intermountain	11	61,500
Southern Colorado Plateau	Intermountain	19	119,100
Southern Plains	Intermountain	10	27,900
Great Lakes	Midwest	9	118,200
Heartland	Midwest	15	78,800
Northern Great Plains	Midwest	13	77,900
National Capital	National Capital	11	68,200
Eastern Rivers and Mountains	Northeast	9	60,600
Mid-Atlantic	Northeast	11	42,300
Northeast Coastal and Barrier	Northeast	8	86,500
Northeast Temperate	Northeast	10	57,700
Klamath	Pacific West	6	73,000
Mediterranean Coast	Pacific West	3	73,000
Mojave Desert	Pacific West	6	76,900
North Coast and Cascades	Pacific West	7	78,800
Pacific Islands	Pacific West	9	145,100
San Francisco Bay	Pacific West	6	67,200
Sierra Nevada	Pacific West	3	60,600
Upper Columbian Basin	Pacific West	8	48,000
Appalachian Highlands	Southeast	4	67,200
Cumberland-Piedmont	Southeast	14	56,700
Gulf Coast	Southeast	8	85,500
South Florida-Caribbean	Southeast	6	141,300
Southeast Coast	Southeast	17	116,300
<b>Total FY 2011 Network Monitoring</b>	<b>Seven NPS Regions</b>	<b>272</b>	<b>\$2,601,300</b>
Service-wide Data Management			136,600
<b>Grand Total</b>			<b>\$2,737,900</b>

# Natural Resource Condition Assessments

## Program Summary

NATURAL RESOURCE CONDITION Assessments (NRCAs) evaluate and report on current conditions, critical data gaps, and selected threat and stressor influences for a subset of important park natural resources. These are multi-disciplinary studies that rely on existing data and expertise from a variety of NPS and non-NPS sources. Focal study resources and indicators are selected on a park-by-park basis through

consideration of park resources and enabling legislation (what are this park's most important natural resources?) and currently available data and expertise (what can be evaluated at this time?). Science-based information delivered in NRCAs is designed to help park managers in their ongoing efforts to take an integrated and strategic approach to resource planning and decision making.



Aquatic ecologist Amy Larsen prepares to deploy a YSI, Inc., multiparameter probe at a small lake in Wrangell–St. Elias National Park & Preserve (Alaska). NPS/ HEIDI KRISTENSON

During 2011 NRCAs were completed and published for 19 park units, and new projects were initiated for an additional 25 park units. Additional program information and completed reports can be found at [www.nature.nps.gov/water/nrca/index.cfm](http://www.nature.nps.gov/water/nrca/index.cfm)

**Table A.6. NPS units with NRCA projects in FY 2011 and the organizations performing the assessments**

Region	Park	State	Agency, Cooperator/Partner, or Contractor	FY 2011 Funding
AKR	KATM	AK	Pacific Northwest CESU/ Saint Mary's University of Minnesota	\$101,000
	ANIA	AK		
	ALAG	AK		
	Multiple Parks		Regional Office project support	60,300
IMR	BAND	NM	U.S. Geological Survey Fort Collins Science Center; Colorado Plateau CESU/Museum of Northern Arizona; NPS Northern and Southern Colorado Plateau Networks	167,000
	BLCA	CO		
	CURE	CO		
	PETR	NM		
	ZION	UT		
	BIBE	TX	Pacific Northwest CESU/Saint Mary's University of Minnesota	115,000
	GUMO	TX		
	BICA	MT, WY	Pacific Northwest CESU/Saint Mary's University of Minnesota; NPS Greater Yellowstone Inventory & Monitoring Network	38,700
	LIBI	MT	Rocky Mountain CESU/Utah State University; University of Colorado; Colorado State University; NPS Southern Plains Inventory & Monitoring Network; NPS Rocky Mountain Inventory & Monitoring Network	60,056
	SAND	CO		
	WABA	OK		
	PAIS	TX	Pacific Northwest CESU/Saint Mary's University of Minnesota	15,000
	PAAL	TX		
	Multiple Parks		Regional Office Geographic Information Systems (GIS) and other project support	67,544

**Table A.6 continued**

Region Park		State	Agency, Cooperator/Partner, or Contractor	FY 2011 Funding
MWR	GRPO MISS SACN	MN MN MN, WI	Great Lakes Northern Forest CESU/ University of Wisconsin–Stevens Point	\$302,000
NCR	CATO CHOH	MD MD, WV, DC	Chesapeake Watershed CESU/University of Maryland; NPS National Capital Inventory & Monitoring Network	74,000
	Multiple Parks		Regional Office project support	6,700
NER	BOWA PETE	VA VA	Chesapeake Watershed CESU/ University of Richmond	84,962
	FRSP	VA	Chesapeake Watershed CESU/ Pennsylvania State University	56,136
	Multiple Parks		Regional Office project support	100,902
PWR	CRLA LAVO LABE	OR CA CA	Pacific Northwest CESU/Southern Oregon University	25,000
	DEVA JOTR LAKE MANZ MOJA PARA	CA, NV CA NV, AZ CA CA AZ	California CESU/University of California–Davis	275,000
	HAVO	HI	Fung Associates	42,250
	MORA NOCA	WA WA	U.S. Geological Survey Forest and Rangeland Ecosystem Center	75,000
	YOSE	CA	Yosemite National Park	20,000
	Multiple Parks		Regional Office project support	6,450

**Parks Climate Challenge participants snorkel on Ross Lake to conduct a fish survey, North Cascades National Park Complex (Washington).** NORTH CASCADES INSTITUTE/BENJ DRUMMOND



**Table A.6 continued**

Region Park		State	Agency, Cooperator/Partner, or Contractor	FY 2011 Funding
SER	BICY	FL	NPS South Florida/Caribbean Network	\$26,678
	EVER	FL		
	CAHA	NC	Piedmont–South Atlantic Coast CESU/ North Carolina State University	92,122
	CALO	NC		
	CHAT	GA		
	CONG	SC		
	CUIS	GA		
	HOBE	AL		
	KEMO	GA		
	MOCR	NC		
	OCMU	GA		
	TIMU	FL		
	CARL	NC	Southern Appalachian CESU/ University of Western Carolina	123,000
	Multiple Parks		Regional Office project support	80,900
<b>Total</b>				<b>\$2,015,700</b>

**Loop Road reflections at Big Cypress National Preserve (Florida).**  
NPS/KIMBERLY ROPP



# NRCA High Priority Project Funding

## Project Summary



The Green River from Harpers Corner Trail in Dinosaur National Monument (Colorado, Utah). NPS COLLECTION

Table A.7. NRCA High Priority Water Resource Project funding FY 2011

Region	Park	State	Project Title	FY 2011 Funding
IMR	DINO	CO, UT	Evaluation of Yampa River Flow and Sediment Regimes to Assist Protection of River-Dependent Resource Attributes	\$35,000
NER	SAIR	MA	Saugus River <i>E. coli</i> Monitoring	22,700
PWR	KAHO	HI	Development of an Environmental Assessment and Eradication Plan to Remove Tilapia from Ponds and Wetlands at National Parks on Island of Hawaii: KAHO and other Sites of Concern	63,000
	NEPE	ID	Hydrological Analysis and Pilot Restoration Project for Weippe Prairie	26,200
	YOSE	CA	Wawona Meadow Wetland Restoration Storm Repair Request	53,000
Servicewide	Multiple Parks		EarthSoft Environmental Quality Information System Acquisition	96,650
		Other Projects	General project support	23,450
<b>Total</b>				<b>\$320,000</b>

### Evaluation of Yampa River Flow and Sediment Regimes to Assist Protection of River-Dependent Resource Attributes, Dinosaur National Monument (Colorado, Utah)

*High Priority Project Funding* \$35,000

The Yampa River is under ever-increasing threats of water development to support extraction of nearby oil and gas resources and potential transbasin export to satisfy municipal and industrial needs in eastern Colorado. As a result, Dinosaur is interested in (1) identifying minimum streamflows that maintain existing water-related resources, conditions, and processes; and (2) developing technical information to predict and quantify the response of these resources

and processes to altered streamflows.

Under separate agreements, Dinosaur and WRD funded scientists from the USGS (2011, \$45,000); Utah State University (2011, \$45,000); and Colorado State University (2012, \$45,000 anticipated) to identify instream flow needs to support and maintain existing conditions of sediment transport and channel form, riparian plants, and endangered fish. These efforts are ongoing and in various stages of completion. This project will synthesize the results of these separate efforts into a single integrated flow prescription for the Yampa River through Dinosaur, to be delivered in 2014. Primary work to date has included literature reviews, site visits, and discussions with other principal investigators.

## Hydrological Analysis and Pilot Restoration Project for Weippe Prairie, Nez Perce National Historical Park (Idaho)

*High Priority Project Funding* \$26,200  
*NEPE Funding* \$15,000

Extensive ditching at Weippe Prairie has drained habitat for camas lily (*Camassia quamash*), a species that is a key cultural resource and an important ecological component of the unit's wetland communities. It was during the camas harvest in 1805 that members of the Lewis and Clark expedition first encountered the Nez Perce people at Weippe Prairie. The Nez Perce provided the expedition party with camas bulbs and other food to eat at a time when game was very scarce and food had become a serious problem. Today, camas populations are well below their historic numbers at many locations, and hydrologic modification (drainage) is known to be a significant factor in this decline. This project was designed to (1) install a hydrologic monitoring network to characterize existing hydrology, including effects of ditches; (2) study relationships between camas populations and hydrologic regimes in unaltered "reference" sites and in sites affected by drainage; and (3) implement and evaluate a pilot restoration (ditch plugging) project and recommend larger scale restoration as appropriate.

During the summer of 2011, several key projects steps were implemented. Detailed topographic data was collected for the

southern portion of the unit, including reference sites and a drained site being considered for the pilot restoration. These data will be merged with LIDAR data available for the entire unit to produce a topographic map. A network of shallow observation wells, piezometers, and staff gauges was installed in the pilot study area and in other parts of Weippe Prairie. All were surveyed to a common datum to support analysis of drainage effects and study of plant community-water table-topography relationships. "Existing condition" hydrologic data will be collected and analyzed during summer 2012, and a pilot restoration (ditch plugging) is planned for autumn 2012. Post-restoration data will be collected and analyzed in 2013, and a final report will be prepared by December 2013.

## Repair of Storm Damage, Wawona Meadow Restoration Project, Yosemite National Park (California)

*High Priority Project Funding* \$53,000

In late winter/early spring 2011, the Wawona area in Yosemite National Park experienced a substantial rain event that began to compromise a recently completed wetland meadow restoration project. The restoration project entailed filling a ditch that had formed in a wet meadow and lowered the local water table. The ditch had been filled to grade and the water table responded as expected, rising in elevation to near surface levels. However, native vegetation had not yet become established and the characteristic root mat was not in place to provide soil stability. During the rain event, some of the fill eroded out of the recently restored ditch, and there was great concern that the process would continue and all of the restoration work would be compromised. Consequently, a proposal for funding to facilitate structural repairs using "soft" treatments such as coir (coconut fiber) logs and mats was submitted and approved. WRD provided funding and repair work was completed in FY 2011.

Young humpback chub leave the bucket and begin to explore their new home in Shinumo Creek, Grand Canyon National Park (Arizona). NPS/MELISSA TRAMMELL



## EarthSoft Environmental Quality Information System Acquisition

*High Priority Project Funding \$96,650*

In 2011 WRD acquired a new database system—EarthSoft’s Environmental Quality Information System (EQuIS)—to replace the STORET database system distributed by the EPA. WRD has used STORET to archive physical, chemical, and biological water quality data from projects conducted by parks, Vital Signs Monitoring Networks, contractors, and cooperators of the EPA’s STORET Data Warehouse ([www.epa.gov/storet/](http://www.epa.gov/storet/)) over the last decade. EPA support for the distributed STORET system ceased in 2009 when EPA adopted the Water Quality Exchange (WQX) format as the sole method for uploading data to the STORET Data Warehouse. EQuIS will provide the same basic functionality (data consistency, aggregation, and transfer to STORET) as

EPA-distributed STORET but will also provide many new features including the WQX schema; the ability to transmit data automatically to the EPA’s national STORET Data Warehouse on a weekly basis; support for groundwater and geotechnical data; automated data quality assurance/control; and integration with a diverse array of GIS, statistical, graphical, and analytical software.

EQuIS has been installed on an NRSS server. Work will be ongoing during 2012, in concert with EarthSoft, to migrate the significant NPS STORET database to EQuIS; to define, adapt, or adopt a new electronic data deliverable specification that is compatible with EQuIS; and to develop a standard operating procedure for parks, networks, and other users to upload data to the system and use its significant processing capabilities.

**Paul Atkinson, Yukon–Charley IT specialist, deploys a Wildlife Acoustics sound monitor next to a lake in Wrangell–St. Elias National Park & Preserve (Alaska). The device monitors bird and wood frog activity as part of the Central Alaska Network’s lake monitoring effort. NPS/HEIDI KRISTENSON**



**Table A.8. Water Resource Protection—Aquatic Resource Professionals staffing**

Region Duty Station		Discipline	Geographic Focus Area
AKR	YUCH	Aquatic Ecologist	Central and Northwest Alaska Network Parks
AKR	LACL	Fisheries Biologist	Southwest and Southeast Alaska Network Parks
IMR	Utah State Coord Office	Fisheries Biologist	Upper Colorado River Basin Parks
IMR/ MWR	Sonoran Desert Network	Groundwater Hydrologist	Texas, Arkansas, and Oklahoma Parks
MWR	SACN	Aquatic Ecologist	Great Lakes Network Parks
MWR	ISRO	Fisheries Biologist	Great Lakes Network Parks
NER/ NCR	Center for Urban Ecology	Aquatic Ecologist	National Capital Region and Virginia Parks
NER	DEWA	Hydrologist	Eastern Rivers and Mountains/Northeast Coastal and Barrier Network Parks
NER	FIIS	Marine Ecologist	Northeast Temperate/Northeast Coastal and Barrier Network Parks
PWR	PORE	Aquatic Ecologist	San Francisco Bay/Sierra Nevada/Klamath/Mediterranean Coast Network Parks
PWR	MORA	Geomorphologist	North Coast and Cascades/Klamath Network Parks
PWR	LAKE	Groundwater Hydrologist	Mojave Desert Network Parks
SER	CHAT	Fisheries Biologist	Southeast Coast/Gulf Coast/Appalachian Highlands/Cumberland–Piedmont Network Parks
SER	CHAT	Wetlands Ecologist	Southeast Coast/Gulf Coast/Appalachian Highlands/Cumberland–Piedmont Network Parks

**Lake Tuendae at Zzyzx Desert Studies Center, Mojave National Preserve (California).** NPS/ANNE MAASBERG



# Ocean and Coastal Resources Program

## Program Summary



Race Point at Cape Cod National Seashore, Providence, Massachusetts. NPS COLLECTION

THE NATIONAL PARK SYSTEM contains over 80 ocean, coastal, and Great Lakes parks across 22 states and four territories. The parks conserve over 11,000 miles (17,700 km) of coast and 2.5 million acres (1 million ha) of ocean, coastal, and Great Lakes waters, including coral reefs, kelp forests, glaciers, estuaries, beaches, wetlands, historic forts, and shipwrecks. They attract over 86 million recreation visits each

year and generate \$6 billion in economic benefits to local communities. Managers of ocean and coastal parks are confronted with multiple threats to natural and cultural resources from inside and outside of their park boundaries. Resource managers need better information about the condition of submerged resources for making decisions, working with other agencies, and communicating with the public.

**Table A.9. Ocean and Coastal Resources Program budget summary**

Total Available in FY 2010	\$1,250,000
Net FY 2010 Decrease	0
Adjustments	0
<b>Total Available in FY 2011</b>	<b>\$1,250,000</b>
Change from FY 2010	0

Created in 2007, the Ocean and Coastal Resources Program was funded for the first time in FY 2010. The program adopted strategies from the 2006 Ocean Park Stewardship Action Plan and regional strategic plans for ocean and coastal park stewardship. The program focuses on increasing NPS organizational and technical capacity to address ocean and coastal issues and working through partnerships with state and federal agencies and local organiza-

tions to better understand and manage submerged resources. Technical specialists have been hired in the Southeast, Pacific West, and Alaska Regions, and project funds were distributed through the competitive Servicewide Comprehensive Call. Projects were selected based on their ability to strengthen the science-based foundation for managing and conserving ocean and coastal resources and to help park managers better understand the human role in these ecosystems.

**Table A.10. Ocean and Coastal Resources Program funding by categories**

Servicewide Comprehensive Call and other Projects	285,000
Field-based Technical Specialists	400,000
NRSS-based Technical Specialists	367,500
Natural Resource Stewardship and Science overhead (10%)	125,000
NPS Dive Program	50,000
Program Administration	22,500
<b>Total Available in FY 2011</b>	<b>1,250,000</b>

# Ocean and Coastal Resources Program

## *Project Summaries*



**Lake Michigan in winter at Indiana Dunes National Lakeshore (Indiana).** NPS/E. HERTEL

### **Ecological Links between Virgin Islands Coral Reef National Monument and Virgin Islands National Park (Virgin Islands): Management to Halt the Crisis of Low Reef Fish Population**

*Funding* \$37,000

*PMIS Number* 118794

*Parks Affected* Virgin Islands Coral Reef National Monument and Virgin Islands National Park (Virgin Islands)

*Project Description* The links between these two Caribbean NPS units and among various habitats in both units are being investigated by studying the movements of fish species in different trophic groups. Information on fish movement into and out of the park units will identify resources and movement pathways over various temporal and spatial scales. Fish will be tagged with sonic tags and their movements monitored by submerged acoustic receivers. The data will be used to develop ecosystem management strategies.

