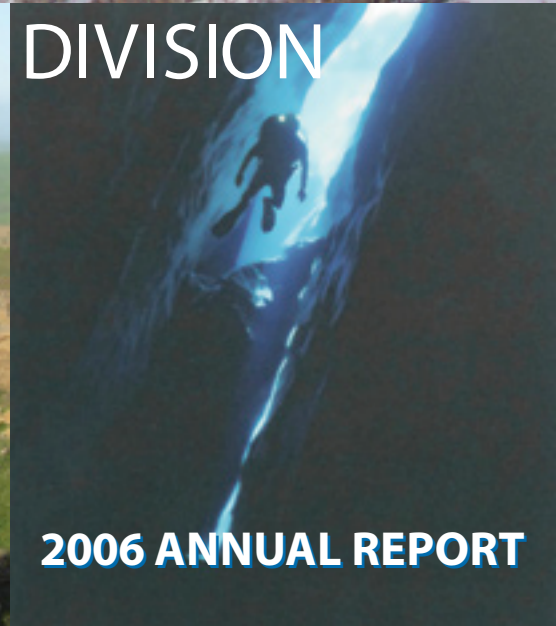
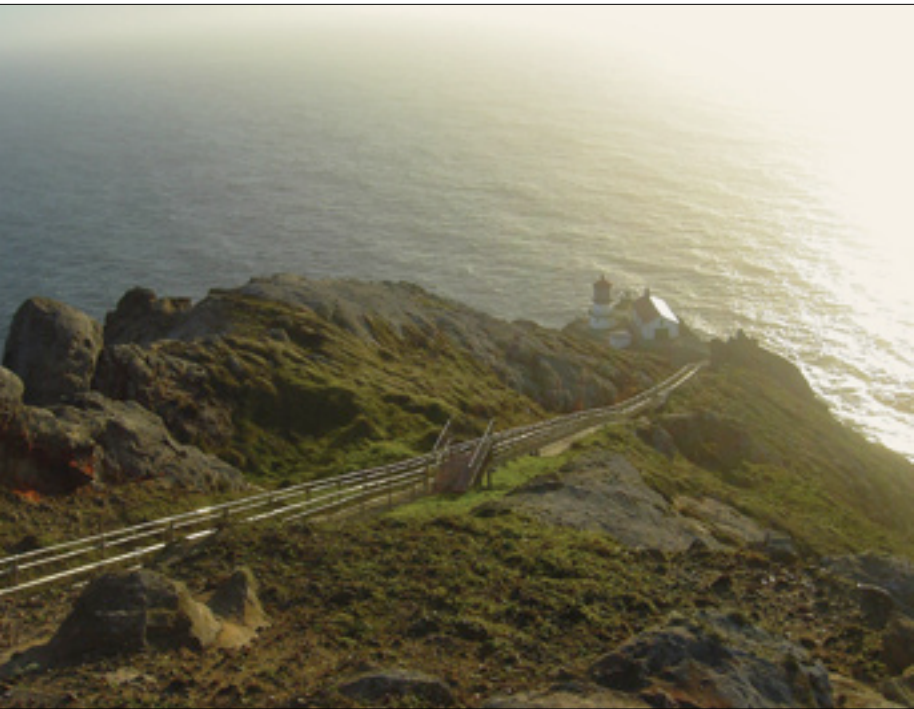




WATER RESOURCES DIVISION



2006 ANNUAL REPORT



Water Resources Division

2006 ANNUAL REPORT

Natural Resource Program Center
1201 Oakridge Drive, Suite 250
Fort Collins, CO 80525
Natural Resource Report NPS/NRWRD/NRR-07/01

National Park Service

U.S. Department of the Interior
Washington, DC

This entire publication, including useful embedded hyperlinks, is available in PDF format at:
<http://www.nature.nps.gov/water/wrdpub.cfm>.

Front cover, photos:

Top: Grand Teton National Park (Gerber, 2007), Lower left: Point Reyes Beach, Point Reyes National Seashore (Keteles, 2006) Lower right: Devils Hole, Death Valley National Park (Devils Hole Dive Team)

Opposite page, photos:

Upper left: Steps to Point Reyes Lighthouse, Point Reyes National Seashore (Keteles, 2006), Top right: Suturing a humpback whitefish after inserting a radio tag, Lake Clark National Park and Preserve (Dan Young, 2006) Lower left: Pelican, Dry Tortugas National Park (Keteles, 2006)

Back cover, photo: Salt Creek, Death Valley National Park (Fisk, 2006)



NPS Photo

The Water Resources Division of the National Park Service Natural Resource Program Center is responsible for providing water resources management policy and guidelines, planning, technical assistance, training, and operation support to units of the National Park System. Program areas include water rights, water resources planning, regulatory guidance and review, hydrology, water quality, watershed management, ground water, fishery and marine resources management, and aquatic ecology.

The National Park Service disseminates the results of biological, physical, and social research through the National Resources Technical Report Series. Natural resources inventories and monitoring activities, scientific literature reviews, bibliographies, and proceedings of technical workshops and conferences are also disseminated through this series.

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Background photo: Unnamed lake sampled for invertebrates, Mount Rainier National Park (Wodzicki, 2005)

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Great Sand Dunes National Park and preserve (NPS).

Background photo - Adult bull trout in Hoh River, Olympic National Park .

A Word from the Associate Director Natural Resource Stewardship and Science

Mike Soukup, Ph.D.



This annual report provides a summary of the 2006 accomplishments of the National Park Service's Water Resources Division (Division or WRD). The Division, in partnership with parks and others, provides program and