*Significance* The marine resources within Virgin Islands Coral Reef are poorly documented and the degree of connectivity to Virgin Islands and adjacent waters is unknown. Reef populations surrounding Virgin Islands Coral Reef are depleted and coral reefs have been lost in part due to reduced abundance of herbivorous fish that keep algae from smothering the reefs.

### **Managing Marine Ecosystem Responses to Increasing Nutrients**

*Funding* \$83,000 (FY10: \$84,000; FY12: \$83,000)

*PMIS Number* 146912

*Parks Affected* Kaloko-Honokōhau National Historical Park and Kalaupapa National Historical Park (Hawaii)

*Project Description* Recent investigations at Kaloko-Honokōhau demonstrated that large volumes of nutrient-laden freshwater are discharged to marine coastal areas via groundwater which increases the potential for nuisance algal growth that adversely affects coral reefs. Herbivory may control some of the increased algal growth, but large herbivores have been greatly reduced by intensive fishing. This project examines the response of algae to nutrient inputs, the effects of herbivores on algal growth, the influence of herbivore abundance and biomass on algal and coral composition, and the potential for managing herbivores to reduce algal biomass and improve coral reef health. The project compares impacts at Kaloko-Honokōhau, an increasingly urbanized park, and Kalaupapa, a relatively remote park with a large herbivore biomass and intact trophic structure.

*Significance* This partnership among Kaloko-Honokōhau, Kalaupapa, University of Hawaii, and Scripps Institute of Oceanography examines the potential impact of increasing coastal development on the health of coral reef ecosystems.

### **Investigations of the Links Between Toxic Red Tides, Hydrodynamics, and Groundwater Nutrient Fluxes at Cape Cod National Seashore (Massachusetts)**

*Funding* \$92,000 (FY10: \$301,000)

*PMIS Number* N/A

*Parks Affected* Cape Cod National Seashore (Massachusetts)



**Barefoot on the beach at Redwood National and State Parks (California).** NPS COLLECTION

**Project Description** Harmful algal blooms, commonly known as red tides, cause devastating impacts to local economies, public health, and ecosystems. The most serious and widespread manifestation is paralytic shellfish poisoning (PSP), a syndrome caused by human ingestion of shellfish that accumulate toxins from dinoflagellates. Cape Cod has had annual episodes of red tides since the 1970s. The characteristics of the PSP at Cape Cod have changed over the last two decades, in some cases resulting in shellfishing closures (and loss of jobs) for several months. This project is investigating the dynamics of anthropogenic nutrient discharges and harmful algal blooms and will produce tools to assist park managers in developing management policies for nutrient control and remediation.

**Significance** This partnership among NPS, Woods Hole Oceanographic Institution, and USGS will increase public knowledge of the need to protect and restore habitats for migratory birds, horseshoe crabs, seagrasses, shellfish, fish, and crustaceans.

#### **Compilation of an Accurate and Contemporary Digital Shoreline for Alaska Coastal Parks**

**Funding** \$21,000 (FY10: \$40,000)

**PMIS Number** 156683

**Parks Affected** Aniakchak National Monument & Preserve, Bering Land Bridge National Preserve, Cape Krusenstern National Monument, Glacier Bay National Park & Preserve, Katmai National Park & Preserve, Kenai Fjords National Park, Klondike Gold-rush National Historical Park, Lake Clark National Park & Preserve, Sitka National Historical Park, and Wrangell–St. Elias National Park & Preserve (Alaska)

**Project Description** Coastal parks in Alaska lack an accurate, consistent, and standardized digital marine shoreline referenced to a known local tidal stage or a vertical tidal

datum referenced to Mean High Water (MHW). Park boundaries in Alaska are generally based on MHW or Mean Lower Low Water (MLLW). The National Hydrographic Dataset (NHD) lacks a consistent tidal datum reference, but it is the recognized source for hydrographic data and contains features for Alaska parks derived from 1950s USGS topographical shoreline data sets (prior to the 1964 earthquake and isostatic rebound). This project uses the best available federal shoreline delineations of MHW or HWL and will integrate them into the NHD.

**Significance** The project will produce a shoreline data set for 10 Alaska coastal parks of immediate use to resource managers, collaborators, and the public.

#### **Legal and Regulatory Assistance on Ocean and Coastal Issues Faced by the National Park System**

**Funding** \$52,000

**PMIS Number** N/A

**Parks Affected** Eighty-four ocean and coastal parks in 22 states and four territories.

**Project Description** An important component of increasing NPS technical capacity is the description and analysis of NPS jurisdiction, authorities, and remedies. The number of ocean and coastal legal and regulatory issues warranting research and analysis outpaces the in-house capability of the ocean and coastal resources program. A contract was awarded to conduct research and develop a reference (guidance) manual on recreational and commercial fishing in ocean and coastal parks.

**Significance** The fishing reference manual will be used by parks and other NPS offices to increase awareness of authorities available to manage recreational and commercial fishing within park boundaries.

## USGS–NPS Water Quality Partnership Program

### *New Projects for FY 2012*



**Sandhill cranes at Great Sand Dunes National Park & Preserve (Colorado).** NPS COLLECTION

IN 1998 THE NPS AND USGS INITIATED the Water Quality Partnership Program with support from the Environmental Protection Agency’s Clean Water Action Plan. In 2011 eight projects were selected for funding beginning in 2012. To date, 163 partnership projects have been initiated in 110 parks.

The program supports a range of scientific activities focused on providing park resource managers with data and information necessary to make scientifically defensible management and policy decisions. These activities range in scope from basic and technical assistance to fixed-station monitoring to intensive/synoptic projects.

**Table A.11. NPS–USGS Water Quality Partnership Project allocation FY 2012**

Region	Park	State	Project Title	FY 2012 Allocation
IMR	ROMO	CO	Occurrence, Sources, and Potential for Biodegradation of Endocrine Disrupting Chemicals in Rocky Mountain NP	\$100,530
MWR	CUVA	OH	Development of a Model for Predicting Recreational Water Quality of the Cuyahoga River in Cuyahoga Valley based on Real-Time Turbidity and State Data	50,000
	HOSP	AR	Assessment of Water Quality Trends in the Hot Springs of Hot Springs NP	48,220
	ISRO	MI	Determination of Algal Toxin Concentration in Surface Water at ISRO, SLBE, and PIRO	50,000
	SLBE	MI		
	PIRO	MI		
	SACN	MI, WI	Climate in Lake St. Croix–Saint Croix National Scenic Riverway	99,170
	VOYA	MN	Assessment of Changes in Trophic State in Voyageurs NP Lakes after Implementation of a Revised Water Level Management Plan	50,000
NER	ACAD	ME	Assessment of the Use of Buffered Zero-Valent Iron Amendments for Reduction of Mercury Methylation in Wetland Sediments at Acadia NP	100,000
	DEWA	PA, NJ	Install Four Continuous Water Quality Monitors near Delaware River Basin Marcellus Shale Development	49,920
<b>Total</b>				<b>\$547,840</b>

# Appendix B

## *Technical Assistance*



**Moonrise over Cape Hatteras National Seashore (North Carolina).**  
NPS/JIM EVANS

### SERVICEWIDE

Represented the NPS on the BLM Solar Energy Programmatic Environmental Impact Statement. ▫ Represented the NPS on the Navajo Nation-Hopi Tribe, Hualapai Tribe, Havasupai Tribe, and Yavapai-Apache Nation Indian Federal Water Rights Negotiation and Assessment Teams. ▫ Co-taught a water-related session for University of Denver's Earth Science Program. ▫ Completed 16 station folders for WRB gauges to support water rights efforts in Arizona, Nevada, and Oklahoma. ▫ Converted all water rights dockets to PDF format and uploaded to IRMA for public accessibility. ▫ Served as the co-lead for the NPS Wild and Scenic Rivers (WSR) Program and member of the NPS WSR Steering Committee and Interagency WSR Coordinating Council. ▫ Evaluated water right applications to determine impacts of diversions on park rights in California, Colorado, Hawaii, Montana, Utah, and Wyoming. ▫ Submitted annual reports for Big Hole NB, Bighorn Canyon NRA, Glacier NP, Little Bighorn Battlefield NM, and Yellowstone NP as required by the Montana-United States, NPS Water Rights Compact. ▫ Served as NRSS Project Coordinator for climate change response projects at Theodore Roosevelt and Wind Cave NPs. ▫ Represented NRSS on NPS Dive Control Board. ▫ Worked with DOI Senior Ocean Policy Team and the NPS regions and parks on the implementation of the new National Ocean Policy (EO 13547). ▫ Represented NPS on the Federal Geospatial Data Committee and Coastal Spatial Data Subcommittee to develop the Coastal and Marine Ecological Classification Standard (CMECS) as a national habitat classification for oceans, coasts, and estuaries. ▫ Developed an aquatic invasive species database for Marine and Great Lakes parks and hosted a servicewide

Webinar to demonstrate database functionality. ▫ Developed servicewide Comprehensive Call ocean and coastal resources program funding guidance and approved and funded projects at \$141,000. ▫ Working with the Lands Resources Division and NRSS GIS, developed shoreline maps for 84 ocean and coastal parks. ▫ Worked with USFWS and NOAA National Estuarine Reserves and National Marine Sanctuary staffs to implement the interagency Seamless Network Agreement. ▫ Worked with Russ Wilson, superintendent at CALO on detail to WASO, to develop a framework for Directors Order on ocean and coastal parks. ▫ Worked with GRD and the Lands Resources Division to develop solicitor opinions to deal with park boundary issues for 10 ocean and coastal parks. ▫ Continued development of NPSTORET—a series of Microsoft Access templates/forms for entering and documenting the results of water quality monitoring projects in compliance with the National Water Quality Monitoring Council's guidelines in a format compatible with uploading to modern STORET using the STORET Import Module or Water Quality Exchange (WQX) format. NPSTORET v.1.82 was released adding new functionality and fixing reported bugs. ▫ Updated the website for Vital Signs Water Quality Data Management and Archiving at [www.nature.nps.gov/water/vitalsigns/vitalsignsmgt.cfm](http://www.nature.nps.gov/water/vitalsigns/vitalsignsmgt.cfm). ▫ Set up a shared/network installation of Aquatic Informatics' Aquarius Workstation and Aquarius Database for parks, networks, and WRD staff to process, analyze, and report on their continuous water resource (both quantity and quality) data. ▫ Coordinated servicewide review and comment on a draft continuous water resource database schema to be implemented in Aquarius. ▫



**St. Johns Bluff, Timucuan Ecological and Historic National Preserve (Florida).** NPS/SHAUNA RAY ALLEN

Maintained the WRD's STORET infrastructure, a data entry workstation version of distributed STORET containing NPS production data. ▫ Provided additions and suggestions to EPA regarding characteristics and other aspects of the WQX schema. ▫ Notified other organizations when problems were encountered with their data in the STORET/WQX Data Warehouse and alerted the EPA to issues with the STORET/WQX Data Warehouse retrieval tools. ▫ Produced quarterly Capital Planning and Investment Control reports and the Office of Management and Budget's Exhibit 300-1 documenting WRD's STORET investment. ▫ Prepared a proposal to acquire EarthSoft's EQuIS (Environmental Quality Information System) software as a replacement for the NPS-distributed STORET database that was subsequently approved. ▫ Prepared contracting materials to shepherd the acquisition of EarthSoft's EQuIS system (EQuIS Professional, Enterprise, EDP, and other components) through purchasing. ▫ Maintained a Sharepoint site on the topic of Water Resources Data Management (<http://nrpcsharepoint/wrd/data/default.aspx>) with a subsite of Continuous Data Management (<http://nrpcsharepoint/wrd/data/continuous/default.aspx>). ▫ Represented WRD during NRSS Integrated Resource Management Applications (IRMA) meetings and provided assistance to the IRMA Steering Committee relative to reporting bugs and contributing suggestions for future releases, including coordinating WRD's review of the water resources mock-up page. ▫ Represented WRD during NRSS Information Technology Technical Advisory Group (IT-TAG) meetings. ▫ Handled the Water Operations Branch ADP function, including ordering new computers and other hardware. ▫ Provided consultation to the NPS Conservation and Outdoor Recreation Program on riverine databases. ▫ Updated webpages (<http://science.nature.nps.gov/im/inventory/waterquality/index.cfm> and <http://science.nature.nps.gov/im/inventory/water/index.cfm>) for the Inventory and Monitoring Division to explain the water quality and water resources inventories. ▫ Prepared the 2010

Annual Administrative Reports and Workplans for the water quality and water resources inventories. ▫ Attended EarthSoft's EQuIS Users Group Meeting in Denver during April. ▫ Maintained NPSEDD v.1.10, the NPS Electronic Data Deliverable specification used by parks and networks for contributing water quality data for inclusion in STORET. ▫ Upgraded NPSCol2Row—a data formatting utility used to restructure data files in preparation for STORET or other applications—to v.2.2, extending its capabilities and ensuring it works in Access 2007. The tool is available on the NPS Vital Signs Water Quality Data Management and Archiving website and EPA's STORET Tools website ([www.epa.gov/storet/otherapps.html](http://www.epa.gov/storet/otherapps.html)) for anyone to download. ▫ Coordinated the upgrade to Terrain Navigator Pro v.8.71 and troubleshooted issues for NRSS users. ▫ Continued to oversee the development and enhancement of the Hydrographic and Impairment Statistics (HIS) database built on a framework of the National Hydrography Dataset and state 303(d) Clean Water Act listings. Coordinated park review of the database and migration of the HIS database to the internet at [www.nature.nps.gov/water/his/](http://www.nature.nps.gov/water/his/). ▫ Maintained and enhanced the software used to quality-assure, compile, and calculate hydrographic statistics in the HIS database. ▫ Provided revisions to the Inventory and Monitoring fact sheets and web pages for the baseline water quality and water body location and classification inventories. ▫ Responded to public water resource inquiries generated by NPS website. ▫ Assisted in the GIS processing and protocol development for the watershed delineation effort in NPScape. ▫ Provided review and comment on the Marine Invasive Species Database front-end. ▫ Provided review, comments, and hydrographic data to the joint Water Resources and Inventory and Monitoring divisions' Natural Resource Preservation Project Draft Solar Programmatic Environmental Impact Statement GIS proposal. ▫ Provided NPS water "fun facts" for Project WET presentation at the Global Water Conference in Bozeman, MT. ▫



**Gathering storm at Pipe Spring National Monument (Arizona).**  
NPS/ERIC SKOPEC

Provided advice and examples to the Inventory and Monitoring Division on how to acquire STORET and NWIS data via web services for use in NPScope analysis of contributing areas. ▫ Set up WRD's Wet-Net mailing lists as a true self-maintaining listserve rather than a series of Lotus Notes email groups. ▫ Coordinated and moderated a water resources inventory and monitoring session at The 2011 George Wright Society Conference on Parks, Protected Areas, and Cultural Sites in New Orleans, LA. ▫ Co-chaired a George Wright Society meeting session (in collaboration with NPS cultural resources) on the topic of cultural and natural resource condition assessments in NPS units. ▫ Coordinated WRD's review and response to the USGS's business case for an enhanced National Elevation Data Program. ▫ Provided ongoing support for a collaborative project with NatureServe, the National Interagency Fire Center, and the NPS Biological Resource Management Division to develop and pilot a set of landscape-scale interpretive products (resource condition narratives and maps) for use in NRCA projects. ▫ Coordinated with regional NRCA leads (and term hires in NER, SER, and IMR) on aspects of overall program and project management to ensure consistency with national guidance; developed updated materials for the NRCA program website. ▫ Ensured that GPRA goals for reporting water information (1a4a, 1a4b, and 1a4c) were taken into consideration, addressed, and given proper weight by networks during the monitoring plan and water/aquatic protocol (narrative) document review process and that WRD's Designated Use and Impairment website (303d listing) had been consulted and compared with other sources (e.g. state) that the network may have also accessed for a listing of impaired water bodies. ▫ Shared new information from water quality instrument vendors and other general monitoring information with networks to keep staff apprised of new technical developments that could enhance their monitoring efforts.

▫ Coordinated with multiple users about their activities in the NRPC water quality lab (WRD, BRMD, ROMN) and kept the lab supplied and maintained. ▫ Participated as a reviewer and regular conference-call participant in the National Water Quality Monitoring Council Methods Board Sensor Workgroup in efforts to advance and foster a broader understanding and consistency of water quality sensor use across the water quality monitoring community. ▫ Worked with the Geologic Resources Division staff in advising Northeast Region development on the possible collateral effects of Marcellus Shale gas development and participated in bi-weekly conference calls. ▫ Continued to stay informed of water quality instrument advances including new sensors for continuous monitors, telemetry system, and other new technological developments and their evaluation through communication with vendors, attendance at locally offered field training seminars, and discussions with USGS research staff and others. ▫ Assisted NPS staff in the evaluation, cost comparison analysis, and procurement of water quality sondes, data analysis software, and monitoring equipment. ▫ Provided and tracked loans of equipment (sondes, flow meters) to various networks as needed/requested to assist in their water component of Vital Signs Monitoring. ▫ Monitored various real-time water quality monitoring sites posted on NWIS that are supported through NPS project funding, and stayed informed about monitoring issues through USGS list-serve email communications. ▫ Participated in Climate Change Response Program meetings related to floodplain management and was project coordinator for Climate Change funded project. ▫ Served as coordinator for NRPC reviews of submissions to the Development Advisory Board. ▫ Member of the Restoration Technical Advisory Group. ▫ Member of the WASO Rivers and Dams workgroup. ▫



**Western Arctic caribou crosses the Kobuk River, Kobuk Valley National Park (Alaska).** NPS/  
GAVIN EMMONS

Reviewed Floodplain Statements of Findings for projects at many parks including Lake Mead NRA (Cottonwood Cove and Katherine Landing DCP/SOF); Overmountain Victory NHT (Headquarters/Visitor Center); Cape Hatteras NS (Off-Road Vehicle Use Plan); Yellowstone NP (Exotic Fish Eradication); Mammoth Cave NP (Green River Ferry Crossing); Badlands NP (South Unit General Management Plan/SOF); Chickasaw NRA (Visitor Center Facilities at Vendome Well area); Mount Rainier NP (Carbon River Access Management Plan); Natchez Trace Parkway (Multi-use Trail Segment 3P16); Congaree NP (Canoe Landing SOF); Ross Lake NRA (General Management Plan SOF); Chesapeake and Ohio Canal NHP (Restoration of Canal Operations at Williamsport); Everglades NP (Tamiami Trail and Gulf Coast Visitor Center); Death Valley NP (Lower Wildrose Road EA/SOF); Yosemite NP (Tenaya Lake Area Plan and Tuolumne River Plan EIS); and Cane River Creole NHP (Bank Erosion Control). □

#### **ALASKA REGION**

**Alaska Region** Maintained partnerships with University of Alaska Fairbanks faculty to investigate shallow lake dynamics in interior Alaska. Faculty collaborators include Dr. Mark Lindberg and Dr. Dave Verbyla. □ Southwest Research Institute reviewed three NSF proposals for Dr. Cynthia Dinwiddie and provided letters of support. □ Collaborate with USFS, FSWCD, and USFWS on *Elodea nuttallii* infestation on Chena Slough, Fairbanks; acquired aerial photography for *Elodea* infestation along Chena Slough; *Elodea* steering committee member. □ Planning committee for Fourth Interagency Conference on Research in the Watersheds. □ Funded development of digital shorelines for eight ocean and coastal parks in Alaska. □

**Denali National Park** Published final Natural Resource Condition Assessment. □

#### **Katmai National Park & Preserve**

Participated on the NPS Resource Management Team regarding the Pebble Mine, a proposed copper and gold mine in southwest Alaska; attended meetings, reviewed study plans, and commented on fisheries resource issues. □ Provided technical review and comments for the Southwest Alaska Salmon Habitat Partnership monitoring strategic plan. □ Reviewed HEC-RAS model and other available data for possible use in a bridge scour analyses. □

**Klondike Gold Rush National Historical Park** Published final Natural Resource Condition Assessment. □

#### **Lake Clark National Park & Preserve**

Drafted proposal and received funding for a project exploring changes in lake trout growth rates relative to changes in the aquatic and terrestrial environment. □ Drafted proposal, received funding, and implemented a radiotelemetry study on the migration of sockeye salmon through the Newhalen River watershed. □ Assisted with logistics and sampling of water quality monitoring in the Chulitna River watershed adjacent to the proposed Pebble Mine. □ Continued to provide technical assistance related to potential impacts to ground and surface waters from the proposed Pebble Project copper-gold-molybdenum mine adjacent to the park. Coordinated with USGS Alaska Water Science Center on their baseline sampling of the Chulitna watershed. □ Drafted proposal, received funding, and implemented a coho salmon escapement project on the Lake Clark coast. □ Provided project oversight, completed data analysis, and wrote an annual report for a monitoring project estimating the number of sockeye salmon returning to Lake Clark. □ Worked cooperatively with the Alaska Department of Fish and Game to coordinate logistics, hiring, and implementation of a sockeye salmon escapement project in the Kuskokwim River drainage in southwest Alaska. □ Coordinated logistics and sampling for a study assessing the feeding ecology of Arctic char in Lower Tazimina Lake. □



Planes on Hardenburg Bay, Lake Clark National Park & Preserve (Alaska). NPS COLLECTION

**Sitka National Historic Site** Provided guidance regarding protection of instream flows and the validity of non-NPS water rights on the Indian River. □

**Yukon–Charley Rivers National Preserve and Gates of the Arctic National Park & Preserve** Provided input on objectives for resource condition assessment. □ Provided input on Gates of the Arctic General Management Plan. □ Member of the unit compliance team. □ Member of the aviation working group. □ Assisted with Natural Resource Condition Assessment for YUCH and DENA. □

**Arctic Network** Served on network technical advisory committees. □ Continued investigating the mechanisms of lake drainage in Kobuk Valley and helped develop a vulnerability model for lake drainage. Maintained contract with ABR Inc. □ Implemented the synoptic sampling portion of the shallow lake monitoring plan in 70 lakes. □ Maintained continuous-data-logger arrays in two lakes. □ Continued cooperative agreement to track changes in lake surface area in Kobuk Valley National Preserve. □ Continued development of interactive geodatabase for observing large scale lake drying and thermokarst events in network parks. □

**Central Alaska Network** Served on network technical advisory committees. □ Maintained water quality monitoring sondes in six lakes in network parks. □ Implemented the synoptic sampling portion of the shallow lake monitoring plan in 100 lakes in Wrangell–St. Elias NP&P. □

**Southwest Alaska Network** Reviewed monitoring protocols and annual reports, and provided technical assistance with various fish and water resource projects. □ Planned and facilitated collection of bathymetry data for Upper and Lower Twin Lakes, Upper and Lower Tazimina Lakes, and Lachbuna Lake. □ Coordinated collection of resident fish species from five different lakes for contaminants analyses. □

Provided review and consultation on a draft schema for NPS continuous water resources data management using Aquarius Workstation and the Aquarius Database. □ Provided review and comment on the “Southwest Alaska Freshwater Flow System Monitoring” Protocol Narrative and SOPs. □

## INTERMOUNTAIN REGION

**Intermountain Region** Served as NPS Hydrologist on Intermountain Regional Burned Area Emergency Response (BAER) Team for Horseshoe 2 fire in Coronado National Forest and Chiricahua National Monument. □ Participated on the USGS/NPS Water Quality grant review panel. □ Served as chair of the Biology Committee of the Upper Colorado River Endangered Fish Recovery Program from January 2011 to December 2011. □ Served as Management Committee representative to the Upper Colorado River Endangered Fish Recovery Program from January 2011 to December 2011. □ Served as Program Secretary for the Desert Fishes Council. □ Provided NPS update on conservation actions, discussed annual reports and provided guidance on future efforts for the Three-Species Conservation Agreement and Strategy □ Presented paper at the Desert Fishes Council annual meeting in Moab, Utah, on Grand Canyon National Park Shinumo Creek Humpback Chub Translocation. □ Supported the Intermountain Region Office Deputy FMO with review of a firefighter chemical exposure draft LLR report investigating a chemical exposure incident at a wildland fire. □

**Arches National Park (Utah)** Prepared Scope of Work for “A Hydrologic Evaluation of Waters of the Entrada and Navajo Aquifers in the Courthouse Wash Area, Arches National Park, Grand County, Utah.” □ Prepared and submitted five water right protests. □ Provided presentation regarding the proposed water rights settlement to Grand County Council, Utah State Engineer, and the Arches superintendent. □



Desert oasis in Big Bend National Park (Texas). NPS/JIM GRAMANN

Provided oversight/consultation to collect spring discharge data. □ Provided continuing advice related to several problematic stream crossings near the Wolfe Ranch area of the park. □

#### **Badlands National Park (South Dakota)**

Consulted with park staff regarding completion of floodplain Statement of Findings. □

#### **Bandelier National Park (New Mexico)**

Provided advice on best ways to prepare for flooding after very large fires occurred this year; planned trip to park in autumn to get a better idea of conditions and will help in future planning-related activities. □

#### **Bent's Old Fort National Historic Site**

(Colorado) Evaluated applications in Water Division 2 to determine impacts of diversions on water rights. □

#### **Big Bend National Park/Rio Grande Wild & Scenic River (Texas)**

Consulted with park on groundwater monitoring instrumentation and deployment options; provided park with sensor deployment cable. □ Assisted park staff and WRB in monitoring groundwater inflow to the Rio Grande Wild & Scenic River. □ Participated in gain/loss study to quantify ground water contributions via spring flows to the mainstem of the Rio Grande River. □ Participated in discussions with Rio Grande Science Team to frame instream flow needs and flow requests from the Rio Conchos (in Mexico) to Rio Grande River. □ Reviewed the annual report for the Reconnaissance of Water Chemistry and Spring Flow from a Transborder Aquifer along the Rio Grande River. □ Facilitated the Outstandingly Remarkable Values workshop for the Rio Grande River. □ Consulted with park staff and performed quick analysis of survey information related to the proposed construction of a new, unstaffed visitor contact station/border crossing at Boquillas. □

#### **Bighorn Canyon National Recreation Area (Montana, Wyoming)**

Submitted annual report as required by the Montana –

United States, NPS Water Rights Compact. □ Served as NRSS Project Coordinator for arid land springs restoration project. □ Responded to SOL inquiry regarding federal facilities located within navigable streams. □ Responded to enquiry by Senator Baucus about lake level management. □

#### **Big Hole National Battlefield (Montana)**

Reviewed applications and filed objections as necessary to protect park water rights. □ Evaluated settlement proposals and coordinated with park, SOL, and other federal agencies to resolve NPS objections to adjudication claims. □ Submitted annual report as required by the Montana–United States, NPS Water Rights Compact. □

#### **Big Thicket National Preserve (Texas)**

Participated in Big Thicket Mussel Survey on Neches River in cooperation with the U.S. Fish & Wildlife; identified species types and number of mussel kills from low water levels. □ Provided hydrologic oversight for the Chevron pipe removal project at the preserve, requiring multiple site visits and coordination of multiple stakeholders. □ Uploaded water quality and benthic macroinvertebrate data to STORET from a series of studies conducted from 1976–1981 by Lamar University. □

#### **Black Canyon of the Gunnison National Park (Colorado)**

Assisted with data collection and initial development of a hydraulic model to support long-term vegetation monitoring. □ Participated in the design/implementation of a long-term monitoring program to document changes in riparian vegetation as a function of upstream reservoir releases. □ Evaluated applications in Water Division 4 to determine effects of diversions on water rights. □ Provided guidance on the effects and operations of Aspinall Unit on park resources and the decreed water right for the Gunnison River. □

#### **Bryce Canyon National Park (Utah)**

Conducted analyses of radius of groundwater travel time to the water-supply wells in the East Creek wellfield. □



The Castle and Sulphur Creek, Capitol Reef National Park (Utah). NPS COLLECTION

**Canyonlands and Arches National Parks (Utah)** Continued to monitor DOE news releases and communicate with park staff concerning the Moab site groundwater remediation, tailings removal and repository build-out activities, and recent concerns with Colorado River flooding adjacent to pile due to the high snowpack and corresponding spring runoff. Approximately 4.7 million total tons of tailings removal was reached (as of October 2011) despite reductions to a single train per day and reverting back to a five-day work week after Recovery Act funding was expended; additional extraction wells near the source captured higher concentrations of ammonia and uranium to increase plume remediation efficiencies (~180 million gallons site groundwater pumped and treated to date). □

**Capitol Reef National Park (Utah)** Completed water right change application. □

**Chickasaw National Recreation Area (Oklahoma)** Assisted in water quality sampling and identified hydrologic issues related to Clean Water Act's Total Maximum Daily Load (303d) process at Chickasaw. □ Represented CHIC and NPS on the Meridian Technical Review Panel. □ Prepared oral and written testimony and exhibits for a public conference on a mine application. □ Prepared comments on the Oklahoma Comprehensive Water Plan. □ Compiled and evaluated hydrologic data collected by the park and nearby mine. □ Prepared standard procedures for transducer operation in monitoring wells. □

**Chiricahua National Monument (Arizona)** Coordinated planning and installation of an ALERT precipitation gauge in the upper Bonita and Rhyolite Creeks watershed area with state and county early flood warning programs and park resource staff. □

**Colorado National Monument (Colorado)** Evaluated applications in Water Division 5 to determine effects of diversions on water rights. □ Prepared report summarizing water rights. □

**Coronado National Memorial (Arizona)** Conducted monitoring of groundwater level to study the adequacy of a new water supply well to meet park requirements. Completed the hydrogeologic analysis and submitted a report with recommendations to park staff. □ Conducted groundwater monitoring at several locations in the park, processed and reported data to park staff. □

**Curecanti National Recreation Area (Colorado)** Assisted with design and planning for construction of a new well at East Elk Creek. □ Evaluated applications in Water Division 4 to determine impacts of diversions on water rights. □

**Devils Tower National Monument (Wyoming)** Conducted analyses of groundwater level monitoring data. □ Consulted with park staff regarding completion of floodplain Statement of Findings. □

**Dinosaur National Monument (Colorado, Utah)** Evaluated applications in Water Division 6 to determine impacts of diversions on water rights. □ Provided leadership in the development of strategies for in-stream flow protection for the Yampa River. □ Provided leadership in the development and implementation of monitoring studies to evaluate near-record high flows on the Green and Yampa Rivers. □

**Florissant Fossil Beds National Monument (Colorado)** Assisted park staff with evaluation and planning for testing of Sawmill Trail Well. □ Evaluated applications in Water Division 1 to determine impacts of diversions on water rights. □ Obtained Ruling of Due Diligence for proposed water use from the Sawmill Trail Well. □

**Fort Bowie National Historic Site (Arizona)** Shepherded NPS new source public water supply permit application between contracting officer, contractor, and Arizona Department of Environmental Quality; permit was awarded August 2011. □



**A commercial raft trip on the Colorado River, Grand Canyon National Park (Arizona).** NPS/  
MICHAEL QUINN

Conducted site review and developed water resource sections for proposed Willow Gulch mine road Environmental Assessment. □ Developed scope of work and shepherded contracting documents for Southwest Conservation Corps crew to implement erosion control treatments in upper Apache Spring watershed; worked with park staff to develop treatment plans and purchase supplies for project. □

#### **Fort Davis National Historic Site (Texas)**

Consulted with park staff and region regarding appropriate use of hydrologic models in assessing post-fire treatments. □

#### **Fort Union National Monument (New Mexico)**

Provided an assessment of the potential for natural gas exploration and hydrofracking to impact park resources. □ Published final Natural Resource Condition Assessment. □

#### **Gila Cliff Dwellings National Monument (New Mexico)**

Selected locations and installed crest stage gauges on the West Fork Gila River and in Cliff Dwellers Canyon; continued support of the West Fork Gila River stream gauge at the pedestrian bridge in the park. □

#### **Glacier National Park (Montana)**

Conducted a hydrogeological assessment for a new well for the Two Medicine water-supply system; provided advice during the construction and testing of a new well for the Fish Creek Campground; conducted a hydrogeological assessment for the Avalanche Creek Campground water-supply system. □ Developed objection policy for applications hydrologically connected to park streams under the Montana Compact. □ Reviewed applications and filed objections as necessary to protect park water rights. □ Submitted annual report as required by the Montana–United States, NPS Water Rights Compact. □

**Glen Canyon National Recreation Area (Arizona, Utah)** Surveyed springs in Iceberg Canyon for presence of nonnative fish

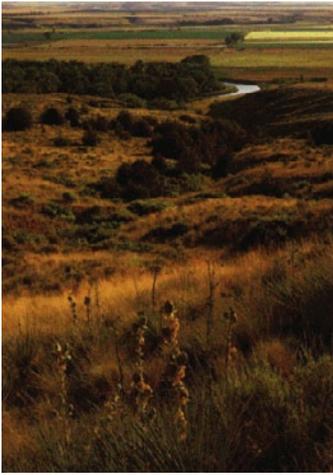
and native amphibians to determine feasibility and efficacy of treating ponded area in preparation for stocking native endangered bonytail; Glen Canyon is partnering with USGS and USFWS to implement project. □ Provided assistance to the NPS Land Resources Division to improve the GIS representation of the park boundary. □

#### **Grand Canyon National Park (Arizona)**

Removed nonnative fish from Bright Angel Creek by electrofishing, and operated and maintained fish weir to block upstream movement and remove nonnative trout; the project is funded by the Bureau of Reclamation and NPS and conducted in cooperation with the University of Missouri and Grand Canyon Trust. This multi-agency group is working together to restore the native fish community in Bright Angel Creek, with help from many volunteers. □ Translocated endangered humpback chub into Shinumo and Havasu creeks; assisted with planning, collection, transportation, and monitoring of humpback chub and fish community in Shinumo and Havasu creeks. □ Reviewed the DEIS for proposed mineral withdrawal near Grand Canyon National Park; provided comments to DOI staff. □

#### **Grand Teton National Park (Wyoming)**

Provided evaluation of well construction and testing at Signal Mountain. □ Began investigation of potential impacts of groundwater pumping on streamflow in Pilgrim Creek. □ Completed water rights amendment to change point of diversion associated with removal of a low head dam on Spread Creek. □ Developed protocols for review of water right activities on the Gros Ventre River. □ Prepared summary of Upper Snake River gauging stations and discharge data. □ Coordinated the quantification of in-stream flow rights with the USFWS, USFS, BOR, and State of Wyoming for the newly designated Snake Headwaters Wild and Scenic River. □ Participated in site visits to boat launch facilities on Snake River. Wrote geomorphic interpretation in combined report done by group. □



**View of Little Bighorn River from Last Stand Hill, Little Bighorn Battlefield National Monument (Montana).** NPS COLLECTION

**Grant–Kohrs National Historic Site (Montana)** Provided guidance to park on the operation of the Westside Ditch Parshall flume and Clark Fork River pump. □ Provided guidance and equipment to conduct discharge measurements. □

**Great Sand Dunes National Park & Preserve (Colorado)** Made three presentations to the May 2011 NRAG meeting, Colorado State University, and the San Luis Valley Geology and Hydrology Workshop. □ Provided oversight for data collection, compilation, and quarterly report preparation for 10 monitoring wells. □ Reviewed the Energy Zones proposed for Colorado in the BLM Solar Energy PEIS. □

**Guadalupe Mountains National Park (Texas)** Assembled and shipped new deployment cables for installation of groundwater sensors; processed groundwater data collected by park staff, updated spreadsheets, and sent results to park and Chihuahuan Desert Network program staff. □ Provided assessment of potential impact of discharge of brine from a desalination plant to the Salt Flats adjacent to the park. □ Continued preparation of a comprehensive assessment of water rights. □

**Hovenweep National Monument (Colorado, Utah)** Submitted annual water use report to Colorado. □

**Little Bighorn Battlefield National Monument (Montana)** Submitted annual report as required by the Montana–United States, NPS Water Rights Compact. □ Reviewed Basin 430 Claims and submitted objections as necessary. □ Advised on flood hazard for proposed new visitor center. □

**Mesa Verde National Park (Colorado)** Initiated wetlands restoration project to rehabilitate an abandoned sewage lagoon. □ Evaluated applications in Water Division 7 to determine impacts of diversions on water rights. □ Advised park staff on the monitoring of the Far View Terrace gasoline

groundwater plume and its cleanup under the Colorado Division of Oil and Public Safety spill remediation reimbursement program. Reviewed and provided comments to state regulatory agencies on Corrective Action Plan (CAP) modifications and semi-annual monitoring documents produced by LUST Program Responsible Party contractor. Past meetings of WRD staff with state Dept. of Labor and Employment (oil section) staff and representatives of ARA-MARK and contractor (Arcadis) have now resulted in a more aggressive and active cleanup approach and further CAP modifications by enhancing plume bioremediation through sulfate addition. This approach is currently being implemented. □ Continued to work with park staff, Denver Service Center contracting office, and PRP contractor (Arcadis) in determining effects (if any) of water pipeline installation “frac outs” on plume monitoring wells and best ways to evaluate any impacts over the course of implementation of the enhanced bioremediation CAP Mod. □

**Montezuma Castle National Monument (Arizona)** Designed, purchased, programmed, and installed a satellite telemetry system at the Beaver Creek stream gauge at the park; coordinated with NOAA and NWS to activate satellite services and web posting of the data stream from this station. □ Provided guidance to operate, maintain, and manage data for gauges on Beaver and Wet Beaver creeks. □ Quantified instream flow water rights and prepared draft reports to support instream flow applications for Beaver and Wet Beaver creeks. □ Monitored USGS investigation to determine source and flowpaths of groundwater in Montezuma Well. □ Provided cartographic support to the Water Rights Branch in mapping and calculating river mile points along Wet Beaver Creek. □

**Natural Bridges National Monument (Utah)** Natural Bridges water rights agreement signed in Salt Lake City, UT. □



The gypsum sand of White Sands National Monument (New Mexico). NPS/JAMES HARTE

**Organ Pipe Cactus National Monument (Arizona)** Assessed causes of pictograph deterioration at Wild Horse Tanks site, identified measures to reduce water-related impacts to the pictographs. Submitted trip report with management recommendations to park resource staff; the recommendations were subsequently acted on by the park. □

**Pecos National Historical Park (New Mexico)** Prepared water right applications for submission to New Mexico Office of the State Engineer. □

**Pipe Spring National Monument (Arizona)** Provided technical assistance for ongoing studies of geology and hydrogeology and causes of springflow reduction. □

**Rocky Mountain National Park (Colorado)** Assisted in planning and constructing new wells at Moraine Park. □ Assisted in reviewing and preparing water rights dockets. □ Evaluated applications in Water Division 1 as required to determine impacts of diversions on water rights. □ Imported the continuous multi-sonde water quality monitoring data collected for the Grand Ditch into Aquarius to serve as a springboard for additional analysis. □ Participated in a Rocky Mountain NP Resource Assessment Workshop to help the park plan near-term workload plans and priorities based on information from their recent NRCA and other sources of scientific data and expertise. □ Continued to support park (Grand Ditch EIS) and network (ROMN) water quality monitoring efforts through installation of water quality monitoring equipment at two sites on the Colorado River. This baseline data will be used in the park's alternatives assessment in selecting a restoration response. The water quality data from one of the sites is also being used by the ROMN to continue a network sentinel monitoring site that WRD assisted in establishing the previous year. □ Travelled to park and hiked area of study by CSU; the work consisted of mapping and dating of debris flows in the Grand Ditch area. □ Provided advice and

design information for the construction of a fence over the Colorado River; the fence needs to prevent animal entry but at the same time not become a screen for debris floating down river. □

**Saguaro National Park (Arizona)** Provided a groundwater monitoring sensor and deployment assembly to the park for installation in the Rincon Creek drainage. Identified and provided hardware and installation for initiation of monitoring at the Madrona Pack Base Well in Chiminea Creek. Data from these two wells will be used in the analysis of hydrological relationships between shallow and deep aquifers in the Rincon Creek watershed. □

**Southeast Arizona Parks** Contributed hydrology and water quality sections and supervised agreement execution for the Chiricahua NM, Coronado NM, and Fort Bowie NHS Natural Resource Condition Assessment. □

**Tonto National Monument (Arizona)** Provided technical support to ongoing study of soil moisture dynamics and groundwater percolation at the unique Hidden Ridge woodland site. □

**Tuzigoot National Monument (Arizona)** Provided technical review and comments on the Environmental Assessment for the Tavaschi Marsh Management and Habitat Enhancement Plan. □

**White Sands National Monument (New Mexico)** Provided technical assistance in the planning and installation of instrumentation for monitoring water levels at Lake Lucero. □ Provided technical assistance in evaluating hydrogeology and water resources of the park. □ Reviewed the Energy Zones proposed for New Mexico in the BLM Solar Energy PEIS. □ Prepared Scopes of Work for Tularosa Basin water rights inventory, the construction of two groundwater monitoring wells, and a hydrogeologic investigation of the Jarilla Fault. □



Visitor at Artist Point overlooking the Grand Canyon of the Yellowstone, Yellowstone National Park (Montana, Wyoming, Idaho). NPS/JIM GRAMANN

**Yellowstone National Park (Wyoming, Montana, Idaho)** Reviewed applications and filed objections as necessary to protect park water rights. □ Attended Yellowstone Groundwater Area–Technical Oversight Committee Meetings. □ Submitted annual reports as required by the Montana–United States, NPS Water Rights Compact. □ Reviewed abstracts for water right claims in Idaho. □ Modified NPSTORET to better accommodate and report fisheries data and provided troubleshooting for network connectivity issues. □ Generated time-series plots of 15-minute turbidity and precipitation data for Mammoth Crystal Springs near Sylvan Pass. □ Consulted with park staff in the closure of monitoring sites on Sylvan Pass and the award of a final USGS contract to dismantle monitoring sites and produce a final report of impacts from gravel mining operations on Sylvan Pass. □ Coordinated with park staff and MT DEQ on various monitoring activities at the McLaren Tailings site during repository build-out and the initiation of tailings removal; consulted with state on the installation of new monitoring wells to ensure and confirm that groundwater fluctuations posed no potential impacts to tailings in the revised repository design calling for increased repository capacity and deeper tailings placement. □ Worked with park and network staff to complete interagency agreements and obtain a continuation of funding of the park gauge on Soda Butte Creek operated by the USGS Montana Science Center; this ensured monitoring of turbidity, specific conductance, and event sampling (ISCO, Inc.) during the McLaren tailings removal and site remediation. FY 2011 was a transition year from baseline monitoring of key water quality parameters (e.g. specific conductance and turbidity) to one of monitoring during actual remediation (initial tailings removal conducted by state) and any loading from the McLaren Tailings site that may occur should a rainfall/runoff event elevate metals in Soda Butte Creek that would be measurable at the park boundary. □ Participated in the continued monitoring of USFS cleanup

of the New World Mining district; reviewed document for USFS of reclamation activities and surface water and groundwater monitoring plans designed to achieve restoration goals as discussed in the Final Water Quality Compliance Report for New World (January 2010). □

#### **Northern Colorado Plateau Network**

Conducted a training for Arches and Northern Colorado Plateau Network staff regarding detailed survey methods and riparian monitoring techniques. □ Provided advice and recommendations on the use of special characters and bulk loading station visit pictures in NPSTORET. □

#### **Rocky Mountain Network**

Provided support in installing and configuring NPSTORET. □

#### **Southern Colorado Plateau Network**

Provided support and recommendations on mapping the network’s water quality data collection to the NPSTORET schema, importing USGS National Water Quality Laboratory data, and entering state water quality standards and criteria. □

### **MIDWEST REGION**

**Midwest Region** Performed GPRA duties for two land health goals. □ Prepared briefing document related to nutrient management issues in the Upper Mississippi River Basin for use by MWR Director at the 2011 MNRG meeting. □ Coordinated project plans, oversaw project activities, and helped develop contracts, agreements, and purchasing documents for many Great Lakes Restoration Initiative (GLRI) Nearshore Health projects, totaling more than \$2M and affecting all six Great Lakes parks. □ Helped coordinate GLRI project “Comprehensive Marine Assessments: Benthic Habitat Mapping”, particularly during summer 2011 mapping activities at SLBE. □



**Statue of Carver as a boy, George Washington Carver National Monument.** NPS/CHRISTOPHER LIGHT

Secured investigator, prepared agreement documents, and made plans for data analysis related to GLRI project “Comprehensive Marine Assessments: Nearshore Ecological Survey.” □ Reviewed work plans, contracts, and draft products related to several GLRI projects including “Implement Recommendations from Watershed Condition Assessments: Develop Spill Response Plans” and “Implement Recommendations from Watershed Condition Assessments: Inventory and Ecological Survey of Coastal Rock Pools.” □ Revised agreement document and assisted with field sampling and analytical work related to GLRI projects “Research Nearshore Lake Michigan Changes: Paleolimnological Study” and “Research Nearshore Lake Michigan Changes: Intensive Food Web Study.” □ Assisted with developing purchase materials for the GLRI project “Research Nearshore Lake Michigan Changes: Purchase Nearshore Monitoring Buoy.” □ Developed a successful proposal to the NPS Air Resources Division to investigate nitrogen deposition histories for Great Lakes Network lakes, using archived sediment core material; prepared related agreement documents. □ Served as one of two NPS points of contact for the Gulf Hypoxia Task Force Coordinating Committee, and provided NPS information for the Annual Reports and Operating Plans. □ Worked with NPS staff, Minnesota Department of Natural Resources staff, and Michigan Technological University to coordinate data analysis and reporting aspects of the multi-park spiny water flea project. □ Supervised term Hydrographic Surveyor that was hired for Great Lakes Restoration Initiative (GLRI) project to map benthic habitat and restoration project sites. □ Worked with parks APIS, GRPO, ISRO, PIRO, and SLBE to further develop projects for Coastal and Fluvial Restoration as part of Great Lake Restoration Initiative. □ Represented Midwest Region for Ocean and Coastal Stewardship program. □ Participated in classroom and underwater training to renew NPS scuba certification. □ Represented NPS at Great Lakes Fishery Commission Lake Superior Technical Committee meetings.

□ Initiated coordination with WRD staff and USFWS Sea Lamprey Control office to develop plans for native lamprey surveys as part of GLRI project in 2012. □ Worked with the EPA to collect data in six Great Lakes parks using National Coastal Assessment protocols (funded by Great Lakes Restoration Initiative). □

**Agate Fossil Beds National Monument (Nebraska)** Conducted analyses of groundwater monitoring data. □

**Buffalo National River (Arkansas)** Coordinated with the USGS and state stewards to update the National Hydrography Dataset within the park. □

**Cuyahoga Valley National Park (Ohio)** Reviewed the results of additional sampling requested by WRD staff to ensure that appropriate due diligence was performed prior to land acquisition by NPS where potential existed for historic dumping of hazardous wastes. Further sampling recommendations were made after completing reviews of Phase I and Phase II site pre-acquisition assessment reports, and these results were favorable toward continuing the acquisition process. □

**George Washington Carver National Monument (Missouri)** Re-uploaded phosphorus, nitrogen, and coliform data to STORET collected by the Newton County Health Department from 2005–2007 to more accurately portray the results. □ Published final Natural Resource Condition Assessment. □

**Grand Portage National Monument (Minnesota)** Conducted simple hydraulic modeling assessment of proposed road crossing and provided advice on low-water crossing design. □

**Hot Springs National Park (Arkansas)** Served as technical expert in Foundations Report workshop, consulted on hydrology related issues. □



Knife River just above the village where Sacagewea lived in 1803, Knife River Indian Villages National Historic Site (North Dakota). NPS/CHRISTOPHER LIGHT

**Indiana Dunes National Lakeshore (Indiana)** Worked with staff to facilitate a re-do of the Natural Resource Condition Assessment, using funding from Great Lakes Restoration Initiative (GLRI) Project 90; provided review comments for draft full report. □ Participated in conference calls and reviewed key background documents for the Indiana Dunes Shoreline Management Plan (e.g., shoreline change analysis and ecological condition analysis) and provided detailed comments on two draft versions of the related EIS. □ Reviewed and provided comments on USGS technical report prepared for Indiana Dunes. □ Provided baseline water quality data inventory and analysis report data and advised on its use and interpretation. □ Reviewed Remedial Investigation documents and worked closely with park staff to provide technical assistance and guidance to management in their dealings with EPA and Responsible Parties. Reviewed and provided comments on the site Human Health Risk Assessment and the site Ecological Risk Assessment to ensure that the Pines CERCLA Remedial Investigation would provide credible data that could better be used to evaluate threats and protect park resources. □ Provided a Clean Water Act review as it applied to reissue of a NPDES permit to a local steel mill discharging to a park stream, and advised the park on any technical grounds or basis for challenging the permit renewal under state statutes. □ Provided review of the Baseline Environmental Risk Assessment (BERA) for the Bailly Generating Plant RCRA site. □

**Isle Royale National Park (Michigan)** Provided technical and logistical assistance to university cooperators conducting the Isle Royale/Acadia nitrogen critical loads project. □ Facilitated the collection of additional sediment cores from two Isle Royale lakes. □ Provided technical input related to the selection of ballast water treatment systems for the Ranger III. □ Participated in conference calls and assisted superintendent with various ballast water issues. □ Worked with staff to finalize revised northern pike regulations for inland lakes of Isle Royale. □

Provided opinion and management recommendations regarding response to a potential outbreak of Viral Hemorrhagic Septicemia (a fish disease). □ Worked with USFWS and Isle Royale to develop benthic mapping plan for Isle Royale. □ Provided comments on document created by superintendent addressed to Michigan Senate Outdoor Recreation and Tourism Committee regarding a bill to amend the state's Natural Resources and Environmental Protection Act. □

**Knife River Indian Villages National Historic Site (North Dakota)** Investigated extent and implications of river erosion at Knife River, developed and implemented an erosion monitoring plan for park staff, and made recommendations to park management on watershed management solutions. □ Reviewed and commented on technical memo regarding streambank erosion. □

**Mississippi National River and Recreation Area (Minnesota)** Continued drafting final report on spatial, seasonal, and long-term water quality trends in and near MISS. □ Contacted Dr. Robert Hirsch of USGS and plan to use his newly developed trend analysis methods on the MISS data set; incorporated some aspects of this approach into recent presentations for MISS. □ Co-presented "Mississippi National River and Recreation Area water quality: Assessing past and monitoring future changes" at the 2011 George Wright Society Conference on Parks, Protected Areas, and Cultural Sites. □ Co-presented "The Mississippi River: Water quality trends over 30 years" at the 2011 Mississippi River Forum. □ Participated in conference calls about management recommendations for controlling Asian carp migrations into MISS and SACN. □

**Missouri National Recreational River (Nebraska, South Dakota)** Facilitated the Outstandingly Remarkable Values workshop for the Missouri River. □ Provided advice to park staff about monitoring constructed sand bars in Missouri River; participated in conference call with other agencies. □



Lake Michigan overlook in winter at Sleeping Bear Dunes National Lakeshore (Michigan). NPS/KERRY KELLY

**Niobrara National Scenic River (Nebraska, South Dakota)** Provided advice to support hydrologic, economic, and fish and wildlife studies to support state-based in-stream flows on the Niobrara River. □ Facilitated the Outstandingly Remarkable Values workshop for the Niobrara River. □

**Ozark National Scenic Riverways (Missouri)** Investigated potential impacts from a proposed large-scale dairy within the recharge area of Big Spring. □ Uploaded results from the park's long-term water quality monitoring program through 2010 from NPSTORET to STORET. □ Uploaded water quality data to STORET through 2010 from the park's ongoing monitoring of 21 springs. □ Uploaded water quality data to STORET through 2010 from the park's ongoing monitoring of 18 tributaries of the Jacks Fork and Current Rivers. □ Uploaded water quality data to STORET collected by park staff at four locations from 2003–2009 to assess bacteriological impacts associated with weekend river recreational use. □

**Pictured Rocks National Lakeshore (Michigan)** Provided detailed comments on draft and final reports for the lakeshore vernal pools project, including the biological survey aspects funded by GLRI Project 90. □ Coordinated field sampling for native mussel and fish host investigations. Purchased fisheries field equipment for park's use on project. □ Coordinated with USFWS on placement of additional passive integrated transponder (PIT) antenna at Miner's Creek for brook trout monitoring; assisted USFWS with PIT maintenance. □

**Saint Croix National Scenic Riverway (Minnesota, Wisconsin)** Provided field and analytical assistance for USGS zebra mussel effects study and climate change effects studies. □ Provided technical assistance related to nuisance algal issues near the Apple River mouth. □ Participated in St. Croix Basin Water Resources Planning Team activities, particularly those of the Monitoring and Assessment Subcommittee. □ Provided

Wild and Scenic River program guidance regarding the St. Croix River Crossing Project. □ Presented “The other nutrient: Nitrogen in Lake St. Croix water and biota” at the October 2010 St. Croix Research Rendezvous. □ Provided comments to park regarding implementation of large wood cover project proposed by state of Wisconsin. □ Began investigation of potential impact of a proposed gravel mining operation adjacent to the park. □

**Sleeping Bear Dunes National Lakeshore (Michigan)** Helped plan, conduct, and coordinate a large suite of multi-agency studies in SLBE's Lake Michigan waters through GLRI Project 9. □ Provided technical assistance related to year three of the NRPP–NRM botulism project. □ Published “Links between type E botulism outbreaks, lake levels, and surface water temperatures in Lake Michigan, 1963–2008” in Journal of Great Lakes Research. □ Prepared a fact sheet addressing GLRI Project 91 activities entitled “Lake Michigan ecosystem research: 2010 field studies at Sleeping Bear Dunes National Lakeshore.” □ Copresented “Are we losing our Great Lakes?” at the St. Croix Watershed Research Station spring 2011 Friends Event. □ Contributed to two presentations (“Investigating botulism mechanisms in the Lake Michigan nearshore: Food web structure and oxygen dynamics” and “Botulism type E toxin in northern Lake Michigan”) at the 2011 meeting of the International Association for Great Lakes Research. □ Contributed to an interagency presentation (“Botulism type E toxin in northern Lake Michigan”) at the 2011 State of Lake Michigan Conference. □ Worked with regional aquatic ecologist to assist park with botulism investigations. □ Represented NPS at Glen Lake–Crystal River Technical Committee meetings. □ Provided guidance regarding the Glen Lake Dam structure and gauge installation. □ Obtained bathymetry and historical aerial imagery and created GIS data of historic shorelines in support of dock relocation analysis on North and South Manitou Islands. □



Purple and yellow prairie coneflowers in bloom at Theodore Roosevelt National Park (North Dakota). NPS COLLECTION

Evaluated and reported on the results of nitrate sampling of park springs in conjunction with a CSU Research Associate after conducting field sampling in August 2010; results indicated that nitrate concentrations were insufficiently elevated in this sampling event to link to the operation of a nearby pig farm's disposal activities. This WRD support alleviated the park's immediate concerns with nutrient degradation of their Aral Spring resource. □

**Theodore Roosevelt National Park (North Dakota)** Served as NRSS Project Coordinator for Climate Change Response project. □ Initiated a USGS study to determine drought stress on cottonwood trees on the Little Missouri River. □ Collected survey data on the Little Missouri River. □ Coordinated with the USGS and state stewards to update the National Hydrography Dataset in two sub-basins covering the park. □

**Voyageurs National Park (Minnesota)** Helped plan for collection and mercury analysis of additional native crayfish and invasive rusty crayfish from a recently invaded Voyageurs site. □

**Wilson's Creek National Battlefield (Missouri)** Re-uploaded to STORET miscellaneous benthic macroinvertebrate data collected by park employees as part of a discontinued monitoring program from 1992–1993 in order to correct issues in a previous upload. □

**Wind Cave National Park (South Dakota)** Reviewed and commented on draft microbiology report. □ Reviewed and summarized discharge measurements collected at Beaver Creek Springs. □ Served as NRSS project coordinator for climate change response project. □

**Great Lakes Network** Uploaded all water quality data through 2010 from NPSTORET to STORET for eight network parks. □

## NATIONAL CAPITAL REGION

**National Capital Region** The hiring process for an NCR–NER shared Aquatic Ecologist position was completed with the new employee entering on duty on 9 October 2011. Equipment and computers were purchased to establish the aquatic ecology program. Each region will contribute \$25,000 or more to the position, augmenting the WRD base by \$80,000. □ Provided support and advice in the use of NPSTORET, troubleshooting data and coding issues, and retrieving data from the STORET Data Warehouse. □

**Rock Creek Park (District of Columbia)** Provided hydrologic and hydraulic support to National Capitol Region related to the recent compliance and erosion problems associated with a road-widening project in the park. □

## NORTHEAST REGION

**Northeast Region** Provided input to Federal Chesapeake Bay Watershed Implementation Plan guide. Evaluated list and provided compliance contacts for National Parks within the watershed. Identified training program for National Park staff that will be implemented to assist with Total Maximum Daily Loads (TMDL) compliance in November 2011. □ Completed three-month work detail as Acting Regional Chief, Natural Resource Stewardship and Science. □

**Acadia National Park (Maine)** Assisted with development and submission of a proposal to develop a hydrologic/hydraulic model for culvert development and wetlands protection at Great Meadows/Sieur du Mont. □ Completed additional analyses of long-term lake water and air quality monitoring data with assistance of the NCBN Quantitative Ecologist. Worked with University of Maine at Orono scientists to examine link between declining water clarity in lakes and changes in sulfur and



**Band of horses in a salt marsh at Assateague Island National Seashore (Maryland, Virginia).** NPS COLLECTION

dissolved organic carbon. Presented resulting information at The 2011 George Wright Society Conference on Parks, Protected Areas, and Cultural Sites and the International Northeast Air Quality Committee meetings. □ Reviewed NPS-funded research presented by University of Maine as a Masters thesis entitled Effects of Increasing Atmospheric Nitrogen and Dissolved Organic Matter on Phytoplankton in Boreal Lakes with Differing Nutrient Limitation Patterns, by Carmen Daggett. □ Provided written review and consultation for water quality report (2006–2009). □ Assisted park with developing specifications for large scale project to be conducted by USGS. □

**Antietam National Battlefield (Maryland)** Published final Natural Resource Condition Assessment. □

**Appalachian National Scenic Trail (Maine to Georgia)** Organized first year progress review of the Appalachian Trail Atmospheric Deposition Study; this study includes more than ten independent researchers with various affiliations and examines effects and potential for recovery of air, soil, water, and vegetation along the entire AT. The study serves as an example for using the Trail as a MEGA-transect to evaluate environmental change across a sensitive corridor that includes most of the eastern states. Collected water and soil samples to support this research. □

**Appomattox Court House National Historical Park (Virginia)** Provided a written review of the Natural Resource Condition Assessment. □

**Assateague Island National Seashore (Maryland, Virginia)** Assisted in developing groundwater monitoring protocol. □ Partnered with Assateague Island National Seashore and the state of Maryland to develop a benthic habitat map. □ Uploaded water quality data to STORET from 2003–2006 pilot tests of the Northeast Coastal and Barrier Network’s protocol for monitoring estuarine nutrient enrichment. □

Published final Natural Resource Condition Assessment. □

**Blue Ridge Parkway (North Carolina, Virginia)** Advised and assisted park in the evaluation of Responsible Party contractor proposed site characterization and mitigation actions related to the Roanoke Valley Resource Authority’s landfill discharges to surface waters and groundwater plume under the park. Consulted and coordinated with park staff on monitoring results from the placement of monitoring well pairs on the parkway and the construction of a remedial water treatment system to address surface water impacts from landfill discharges to surface water. □ Reviewed and provided comments on the Peaks of Otter Cultural Landscape Report. □ Reviewed and provided comments on the Humpback Rocks Cultural Landscape Report. □ Reviewed and provided comments for General Management Plan. □

**Boston Harbor Islands National Recreation Area (Massachusetts)** Evaluated wetland condition and potential for restoration with NER team; assisted with trip report to describe findings. □ Developed SOPs for intertidal use and protection. □

**Cape Cod National Seashore (Massachusetts)** Provided review of municipal water supply projects at Wellfleet and Eastham. □ Provided continuing technical assistance for the Herring River restoration project; provided analyses and review of hydrologic monitoring data. □ Funded Woods Hole Oceanographic Institution to investigate the dynamics of anthropogenic nutrient discharges and harmful algal blooms, and to produce tools to assist park managers in developing policy and management for nutrient control and remediation. □

**Colonial National Historic Park (Virginia)** Contributed technical knowledge on ecosystem ecology and shoreline management via site visit as well as review and comment on COLO Draft York River Shoreline Environmental Assessment. □



**Bald eagle chick in a nest overlooking the Delaware River, Upper Delaware Scenic and Recreational River (New York, Pennsylvania) NPS/SCOTT VAN ARSDALE**

Uploaded water quality data to STORET from 2003–2006 pilot tests of the Northeast Coastal and Barrier Network’s protocol for monitoring estuarine nutrient enrichment. ▫

**Delaware River (Upper Delaware National Scenic and Recreational River, Delaware Water Gap National Recreation Area, Lower Delaware National Wild and Scenic River) (New Jersey, New York, Pennsylvania)** Represented NPS at the Subcommittee for Ecological Flows meeting to evaluate aquatic resource needs for the river. Provided written review of PA/NY recommendations for flows to support aquatic life (primarily non-native trout). Lobbied for inclusion of native populations dependent on water resources of the Delaware River. ▫ Organized discussion of aquatic biota management at The 2011 George Wright Society Conference on Parks, Protected Areas, and Cultural Sites; decided to identify Wild and Scenic River values to focus NPS energy on the most important resources in the basin. Identified opportunity to use Denver Service Center expertise for establishing Outstandingly Remarkable Values along the Delaware River and within discrete park units; this effort will begin spring 2012. ▫ Developed proposal with DEWA and State University of New York College of Environmental Science and Forestry as a CESU partner to evaluate historic flows along the river pre-forest harvesting, pre-dam construction, and modern day. ▫ Provided review and written comment on proposed shale gas production regulations and environmental impact assessments for the Delaware River Basin Commission, NY, and PA. ▫ Participated in a federal implementation team (DBFIT) to provide a forum for federal stakeholders within the Delaware Basin to discuss management issues and present results in a unified manner through the federal representative; initiation of a USGS cumulative impact assessment of shale gas development also resulted from this workshop. ▫ Coordinated NPS WaterSMART initiative comments from park units along the Delaware River; flow needs, water quality, and establishment

of the basin water budget were identified as focal study issues. ▫ Worked with DEWA, UPDE, and USGS to develop a funded proposal to train NPS staff in placement and operation of water quality recorders; these units have been deployed to establish baseline water quality and assess changes associated with basin development. ▫ Provided written comment for determination of direct and adverse effect on Wild and Scenic River system due to proposed stream alteration at Callicoon Creek. ▫

**Fire Island National Seashore (New York)** Assisted with preparation of a proposal to examine presence of endocrine-disrupting compounds in park groundwater associated with Fire Island septic systems. Identified and coordinated alternate funding from park, region, and USGS sources to begin study with a pilot project. ▫ Trained and coordinated 18 citizen scientists who volunteered 175 hours to complete 40 horseshoe crab spawning surveys and to tag 37 horseshoe crabs for the NRPP-funded project “Assessment of Spawning Horseshoe Crabs within Mid-Atlantic Coastal NPS Units.” ▫ Conducted monthly nekton sampling (April–October) and biannual benthic sampling for NRPP-funded demonstration project for the restoration of bayside sediment transport at Sailors Haven. ▫ Developed and conducted interpretive program “Sampling Like a Scientist” for Junior Ranger Day program. ▫ Developed information on recreational fishery issues to include in the General Management Plan process. ▫ Uploaded water quality data to STORET from 2003–2006 pilot tests of the Northeast Coastal and Barrier Network’s protocol for monitoring estuarine nutrient enrichment. ▫ Uploaded water quality data from seven environmental studies conducted during 1999–2002 to document baseline characteristics in potential offshore sand source or “borrow” areas from a U.S. Army Corps of Engineers database to STORET. ▫ Uploaded benthic macroinvertebrate data to STORET collected in 1998 by the U.S. Army Corps of Engineers to determine impacts of beach nourishment. ▫



**Rainbow over Jamaica Bay, Gateway National Recreation Area (New York, New Jersey).** NPS/  
JOHN LINCOLN HALLOWELL

**Fort Necessity National Battlefield (Pennsylvania)** Assisted with evaluation of potential impacts from shale gas assessments prescribed for privately owned subsurface resources at request of park staff. □

**Gateway National Recreation Area (New Jersey, New York)** Implemented ecological monitoring to evaluate restoration of 69 acres of salt marsh at Elders Point East and West, Jamaica Bay. Monitoring parameters include nekton, vegetation, and avian species composition and abundance; above- and below-ground primary production; and macrobenthic infauna and epifauna. □ Conducted baseline monitoring of nekton and vegetation communities at Yellow Bar, Rulers Bar, and Black Wall marshes, Jamaica Bay. Restoration of 80 acres of salt marsh will be completed at these marshes in FY 2012. □ Implemented National Fish and Wildlife Foundation funded project to determine if nitrogen loading has altered marsh function and sediment accretion in Jamaica Bay. □ Contributed technical knowledge on ecosystem ecology and restoration as a member of the multi-agency Planning and Development Team to develop salt marsh restoration design plans for Yellow Bar, Rulers Bar, and Black Wall marsh islands, Jamaica Bay. □ Received Coastal America Spirit Award for exceptional partnering to protect and conserve coastal ecosystems; this award recognized efforts of the multi-agency partnership that worked cooperatively to restore 69 acres (28 ha) of salt marsh at Elders Point East and Elders Point West, Jamaica Bay Unit. □ Authored “Building partnerships to restore an urban marsh ecosystem at Gateway National Recreation Area” for publication in *Park Science*. □ Presented “Jamaica Bay Marsh Island Loss and Restoration” for Herbert Johnson Lecture Series, Brooklyn, NY. □ Uploaded water quality data to STORET from 2003–2006 pilot tests of the Northeast Coastal and Barrier Network’s protocol for monitoring estuarine nutrient enrichment. □

**Gettysburg National Military Park (Pennsylvania)** Coordinated with the USGS and state stewards to update the National Hydrography Dataset within the park. □

**Hopewell Furnace National Historic Site (Pennsylvania)** Provided written and verbal reviews of Corps of Engineers hydrologic and hydraulic models designed to evaluate alternatives to reduce flooding of park buildings. □ Provided review of engineering study being conducted by the Corps of creek that runs through park; creek has been manipulated and has a small bridge crossing which complicates the analysis. □

**Marsh–Billings–Rockefeller National Historical Park (Vermont)** Analyzed discharge records under development for The Pogue; provided comment identifying discrepancies with flow data. □

**Morristown National Historical Park (New Jersey)** Provided written review of headwater flow and water quality report. □

**National Parks of New York Harbor (New Jersey, New York)** Contributed technical knowledge on ecosystem ecology and restoration via participation in the National Parks of New York Harbor: A Strategy to Become America’s Premier Urban National Park Planning Charette. □ Worked cooperatively with National Parks of New York Harbor Education Center on a Youth-in-Park application and mentored one YIP participant in July and August 2011. □

**Petersburg National Battlefield (Virginia)** Produced trip report describing process for evaluating flow changes within park streams potentially impacted by development adjacent to park lands. □

**Richmond National Battlefield Park (Virginia)** Provided verbal and written assistance with production of a proposal to evaluate stream impairment due to *E. coli* levels. Proposal submitted to USGS/NPS funding source. □



Eel Creek seen from the Sagamore Hill footbridge, Sagamore Hill National Historic Site (New York). NPS COLLECTION

Provided written review of park (2001–2011) water quality report. □ Provided written review of Natural Resource Condition Assessment. □ Assessment of slope stability at Drewry's Bluff. □

**Roosevelt–Vanderbilt National Historic Sites (New York)** Reviewed Natural Resource Condition Assessment. □

**Sagamore Hill National Historic Site (New York)** Assisted University of Rhode Island CESU cooperator in presenting a horseshoe crab interpretive program. □

**Salem Maritime National Historic Site (Massachusetts)** Continued to work with the park and NRSS Environmental Quality Specialist on Derby Wharf Work Plan. □

**Saugus Iron Works National Historic Site (Massachusetts)** Funded project to monitor *E. coli* in the Saugus River. □

**Shenandoah National Park (Virginia)** Provided review and comments on the Shenandoah Watershed Study Monitoring Protocol Narrative and SOPs. □ Provided support to the University of Virginia and the USGS on water quality and fisheries-related databases for the park. □

**Upper Delaware Scenic and Recreational River (New York, Pennsylvania)** Continued to monitor shale gas plays throughout the country and in particular the effects that their development may have on park lands in the northeast where the activity in the expansive Marcellus Shale gas play surrounding UPDE is increasing. Coordinated with GRD staff to support parks in the region in the review and comment on multiple versions and revisions to proposed regulations of the Delaware River Basin Commission and New York State Department of Environmental Protection (Draft & Final Revised New York State Supplemental Generic Environmental Impact Statement) governing gas development. Advised NPS staff on the new threats posed to parks from

the greater infrastructure, water resource demands, and waste disposal issues unique to shale gas plays and the challenges parks will face from this new type of energy development near park boundaries and within their shared watersheds. Participated in EPA Hydraulic Fracturing Experts Workshop on Fate and Transport of fracking fluids, attended a Marcellus Shale Water Management conference and a University of Wyoming Forum addressing water demands and related resource risks posed by hydraulic fracturing. □ Contacted several state oil and gas commission representatives/regulatory bodies, BLM officials, industry representatives, and others to determine status of oil and gas well design measures taken in controlling stray gas migration and if standard well designs are adequate in controlling stray gas migration potential impacts to drinking water supplies. □

**Valley Forge National Historical Park (Pennsylvania)** Provided written comment on water resource stewardship strategies for planning. □ Provided written review of Natural Resource Condition Assessment. □

**Mid–Atlantic Network** Provided assistance and recommendations on the use of analytical groups in NPSTORET. □

## PACIFIC WEST REGION

**Pacific West Region** Provided technical assistance for Natural Resource Managers in PWR for reviewing and improving proposals seeking funding for ecological restoration and monitoring projects. □ With Lassen Volcanic Ecologist and Planner, drafted PWR Resource Stewardship Strategy Lessons Learned document. □ Co-taught a Bureau of Land Management class entitled Measuring and Monitoring Plant Populations to increase the quality of government vegetation restoration and monitoring projects in the PWR. □ Served as NPS liaison to National Ocean Policy planning team for water quality and coastal land management practices. □



**A salt pool at Badwater, Death Valley National Park (California, Nevada).** NPS/ALAN VAN VALKENBURG

With interagency government team, facilitated by USFS Regional Hydrologist, co-authored recommendations to California State Water Plan Update regarding protection of wet meadow habitats. □ With interdisciplinary NPS team, co-drafted cave monitoring framework for the national Inventory and Monitoring Program. □ Prepared and filed Reports of Licensee and Statements of Water Diversion and Use for triennial filings for Death Valley NP, Mojave NP, Whiskeytown NRA, Redwoods NP, Pinnacles NM, Lassen Volcanic NP, and Sequoia and Kings Canyon NPs. □

**Cabrillo National Monument (California)** Uploaded to STORET relevant fish tissue data collected during 1990, 1993, and 2000 by the California State Water Resources Control Board's Toxic Substances Monitoring Program. □ Uploaded to STORET bacteriological data collected during 2001–2006 from thirteen beaches near the park by the San Diego Chapter of the Surfrider Foundation–Blue Water Task Force. □

**Channel Islands National Park (California)** Co-led project to design Prisoners Harbor Coastal Lagoon Restoration Project to restore degraded wetland on Santa Cruz Island; project to benefit migratory birds and archeological resources. In FY 2011 completed needed permits, drafted monitoring plan, completed contracting for earthmoving and plant grow-out, completed proposals seeking additional funding; project to be completed FY 2012. □ Completed final project design drawings and participated in excavation for restoration of Prisoners Harbor coastal wetland. □ Completed initial geodetic monumentation work; located and occupied several historic benchmarks with survey-grade GPS to establish precise locations for tidal benchmarks that will facilitate sea level monitoring. □ Uploaded to STORET the 1998 data from the multi-agency Southern California Coastal Bight Project collected near the park. □

**Crater Lake National Park (Oregon)** Completed draft 2008 Seepage Investigation Report for Annie Creek. □

**Death Valley National Park (California)** Participated in Amargosa Desert Managers Group meetings, an interagency work group established to discuss water resource concerns in the Amargosa Desert basin—including Devils Hole, a detached unit of Death Valley National Park. □ Reviewed applications and filed objections as necessary to protect park water rights. □ Compiled and archived data from nine groundwater stations in the Furnace Creek Wash area. □ Researched historic Water Master reports and updated historic pumping records for Ash Meadows. □ Compared pumping records and water level observations to USGS regional groundwater flow model simulations. □ Participated in biannual Amargosa Coordination Meetings and coordinated with federal agencies within the Amargosa Desert on solar energy development projects, land disposal issues, and the BLM Las Vegas proposed revision to the RMP. □ Prepared agreement for University of Colorado to develop an earthquake catalog for Devils Hole.

**Devils Postpile National Monument (California)** NPS Natural Resource Specialist for the joint NPS/USFS General Management Plan team. Team developed management alternatives to protect natural and cultural resources while providing appropriate visitor experiences. Completed floodplain analysis for developed areas and campgrounds in the planning area. Completed “Affected Environment” chapter of EIS in FY 2011. Draft GMP (tentatively) to be released for public review in FY 2012. □ NPS Natural Resource Specialist advisor for the park: assisted park with monitoring invasive plant species in high-value wet meadow habitats, reviewed the draft Natural Resource Condition Assessment, represented the park to the Sierra Nevada Network, and initiated work on a Status of Knowledge inventory of Natural Resource scholarly information. □



**June in the high country of Great Basin National Park (Nevada).**  
NPS/BRYAN PETRYL

Conducted literature search regarding hydrogeologic studies in and adjacent to the park. □ Conducted field reconnaissance of DEPO and Mammoth Mountain area to evaluate water resources, the hydrogeologic setting, and evidence of groundwater–surface water interactions. □ Provided comments for the draft DEPO Natural Resource Condition Assessment. □ Conducted flood-plain analyses in support of on-going General Management Plan. □

**Golden Gate National Recreation Area (California)** Prepared discharge estimates for Denniston and Saint Vicente creeks at Golden Gate. □

**Grand Canyon–Parashant National Monument (Arizona)** Provided technical oversight on the implementation of a phased reconnaissance-level study conducted by the USGS to evaluate the water source of Tassi Spring and Pakoon Spring. □

**Great Basin National Park (Nevada)** Assisted WRD, Great Basin National Park, and Lake Mead National Recreation Area in developing cooperating agency comments to the administrative draft EIS and the draft EIS for the Clark, Lincoln, and White Pine counties groundwater development pipeline project. □ Assisted the WRD in implementing an interagency-supported field program near Great Basin to characterize the potential for impacts to surface water and groundwater resources in and around the park from proposed groundwater development in Snake Valley, Nevada. □ Represented NPS interests on an interagency, hydrologic technical review panel for the stipulated agreement to monitor, manage, and mitigate potential impacts from groundwater withdrawals in Spring Valley, Nevada. □ Reviewed applications and filed objections as necessary to protect park water rights. □ Continued agreement to continuously monitor discharge at Lehman Creek. □ Managed ongoing project by USGS and

the University of Nevada, Reno, to evaluate basin-fill aquifers in Snake Valley, including drilling, sampling, and aquifer testing of two wells southeast of the park, one in the basin-fill aquifer and one in the carbonate-rock aquifer. □ Managed and participated in eight presentations at the annual conference of the Nevada Water Resources Association and at public meetings in Ely and Baker, NV. □ Completed and submitted a statement of purpose, need, and proposed action for hydrogeologic research within GRBA, including the completion of an Environmental Assessment. □ NPS hydrology technical representative on the Spring Valley Stipulated Agreement for withdrawal of NPS protests to Southern Nevada Water Authority (SNWA) water-rights applications. □ Coordinated with SNWA and USGS/UNR on the drilling and installation of two new monitoring wells, and water quality sampling from 35 to 40 selected streams, springs, and wells. □ Coordinated with U.S. Forest Service (USFS) to implement a comprehensive monitoring network. □ Completed a USGS project that published the Snake Valley numerical groundwater flow model to simulate proposed groundwater withdrawals in accordance with pending water rights applications. □ Completed a USGS project that published the results of AMT geophysical surveys in Snake Valley to evaluate range-front faults and their role in connectivity of aquifers. □ Conducted a dye-tracing study to evaluate groundwater flow paths and connectivity of aquifers in the vicinity of the Baker Creek cave system within and adjacent to the park. □ Reviewed regional numerical groundwater flow model of eastern Nevada and western Utah to evaluate the threat of proposed groundwater development. □ Evaluated groundwater models and administrative drafts of the Clark, Lincoln, and White Pine counties Groundwater Development EIS and coordinated with the BLM to resolve NPS concerns; briefed the DOI on NPS concerns. □ Compared results of the EIS groundwater model with the recently completed Snake Valley USGS groundwater model. □



**Young monk seals on the beach at Kalaupapa National Historical Park (Hawaii).** NPS/BRYAN HARRY

**Joshua Tree National Park (California)** Collaborated with park and WRD and PWR personnel to formulate NPS comments to a draft EIS, outlining NPS concerns with potential impacts to the park's groundwater resources and other natural resources associated with a proposed groundwater-pumped storage electrical generation project adjacent to Joshua Tree National Park. □ Assisted WRD and park personnel in developing public scoping comments for draft EISes outlining concerns with potential impacts to the park's groundwater resources and other natural resources related to several fast-track solar energy projects surrounding Joshua Tree National Park. □ Reviewed the Energy Zones proposed for California in the BLM Solar Energy PEIS. □ Evaluated water uses for DOI's high priority solar energy projects proposed near the park, and coordinated water issues with directorate, park, region, and NRSS external energy program manager. □ Provided continuing support of flood study at Black Rock Campground. □

**Kaloko-Honokōhau National Historical Park (Hawaii)** Prepared contract for expert services to coordinate water protection strategies with county and state offices. □ Prepared oral and written testimony for Land Use Commission Docket A10-788, Forest City Hawaii Kona, LLC, and Hawaii Housing Finance and Development Corporation. □ Reviewed methods used by Hawaii to determine sustainable yield for the Keauhou Aquifer System and recalculated the yield of selected aquifer systems using new USGS values for groundwater recharge. □ Assisted superintendent in briefing the PWR directorate on plans to request state administrative action to protect groundwater discharge and coastal leakage in KAHO. □ Developed communications plan and talking points for superintendent to aid in discussions with stakeholders regarding a potential water management area designation. □ Assisted superintendent in briefing state and county officials and

other stakeholders regarding NPS efforts to protect groundwater discharge for cultural and natural resources. □ Prepared oral and written testimony for superintendent and attended the public hearing on the Hawaii County Water Use and Development Plan Update. □ Represented NPS at the Workshop on Groundwater Availability in the Keauhou Aquifer System sponsored by the USGS and the Hawaii Commission on Water Resource Management. □ Analyzed water quality and water level monitoring data collected by The Shores at Kohanaiki, the USGS, and the NPS. □ Provided comments on the Kaloko Makai Draft EIS regarding potential groundwater impacts in the park from proposed development. □ Collected and summarized cultural use and extraction of native marine species data for use in legal or administrative proceedings. □

**Kaloko-Honokōhau and Kalaupapa National Historical Parks (Hawaii)** Funded a project to examine the response of algae to nutrient inputs, the effects of herbivores on algal growth and coral composition, and the potential to manage herbivores to reduce algal biomass and improve coral reef health. □

**Lake Mead National Recreation Area (Nevada, Arizona)** Supplied technical and management oversight on a USGS study being conducted to characterize the source of springs in the Black Canyon area below Lake Mead and evaluate their potential susceptibility to regional groundwater development impacts. □ Implemented groundwater monitoring and management provisions of negotiated settlements with the Southern Nevada Water Authority and Vidler Water Company on NPS protests to water rights applications in Tule Desert Basin and Coyote Spring Valley. □ Assisted WRD in recommending NPS protests to several water rights applications filed by development entities in the vicinity of Lake Mead NRA. □ Provided technical oversight on USGS agreement to operate and maintain stream gauges at Rogers and Blue Point springs in Lake Mead NRA and the Virgin River near Overton, NV. □



**Arrowweed Spring in Mojave National Preserve (California).**  
NPS COLLECTION

Monitored progress on implementation of a Hydrologic Monitoring and Mitigation Program developed as part of the Virgin River Habitat Conservation and Recovery Program to evaluate future groundwater development impacts on surface water and groundwater resources in the Lower Virgin River Basin. □ Provided technical oversight for Lake Mead NRA management regarding an interagency-supported effort to drill and install a groundwater monitoring well within the park to monitor groundwater levels in the regional carbonate-rock aquifer. □ Reviewed applications and filed objections as necessary to protect park water rights. □ Continued continuous monitoring of discharge on the Virgin River near Overton. □ Managed project to develop a numerical groundwater flow model of an area in and adjacent to the park. □ Reviewed the Energy Zones proposed for Nevada in the BLM Solar Energy PEIS. □ Evaluated groundwater models and administrative drafts of the Clark, Lincoln, and White Pine Counties Groundwater Development EIS and coordinated with the BLM to resolve NPS concerns. Briefed the DOI on NPS concerns. □ Coordinated with USGS and state stewards to update the National Hydrography Dataset in three sub-basins covering the park. □

#### **Minidoka National Historic Site (Idaho)**

Provided assessment of potential impact of a nearby Concentrated Animal Feeding Operation and assisted park in developing a groundwater monitoring plan. □

#### **Mojave National Preserve (California)**

Formulated and submitted scoping comments outlining NPS concerns with potential impacts to Mojave National Preserve's groundwater resources associated with the resurrected Cadiz Valley Water Conservation, Recovery, and Storage Project. Assisted park with development of a management plan for springs and guzzlers. □ Maintained communications with park staff regarding the Mountain Pass Mine groundwater plume while permits were obtained from

BLM for additional delineation in Wheaton Wash; the groundwater plume's mapped extent indicates its presence immediately up gradient from park boundary, and the results from drilling and sampling of two additional wells that MolyCorp must drill should determine fate and extent of the high-TDS groundwater plume. This current activity on BLM lands is under direction of the Lahontan Regional Water Quality Control Board and should determine if park groundwater is likely impacted or if more drilling and sampling will be required.

**Mount Rainier National Park (Washington)** Due to a surfeit of sediment, the park's rivers are aggrading—that is, river channels are filling in with sediment. This means that for the same size storms, the flood potential is ever-increasing. Additionally, the number of destructive debris flows appears to be rising as a result of global climate change. Some experts (e.g., Gordon Grant, Oregon State University) consider Mount Rainier to be the best example in the United States of catastrophic impacts from climate change. □ Completed the pilot Nisqually Glacier stagnant ice survey where we measured ice velocities on the lower Nisqually Glacier and found over 50% of the glacier is effectively stagnant (non-moving). In the past there was a strong empiric association of stagnant ice and destructive summer glacier outburst floods, or jökulhaups; jökulhaups usually turn into highly erosive and destructive debris flows as they course down glacier-sourced rivers. They can produce flood peaks greatly in excess of floods from precipitation events. □ Identified and mitigated current flood and debris flow hazards. □ Provided technical assistance on engineered logjam placement locations for the Carbon River, and interim barb installation near entrance; engineered logjams provide permanent, superior erosion protection, while minimizing impacts to fish habitat. □



Laundress quarters with the Olympic Mountains and Strait of Juan de Fuca in the background, San Juan Island National Historical Park (Washington). NPS/MIKE VOURI

Initiated a collaborative project with University of Colorado to identify discrete sediment waves from past debris flows in Tahoma Creek and track their movement thorough time in order to predict future hazards to the Tahoma Creek bridge and the Westside road. Techniques employed include multiple aerial LIDAR sets, state-of-the-art terrestrial LIDAR, and field surveys.

- Started a collaborative project with the University of Oregon to extend the known debris flow history for hazard planning; in Kautz Creek watershed, researchers identified and dated previously unknown debris flow events using techniques such as lichenometry, dendrochronology, and carbon-14 analyses. ▫

**National Park of American Samoa (American Samoa)** Advised superintendent, PWR, and DOI on proposed expansion of Fagatele Bay National Marine Sanctuary and overlay of national park marine area. ▫

**North Cascades National Park Complex (Washington)** Combined two sources of survey data with a LIDAR model to produce topographic cross sections of the Stehekin River for later use in HEC-RAS. ▫ Consulted with park staff regarding completion of floodplain Statement of Findings. ▫ Coordinated with the USGS and state stewards to update the National Hydrography Dataset in four sub-basins covering the park. ▫

**Olympic National Park (Washington)** Completed a flood protection study and report for the Elwha River Ranger Station, detailing emergency response plans to preserve historic resources threatened by dam removal related aggradation flooding threats. ▫ In preparation for the Elwha Dam removals, had numerous site visits and meetings with Olympic National Park, Water Resources Division, and the Bureau of Recreation in preparation for the removal of two dams, which started in FY 2011. This is a major and continuing project. ▫ Provided continuing assistance related to the Elwha River Restoration Project; par-

ticipated in Sediment Management Team meetings; wrote PD and was on selection panel for project on-site geomorphologist; traveled to the park two times during the year—first trip was made to inspect conditions on the deltas to see if they were as ready as possible for the start of the project; second trip was made with other members of the sediment management team to participate in project commencement activities. ▫ Provided site assessments for several water-supply systems in the park, including a hydrogeologic assessment of the potential for developing a groundwater source at Kallaloch. ▫

**Oregon Caves National Monument (Oregon)** Consulted with park regarding request to produce a hydrologic budget for climate change assessment. ▫

**Pinnacles National Monument (California)** Provided technical assistance for wetlands protection and compliance for Sandy Creek Bridge reconstruction project; wetland delineation completed FY 2011.

- Completed feasibility and scope assessment of potential pond reconstruction site.
- Completed stream stability assessment at two sites within the park.
- Compiled available water wells records for park.
- Reviewed and commented on hydrology related sections of draft General Management Plan.
- Re-uploaded water quality data to STORET from Moore's 1997–2004 study to characterize and quantify stream dynamics, habitat value and vulnerability, and the presence and movement of pollutants in the Chalone Creek watershed to better represent replicate/duplicate samples.
- Finalized long term monitoring plan to track integrity of wetlands and riparian habitats. ▫

**Point Reyes National Seashore (California)** Completed wetland delineation to assist with planning in the Drake's Estero watershed. ▫ Completed internal review and re-draft of sections of the park General Management Plan, including Introduction, Management Alternatives, Affected Environment chapters. ▫



**Fin Dome and Arrowhead Lake in Kings Canyon National Park (California).** NPS/GAVIN EMMONS

Provided technical assistance for review of draft Coastal Watershed Assessment. ▫ Partnered with USGS and Moss Landing Marine Laboratories to develop benthic habitat and geologic maps. ▫

**San Juan Island National Historical Park (Washington)** Partnered with USGS and the University of Washington to develop benthic habitat maps. ▫ Purchased a new Hach-Hydrolab water quality sonde for WRD in conjunction with funds supplied from SAJH to offset a sonde previously supplied by WRD; SAJH elected to retain the loaned WRD sonde for future work after conducting monitoring research at the park over the last two years and was prepared to compensate WRD for its previous investment in that instrument. ▫

**Santa Monica Mountains National Recreation Area (California)** Uploaded water quality data to STORET from studies conducted in 1977, 1985, and 1990 by the Southern California Coastal Water Research Project. ▫ Uploaded 1994 and 1998 data to STORET from the multi-agency Southern California Coastal Bight Project collected near the park. ▫

**Sequoia and Kings Canyon National Parks (California)** Assisted with developing a scope of work to assess potential impacts of private septic systems in the Mineral King area. ▫

**Yosemite National Park (California)** Conducted field assessment regarding restoration of a disturbed site along the Merced River. ▫ Provided on-site advice for treating runoff damage of a recent restoration site. ▫

**Klamath Network** Provided review and comment on the “Integrated Aquatic Community and Water Quality Monitoring of Wadeable Streams in the Klamath Network” Protocol Narrative and SOPs. ▫

**Mojave Desert Network** Partnered with WRD to monitor and evaluate potential water resource impacts to network parks

from proposed solar energy development in the region. Efforts included implementing a tracking system for solar projects of concern; reviewing solar energy plans of development to assess potential project water demands; and assisting WRD in formulating NPS response documents to BLM for the solar PEIS. ▫ Assisted personnel from the Mojave Desert Network I&M Program by reviewing a draft spring protocol document outlining methodologies that will aid in the assessment, conservation, and restoration of water resources associated with regionally and locally derived springs in network parks. ▫ Attended the Nevada Water Resources Association annual conference to track new and existing water resource projects, studies, and concerns throughout Nevada. ▫ Attended the Devils Hole Workshop to track new and existing water resource concerns and studies in the Amargosa Desert basin. ▫ Provided comments on MOJN Spring Monitoring Protocols. ▫ Participated in the Water Resources Working Group with MOJN and park staff to facilitate coordination. ▫ Provided review and comment on the “Surface Water Dynamics and Water Quality in Streams and Lakes of the Mojave Desert Network (GRBA and LAKE)” Protocol Narrative and SOPs. ▫ Provided review and comment on the “Surface Water Dynamics and Water Quality of Carbonate and Valley-Fill Aquifer Springs of the Mojave Desert Network” Protocol Narrative and SOPs. ▫

**North Coasts and Cascades Network** Continued technical assistance and policy guidance to the Federal Lands Highway Division, presented to FLHD staff how climate change (and changing design consideration for park roads) needs to be accounted for in flood repair. Continued to make the case that replacing damaged infrastructure “in-kind” is not technically nor fiscally justifiable. ▫ Provided review and comment on the network’s “Water Quality Monitoring” Protocol Narrative and SOPs. ▫



**Yahoo Falls, Big South Fork National River and Recreation Area (Tennessee, Kentucky).** NPS/STEVEN SEVEN

**Pacific Island Network** Uploaded all water quality data through 2010 from NPSTORET to STORET for eight network parks. □

**San Francisco Bay Area Network** Planned for implementation of monitoring protocol in FY 2012. □ Provided technical assistance for program management (budget formulation) and designing Plant Community Change monitoring protocol. □

**Sierra Nevada Network** Provided review and guidance on incorporating Aquarius time series processing in Protocol and SOP documents. □

## SOUTHEAST REGION

**Southeast Region** Acted as Regional Goal Contact for FY 2007–2011 and FY 2008–2012 NPS Strategic Plan Goal 1a1H—Land Health—Acres in Condition. □ Represented the NPS at the Gulf of Mexico Alliance meetings and participated as a member on the Habitat Conservation and Restoration Team. □ Continued to develop a sediment budget for restoration in the northern Gulf of Mexico coast. Participated in administering the annual Servicewide Combined Call including projects that resulted in protection and/or restoration of wetland habitat. □ Presented poster on sea level rise impacts to coastal National Park units at The George Wright Society Conference on Parks, Protected Areas, and Cultural Sites in New Orleans, LA. □ Served 50% year-long work detail to Gulf Coast Ecosystem Restoration Task Force in preparation of Gulf of Mexico Restoration Plan: led writing team for Community Resiliency sections, served on Habitat Restoration and Storm Buffers work groups, and served as team lead for Community Resiliency writing for science support document, “Gulf of Mexico Ecosystem Science Assessment and Needs.” □ Planned and facilitated Southeast Natural Resource Leadership Council meeting in Charleston, SC. □ Facilitated quarterly river calls with

NPS units dealing with aquatic resource management issues. □ Completed DOI Motor Boat Operator Certification Training. □ With SERO, planned and convened multidisciplinary workshop on lionfish invasion and completed draft servicewide invasive species response plan for peer review. □ Continued to work with Florida parks, the EPA, and the state of Florida on estuarine water quality standards.

**Deepwater Horizon Oil Spill** Participated in DWH Oil Spill NRDA activities. □ Co-chaired Submerged Aquatic Vegetation Technical Working Group (TWG). □ Served as NPS lead on Shoreline TWG; trustee co-lead for Beach Subgroup; hosted TWG meetings at Jean Lafitte National Historical Park and Preserve. □ Served on Injury Impact TWG in identifying all response injuries across all TWGs. □ Coordinated with USFWS and WASO to prepare Injury Assessment plans, literature searches, and data collection with the assistance of contractors. □ Participated in Trustee Council–TWG NRDA meeting in Austin, TX. □

**Abraham Lincoln Birthplace National Historical Park (Kentucky)** Published final Natural Resource Condition Assessment. □

**Big South Fork National River and Recreation Area (Kentucky, Tennessee)** Reviewed and provided comments on Oil and Gas EIS. □ Assisted park in evaluating potential impacts to aquatic resources associated with the Roberta Landfill. □ Drafted formal determination document regarding potential impacts of Roberta Landfill to the park, and negotiated potential mitigation alternatives. □ Began initial consultation on Huntsville Water Supply project evaluating the effects of water withdrawals on park habitats. □

**Blue Ridge Parkway (North Carolina, Virginia)** *See Northeast Region*



**Purple gallinule at Shark Valley, Everglades National Park (Florida).** NPS/ERIN HUGGINS

**Buck Island Reef National Monument (Virgin Islands)** Partnered with NOAA to develop a benthic habitat map. □

**Canaveral National Seashore (Florida)** Worked with staff to submit projects for funding related to fisheries management. □ Participated in hydrologic modeling training for a newly developed hydrodynamic model of the Mosquito Lagoon. □ Reviewed Assessment Report—An Assessment of Coastal Water Resources and Watershed Conditions in and Adjacent to Canaveral National Seashore. □

**Cane River Creole National Historical Park (Louisiana)** Reviewed and provided comments on the Draft Construction Plans for Emergency Stabilization/Erosion Control on the Bank of Cane River Lake. □ Reviewed and provided comments on Draft Wetlands Statement of Findings (WSOF). □

**Cape Hatteras National Seashore (North Carolina)** Reviewed and provided comments on the Draft Foundation Statement. □

**Cape Lookout National Seashore (North Carolina)** Provided GIS and remote sensing support (assembled imagery, provided maps, change analysis, etc.) to park staff and Hurricane Irene Incident Management Team. □

**Carl Sandburg Home National Historic Site (North Carolina)** Provided comments for the Draft Visitor Center review. □ Collaborated with SERO Fisheries Biologist and Threatened and Endangered Species Specialist on wetlands concerns with ponds near the home. □ Reviewed and provided comments for Amphitheater Relocation Design. □ Assisted park staff in determining appropriate management actions for aquatic resources (e.g., Front Lake, Side Lake). This resulted in a Water Resources Issues and Overview Report which will be developed in FY 2012. □

**Chattahoochee River National Recreation Area (Georgia)** Reviewed and provided comments on the on-going planning for the Willeo Road Multi-Use Trail project which will cross Chattahoochee wetlands. Visited area wetlands sites with natural resources staff. □ Reviewed and provided comments on Resource Stewardship Strategy. □ Reviewed and provided comments on Rogers Bridge Replacement EA. □ Coordinated with park staff on implementation of shoal bass assessment. □ Worked with WRD and park staff to evaluate park authorities relating to shoreline development. This effort led to a workshop slated for FY 2012 to describe the values for which the park was established. □ Assisted park with determination of authority to permit water withdrawals on the Chatahoochee River. □

**Chickamauga and Chattanooga National Military Park (Georgia, Tennessee)** Reviewed and provided comments on Draft Storm Drainage reconstruction. □ Reviewed and provided comments on Craven House Cultural Landscape Report. □ Reviewed and provided comments on Moccasin Bend WSOF. □

**Congaree National Park (South Carolina)** Reviewed and provided comments for Ramsar Convention designation as a wetland of international significance. □

**Dry Tortugas National Park (Florida)** Reviewed and provided comments on Garden Key Cultural Landscape Report. □

**Everglades National Park (Florida)** Reviewed and provided comments on the Everglades Draft Water Plan. □ Reviewed and provided comments on the Everglades General Management Plan □ Reviewed and provided comments on the Gulf Coast Visitor Center Design Plans □ Reviewed and provided comments on the Shark Valley Visitor Center Plan. □



Alligators at Cypress Swamp, Natchez Trace Parkway (Mississippi, Alabama, Tennessee). NPS COLLECTION

**Fort Donelson National Battlefield (Tennessee, Kentucky)** Reviewed and provided comments for Cemetery Carriage House Structural Report. ▫ Reviewed and provided comments on Draft Foundation Statement. ▫ Reviewed and provided comments on Cultural Landscape Report. ▫

**Fort Pulaski National Monument (Georgia)** Reviewed and provided comments on the Cockspur Island Cultural Landscape Report. ▫ Reviewed and provided comments on the Fort Pulaski General Management Plan and EIS. ▫ Reviewed Savannah River Dredging EA for potential impacts to Fort Pulaski for Corps of Engineers. ▫

**Great Smoky Mountains National Park (North Carolina, Tennessee)** Provided hydrogeological assessment for a new well at Cades Cove. ▫ Uploaded water quality data collected during 2010 by park staff and the University of Tennessee from NPSTORET to STORET. ▫ Uploaded water quality data to STORET from a 2008–2009 University of Tennessee project that collected data from 16 locations in the park to examine the influence of basin characteristics on acidification response. ▫ Uploaded water quality data to STORET from an EPA-funded University of Tennessee project that collected data from six throughfall and stream sites in the park during 2006–2010 to examine the effects of acidification on caged native brook trout. ▫ Uploaded water quality data to STORET collected from four streams during 2003–2005 to assess the potential impacts of the Greenbrier Road widening project. ▫ Uploaded water quality data to STORET collected from two locations on Straight Fork during 2004–2007 to determine water quality impacts from the 2006 Straight Fork bridge replacement project. ▫

**Gulf Islands National Seashore (Florida, Mississippi)** Reviewed and provided comments for Perdido Key Pass dredging EA. ▫ Reviewed and provided comments for the General Management Plan. ▫ Reviewed and provided comments for the Mississippi District Road Replacement plans. ▫ Reviewed

and provided comments for the MsCIP Barrier Island EIS. ▫ Reviewed and provided comments for the Deepwater Horizon SAV Restoration EA. ▫ Worked with other SERO and WASO staff to prepare a science-based position paper outlining the basis for Stage III Beach Subsurface oil cleaning at Gulf Islands. Prepared drafts of the decision document which was added as an appendix to the Stage III Cleaning Framework Document, coordinating with the superintendent and resource staff. ▫ Co-authored white paper on the implications of beach clean-up activities on natural resources. ▫ Assisted DOI representatives in evaluating potential restoration alternatives associated with the Deepwater Horizon Incident. ▫ Served as a Resource Advisor overseeing night cleanup of oil deposited on beaches. ▫ Reviewed and provided comments on NRCS Gulf of Mexico Initiative which will impact Gulf Islands. ▫ Funded Dauphin Marine Laboratory to measure the impacts of oil on sea-grass beds at GUIIS. ▫

**Jean Lafitte National Historical Park and Preserve (Louisiana)** Assisted staff with development of emergency restoration proposal for the DWH Oil Spill. ▫ Assisted staff in obtaining funding for canal restoration project; visited and reviewed the ongoing project as well as data indicating that hydrology is improving and reverting to a natural regime. ▫

**Kings Mountain National Military Park (South Carolina)** Conducted stream geomorphology/stability assessment. ▫

**Little River Canyon National Preserve (Alabama)** Published final Natural Resource Condition Assessment. ▫

**Mammoth Cave National Park (Kentucky)** Reviewed and provided comments on draft FONSI for Green River Ferry Crossing. ▫



**Green turtle with baitfish, Virgin Islands National Park (Virgin Islands).** NPS/CAROLINE ROGERS

**Natchez Trace Parkway (Mississippi, Alabama, Tennessee)** Provided comments and recommendations on the Natchez Trace Multi-Use Trail Segment Wetland and Floodplain SOF which proposed to construct additional trails along the parkway and will impact several acres of wetlands and floodplain habitat. □ Visited and examined Bogue Chitto wetland mitigation site with Natchez Trace staff and contractors. □ Reviewed plans for wetland mitigation and Statement of Work. □ Reviewed and provided comments on Draft Biological Assessment. □ Uploaded water quality data to STORET from the 2007–2009 Level I Water Quality Inventory conducted by the Gulf Coast Network. □

**Obed Wild and Scenic River (Tennessee)** Assisted park in evaluating instream impacts of the proposed Lake Tansi Water Harvesting project. □ Drafted Section 7 determination in partnership with park staff for the Corps of Engineers. □ Worked with park to determine potential impacts of pesticide use to control the hemlock woolly adelgid invasion. □ Attended the annual meeting of the Cumberland Habitat Conservation Plan Science Advisory Committee. □ Provided comments for the proposed water monitoring agreement with the city of Crossville. □

**Salt River Bay National Historical Park & Ecological Preserve (St. Croix, Virgin Islands)** Partnered with NOAA to develop a benthic habitat map. □

**Shiloh National Military Park (Tennessee, Mississippi)** Reviewed and commented on Collection Management Plan. □

**Virgin Islands National Park (Virgin Islands)** Reviewed and provided comments on Draft General Management Plan. □ Reviewed and provided comments on Little Cruz Bay pier replacement. □ Provided baseline water quality data inventory and analysis report data and advised on discrepancies in data content between legacy STORET and the STORET/WQX Data Warehouse. □

**Virgin Islands National Park and Virgin Islands Coral Reef National Monument (Virgin Islands)** Funded a project to identify links between VICR and VIIS and among various habitat types by studying the movements of fish species. □

**Wekiva Partnership Wild and Scenic River (Florida)** Served as agency lead for Wekiva River consultation under Section 7(a) of the Wild and Scenic Rivers Act. Leveraged technical support for visual assessment from MWRO. Helped plan and lead a bridge-design charette with Florida DOT, Federal Highways, and others. Coordinated correspondence with project proponent. Assisted in drafting, reviewing, and finalizing EA for the Wekiva WSR Comprehensive River Management. □

**Appalachian Highlands Network** Provided review and recommendations on mapping characteristics and how to import network spreadsheets into NPSTORET. □

**Cumberland–Piedmont Network** Uploaded all water quality data through 2010 from NPSTORET to STORET for fourteen network parks. □

**Gulf Coast Network** Uploaded all water quality data through 2010 from NPSTORET to STORET for eight network parks. □

**Southeast Coast Network** Assisted with the import of nutrient and sediment data into NPSTORET. □

# Appendix C

## *Publications, Posters, Presentations, and Webinars*

### PUBLICATIONS

- Adema, G., D. Vana-Miller, and D. Weeks. 2011. Resource Stewardship Strategy Pilot Review. Natural Resource Report NPS/NRSS/NRR—2011/412. National Park Service, Natural Resource Stewardship and Science. Denver. 35 pp.
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Asch, T. H. and D. Sweetkind. 2011. Geophysical characterization of range-front faults, Snake Valley, Nevada. U.S. Geological Survey, Geologic Discipline, Denver, CO. Written abstract (one page) and poster (one oversized sheet) presented at Nevada Water Resources Association annual conference. Reno, NV.

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## WEBINARS

Eva DiDonato of the Ocean and Coastal Resources Branch began producing webinars (web-based presentations) in 2009 to address priority topics of our ocean, coastal and Great Lakes parks. The webinars are posted at <http://www1.nrintra.nps.gov/wrd/oceans/webinars.cfm>

Bagstad K., Mendenhall Postdoctoral Fellow, Research Economist, USGS. 2011. Ecosystem services in decision making for public lands: Applications and tools for BLM and beyond.

Cross, J. 2010. Submerged Resources Inventory, Pacific Ocean Educators Team.

Curdts, T. 2011. Water strider or ocean liner? How do you estimate shoreline length? Or did you mean coastline?

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Lepore R., Attorney, DOI Office of the Solicitor; and J. Brunner, NPS Policy and Regulatory Specialist, Geologic Resources Division. 2011. Recreational and commercial fishing jurisdiction.

Lepore, R., Attorney, DOI Office of the Solicitor; J. Brunner, NPS Policy and Regulatory Specialist, Geologic Resources Division; and J. Eshleman, Coastal Engineer, Geologic Resources Division. 2011. Coastal sediment jurisdiction & design toolbox.

Prudhomme, C. and B. Thompson, Interns, Chicago Botanic Gardens. 2011. What We Know about Marine Invasive Species in our Parks.

# Appendix D

## 2011 Staff

### OFFICE OF THE DIVISION CHIEF

**Bill Jackson** Division Chief, PhD in Hydrology. Specialty areas include sedimentation processes, fluvial geomorphology, and river assessment, restoration, and management.

**Sharon Kliwinski** Water Resources Washington Liaison, BS in Environmental and Pollution Sciences. Specialty areas include environmental legislation and regulations, natural resource policy issues, and mining laws, policies, and programs.

**Debi Cox** Program Analyst, EEO Counselor, BA in Anthropology. Specialty areas include coordination of interagency and cooperative agreements and project funding.

**Kris Parker** Lead Administrative Assistant, EEO Counselor, AA in History. Specialty areas include conference and meeting planning and coordination, PMIS, and report coordination and editing.

**Carol Liester** Purchasing Assistant. Specialty areas include procurement, property management, and GSA vehicles.

**Laura Pascavis** Archivist, Web Developer, MA in Archival Science, MA in Historical Archeology.

**Glenn Patterson** Colorado State University Research Associate serving as advisor to the NPS Water Resources Division for USGS Water Activities. Specialty areas include hydrology, water quality, sedimentation, and program coordination.

### OCEAN AND COASTAL RESOURCES BRANCH

**Jeffrey Cross** Branch Chief, PhD in Marine Fisheries, MS and BS in Zoology. Specialty areas include marine and freshwater ecology, fisheries biology, and natural resource management.

**Karl Brookins** Marine Fisheries Scientist, PhD in Fishery Science, MS in Oceanography, BS in Marine Biology. Specialty areas include marine fishery and estuarine science.

**Eva DiDonato** Marine Pollution Ecologist, MS and BS in Biology. Specialty areas include water quality and marine and estuarine ecology.

**Cliff McCreedy** Marine Management Specialist, BA in Political Science with career emphasis on regulatory and ocean policy. Specialty areas include marine resource management and planning, marine protected areas, coral reefs, coastal watershed assessment, and interagency marine partnerships.

**Thom Curdts** GIS and Remote Sensing Specialist, MS in Forest Sciences (GIS/RS program). Specialty areas include GIS analysis, natural resource mapping, image analysis, and data management.

**Jeremy Cantor** Colorado State University GIS Technician, MS in Natural Resources Stewardship–Spatial Information Systems, BA in Geography.

## PLANNING AND EVALUATION BRANCH

**Jeff Albright** Acting Branch Chief, NRCA Program Coordinator, MS in Watershed Management. Specialty areas include hydrology data collection and data management protocols, watershed assessments, and integration of science and policy in resource protection/restoration programs.

**Kevin Noon** Wetland Specialist, PhD in Wetland Ecology. Specialty areas include wetland evaluation, management, restoration, and regulatory issues.

**Joel Wagner** Wetlands Program Team Leader, MS in Environmental Science (Water Resources). Specialty areas include wetlands science, hydrology, restoration, and regulatory issues.

**John Wullschleger** Fisheries Program Team Leader, MS in Fish and Wildlife Science. Specialty areas include freshwater invertebrates, marine intertidal biota, fluvial ecology, and stream habitat restoration.

**Carl Nicolas (Nic) Medley** Fisheries Biologist, MS in Fisheries and Wildlife Biology. Specialty areas include freshwater fisheries, aquatic ecology, ecotoxicology, and geomorphology.

**Jeff Wagner** Fisheries Biologist (SCEP), BS in Aquatic Biology with a minor in Fisheries Biology. Specialty areas include native fish restoration and stream habitat restoration.

**David Vana-Miller** Water Resources Planning Program Team Leader, MS in Marine Biology. Specialty areas include water resources planning, aquatic and marine resources management, water quality, and measures of biotic integrity.

**Don Weeks** Hydrologist, MS in Geology (Hydrogeology). Specialty areas include water resources management planning, groundwater monitoring, and wetland management.

**Lael Wagner** Administrative Assistant.

## WATER OPERATIONS BRANCH

**Gary Rosenlieb** Branch Chief, Water Quality Program Team Leader, MS in Water Resources. Specialty areas include water quality (chemistry and microbiology), groundwater quality, and hazardous materials management.

**Gary Smillie** Hydrology Program Team Leader, Hydrologist/Hydraulic Engineer, MS in Civil Engineering. Specialty areas include flood frequency analysis, open channel hydraulics, floodplain management, and sediment transport.

**Dean Tucker** Information Management Program Leader, Natural Resource Specialist, PhD in Forestry. Specialty areas include data management and reporting, hydrographic analysis, computer graphics, and water resources applications in GIS.

**Larry Martin** Hydrogeologist, MS in Hydrology. Specialty areas include groundwater management, groundwater modeling, surface water/groundwater interactions, water supply development, and source water protection.

**Pete Penoyer** Hydrogeologist, Associate in Hazardous Materials, MS in Geology, Professional Degree in Hydrogeology. Specialty areas include groundwater analysis, groundwater contamination, site assessments under CERCLA, and water quality monitoring.

**Rick Inglis** Hydrologist, BS in Watershed Science. Specialty areas include field hydrologic data collection and analysis, watershed condition and riparian zone assessment and management, and stream restoration.

**Michael Martin** Hydrologist, MS in Watershed Science, BS in Environmental Geology. Specialty areas include open channel flow, geomorphology, flood analysis, wetlands hydrology, geochemistry, and water quality.

**Roy Irwin** Senior Contaminants Specialist, PhD in Biology. Specialty areas include environmental contaminants, ecological/biological aspects of water quality, monitoring study design and development, measurement uncertainty, and QA/QC issues.

**Mike Matz** Colorado State University Research Associate, Water Quality Database Manager, MS in Civil Engineering. Specialty areas include water quality planning and management, inventory and monitoring, and data analysis.

**Paula Galloway** Colorado State University Research Associate, NPSTORET Database Project, PhD in Chemical Engineering.

**Caroline Goughis** Colorado State University Research Associate, STORET Database Project, MS in Marine Sciences.

**Jia Ling** Impaired Waters Database Manager, BS in Wildlife Biology, MS Candidate in Forest Science. Specialty area is GIS.

#### WATER RIGHTS BRANCH

**Bill Hansen** Branch Chief, MS in Hydrology. Specialty areas include water rights policy and protection, surface water hydrology, and Wild and Scenic Rivers.

**Dan McGlothlin** Supervisory Hydrologist, Monitoring and Enforcement Program Leader, BS in Watershed Hydrology. Specialty areas include water rights establishment and protection and water resources policy.

**Jennifer Back** Hydrologist, MS in Watershed Science. Specialty areas include surface water and groundwater interactions and stable isotopes.

**Paul Christensen** Hydrologist, MS in Geology. Specialty areas include hydrogeology, water resources, and water rights.

**Paula Cutillo** Hydrologist, PhD in Hydrogeology. Specialty areas include subsurface hydrodynamics and hydrogeologic modeling.

**Chris Gable** Hydrologist, BS in Watershed Science. Specialty areas include surface water hydrology, field methods, instrumentation, and data analysis.

**Gwen Gerber** Hydrologist, MS in Geology. Specialty areas include hydrogeology and surface water data collection.

**James Harte** Hydrologist, BS in Forestry/Watershed Sciences. Specialty areas include surface water hydrology, sediment transport, and watershed management.

**Jeff Hughes** Hydrologist, MS in Watershed Sciences. Specialty areas include water rights and surface water hydrology.

**Eric Lord** Water Rights Specialist, JD, MS in Forestry, BS in Mineral Land Management. Specialty areas include water rights policy, validation, and investigation.

**Bill Van Liew** Hydrologist, MS in Groundwater Engineering/Environmental Hydrogeology. Specialty areas include groundwater hydrology and groundwater/surface water interactions.

**Mark Wondzell** Hydrologist, MS in Agricultural Engineering. Specialty areas include water rights, surface water hydrology, and riparian ecology.

**Joseph Chafey** Hydrologic Technician, BS in Natural Resource Management with a minor in Watershed Science. Specialty areas include groundwater and surface water data processing.

**Kathryn Converse** SCEP Hydrologist, BS in Earth Sciences, MS Candidate in Anthropology, International Development. Specialty areas include groundwater and surface water data collection and processing.

**Sharla Stevenson** SCEP Hydrologist, PhD Candidate in Watershed Science. Specialty areas include hydrologic modeling and geographic information systems.

**Maria Brandt** Colorado State University Student Assistant, BS Candidate with double major in Forestry and Natural Resources Management.

**Alyssa Fenzel** Colorado State University Student Assistant, BS Candidate in Environmental Health.

**Mallory Hall** Colorado State University Student Assistant, BS Candidate in Geology with a minor in Watershed Sciences.

**Flora Romero** Colorado State University Administrative Assistant, AA in Business. Specialty area is water rights quantification and protection projects.

#### **AQUATIC PROFESSIONALS FIELD STAFF**

**Jalyn Cummings** Intermountain Region Hydrologist, MS in Watershed Management. Specialty areas include water quality, geomorphology, and watershed management.

**Marie Denn** Pacific West Region Aquatic Ecologist, MS in Environmental Science and Management, BS in Zoology. Specialty areas include wetland and riparian area restoration, management, and monitoring.

**Jeff Duncan** Southeast Region Fisheries Biologist.

**Alan Ellsworth** Northeast Region Hydrologist, MS in Watershed Science. Specialty areas include watershed impacts, atmospheric deposition, general hydrology, snow hydrology, water quality, and water science and policy.

**Colleen Filippone** Intermountain Region Hydrologist, MS in Hydrology and Water Resources. Specialty areas include groundwater, unsaturated zone hydrology, and water quality.

**Mark A. Ford** Southeast Region Wetland Ecologist, PhD in Wetland Ecology. Specialty areas include wetland evaluation, plant ecology, restoration, disturbance, and regulatory issues.

**Jay Glase** Midwest Region Fisheries Biologist.

**Brenda Moraska Lafrancois** Midwest Region Aquatic Ecologist, PhD in Ecology (Fishery and Wildlife Biology). Specialty areas include water quality, invasive species, Great Lakes coastal resources, and effects of atmospheric deposition.

**Amy Larsen** Alaska Region Aquatic Ecologist, PhD in Botany. Specialty areas include wetland ecology, high latitude hydrology, permafrost, wetland vegetation, and lake ecosystem dynamics.

**Gary Karst** Pacific West Region Groundwater Hydrologist.

**Paul Kennard** Pacific West Region Geomorphologist, MS in Geophysics (glaciology). Licensed Engineering Geologist and Hydrogeologist. Specialty areas include analyses of hillslope and fluvial geomorphology, including glaciology, debris flows, and flood protection.

**Patricia Rafferty** Northeast Region Marine Ecologist.

**Melissa Trammell** Intermountain Region Fisheries Biologist.

**Dan Young** Alaska Region Fisheries Biologist, MS in Fisheries Science. Specialty areas include salmonid ecology, freshwater fish biology, salmon enumeration, and radio telemetry.

# Appendix E

## *Acronyms and Abbreviations*

### PARK ACRONYMS

ACAD	Acadia National Park
ALAG	Alagnak National Wild River
ANIA	Aniakchak National Monument & Preserve
APIS	Apostle Islands National Lakeshore
ASIS	Assateague Island National Seashore
BAND	Bandelier National Park
BIBE	Big Bend National Park
BICA	Bighorn Canyon National Recreation Area
BICY	Big Cypress National Preserve
BLCA	Black Canyon of the Gunnison National Park
BOWA	Booker T. Washington National Monument
CAHA	Cape Hatteras National Seashore
CALO	Cape Lookout National Seashore
CARL	Carl Sandburg Home National Historic Site
CATO	Catoctin Mountain Park
CHAT	Chattahoochee River National Recreation Area
CHIC	Chickasaw National Recreation Area
CHIS	Channel Islands National Park
CHOH	Chesapeake and Ohio Canal National Historical Park
COLO	Colonial National Historical Park
CONG	Congaree National Park
CRLA	Crater Lake National Park
CUIS	Cumberland Island National Seashore
CURE	Curecanti National Recreation Area
CUVA	Cuyahoga Valley National Park
DEVA	Death Valley National Park
DEWA	Delaware Water Gap National Recreation Area
DINO	Dinosaur National Monument
EVER	Everglades National Park
FIIS	Fire Island National Seashore
FRSP	Fredericksburg and Spotsylvania National Military Park
GOGA	Golden Gate National Recreation Area
GRBA	Great Basin National Park
GRPO	Grand Portage National Monument
GRTE	Grand Teton National Park
GUMO	Guadalupe Mountains National Park
HAVO	Hawaii Volcanoes National Park
HOBE	Horseshoe Bend National Military Park

HOSP	Hot Springs National Park
ISRO	Isle Royale National Park
JOTR	Joshua Tree National Park
KAHO	Kaloko-Honokōhau National Historical Park
KATM	Katmai National Park & Preserve
KEMO	Kennesaw Mountain National Battlefield
LABE	Lava Beds National Monument
LACL	Lake Clark National Park & Preserve
LAKE	Lake Mead National Recreation Area
LAVO	Lassen Volcanic National Park
LIBI	Little Bighorn Battlefield National Monument
MANZ	Manzanar National Historic Site
MISS	Mississippi National River and Recreation Area
MOCR	Moores Creek National Battlefield
MOJA	Mojave National Preserve
MORA	Mount Rainier National Park
NEPE	Nez Perce National Historical Park
NOCA	North Cascades National Park Complex
OCMU	Ocmulgee National Monument
PAAL	Palo Alto Battlefield National Historical Park
PAIS	Padre Island National Seashore
PARA	Grand Canyon–Parashant National Monument
PETE	Petersburg National Battlefield
PETR	Petroglyph National Monument
PIRO	Pictured Rocks National Lakeshore
PORE	Point Reyes National Seashore
ROMO	Rocky Mountain National Park
SACN	Saint Croix National Scenic Riverway
SAIR	Saugus Iron Works National Historic Site
SAJH	San Juan Island National Historical Park
SAND	Sand Creek Massacre National Historic Site
SLBE	Sleeping Bear Dunes National Lakeshore
THRO	Theodore Roosevelt National Park
TIMU	Timucuan Ecological and Historic National Preserve
UPDE	Upper Delaware Scenic and Recreational River
VICR	Virgin Islands Coral Reef National Monument
VIIS	Virgin Islands National Park
VOYA	Voyageurs National Park
WABA	Washita Battlefield National Historic Site
WHSA	White Sands National Monument
WICA	Wind Cave National Monument
YOSE	Yosemite National Park
YUCH	Yukon–Charley Rivers National Preserve
ZION	Zion National Park

## ABBREVIATIONS

ADP	Automated Data Processing
ALERT	Automated Local Elevation in Real Time
AKR	Alaska Region
AMT	Audio-Frequency Magneto-Telluric
ASMFC	Atlantic States Marine Fisheries Commission
AT	Appalachian Trail
BAER	Burned Area Emergency Response
BERA	Baseline Environmental Risk Assessment
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
BRMD	Biological Resource Management Division
CAP	Corrective Action Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESU	Cooperative Ecosystem Studies Units
CMECS	Coastal and Marine Ecological Classification Standard
CSU	Colorado State University
DBFIT	Delaware Basin Federal Implementation Team
DCP	Development Concept Plan
DEIS	Draft Environmental Impact Statement
DEM	Digital Elevation Model
DOE	Department of Energy
DOI	Department of the Interior
DOT	Department of Transportation
DWH	Deepwater Horizon
EA	Environmental Assessment
EDP	EQuIS Data Processor
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EQuIS	Environmental Quality Information System
FMO	Fire Management Officer
FONSI	Finding of No Significant Impact
FSWCD	Fairbanks Soil and Water Conservation District
GIS	Geographic Information System
GPRA	Government Performance and Results Act
GRD	Geological Resources Division
GRLI	Great Lakes Restoration Initiative
GVR	Gros Ventre River
HEC-RAS	Hydrologic Engineering Centers River Analysis System
HIS	Hydrographic and Impairments Statistics
HWL	High Water Level
I&M	Inventory and Monitoring
IMR	Intermountain Region
IRMA	Integrated Resource Management Applications

IT-TAG	Information Technology Technical Advisory Group
LIDAR	Light Detection and Ranging
LLR	Department of Labor, Licensing, and Regulation
LUST	Leaking Underground Storage Tank
MHW	Mean High Water
MLLW	Mean Lower Low Water
MNRG	Midwest Natural Resources Group
MOJN	Mojave Desert Network
MRIP	Marine Recreational Information Program
MsCIP	Mississippi Coastal Improvement Program
MT DEQ	Montana Department of Environmental Quality
MWR	Midwest Region
MWRO	Midwest Regional Office
NCBN	Northeast Coastal and Barrier Network
NCR	National Capital Region
NEPA	National Environmental Protection Act
NER	Northeast Region
NFHP	National Fish Habitat Partnership
NHD	National Hydrographic Dataset
NHP	National Historical Park
NHS	National Historic Site
NM	National Monument
NOAA	National Oceanic and Atmospheric Administration
NP	National Park
NP&P	National Park and Preserve
NPDES	National Pollution Discharge Elimination System
NPres	National Preserve
NPS	National Park Service
NPSEDD	National Park Service Electronic Data Deliverable
NPSTORET	National Park Storage and Retrieval
NRA	National Recreation Area
NRAG	Natural Resources Assessment Group
NRCA	Natural Resource Condition Assessment
NRCS	Natural Resources Conservation Service
NRDA	Natural Resource Damage Assessment
NRM	Natural Resource Management
NRPC	Natural Resource Program Center
NRPP	Natural Resource Preservation Program
NRSS	Natural Resource Stewardship and Science
NS	National Seashore
NSF	National Science Foundation
NWIS	National Water Information System
NWS	National Weather Service
OCRB	Ocean and Coastal Resources Branch
ONRW	Outstanding National Resource Waters

PCB	Polychlorinated Biphenyl
PEB	Planning and Evaluation Branch
PEIS	Programmatic Environmental Impact Statement
PFC	Proper Functioning Condition
PIB	Planning and Information Branch
PIT	Passive Integrated Transponder
PMIS	Project Management Information System
PRP	Potential Responsible Party
PSP	Paralytic Shellfish Poisoning
PWR	Pacific West Region
RCRA	Resource Conservation and Recovery Act
RMP	Resource Management Plan
ROMN	Rocky Mountain Network
RSS	Resource Stewardship Strategy
SER	Southeast Region
SERO	Southeast Regional Office
SMUMN	Saint Mary's University of Minnesota
SNWA	Southern Nevada Water Authority
SOF	Statement of Finding
SOL	Office of the Solicitor
STORET	STOrage and RETrieval
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TWG	Technical Working Group
UNR	University of Nevada, Reno
USAID	U.S. Agency for International Development
USFWS	U.S. Fish & Wildlife Service
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
WASO	Washington Support Office
WOB	Water Operations Branch
WRB	Water Rights Branch
WRD	Water Resources Division
WSOF	Wetlands Statement of Finding
WSR	Wild and Scenic River
WXQ	Water Quality Exchange
YIP	Youth-in-Parks
YSI	Yellow Springs Instruments



## **Water Resources Division SUMMARY OF FISCAL YEAR 2011 ACCOMPLISHMENTS**

***National Park Service***  
Director

Jonathan B. Jarvis

***Natural Resource Stewardship and Science***  
Associate Director  
Deputy Associate Director for  
Budget and Policy  
Deputy Associate Director for  
Operations and Program Support

Bert Frost

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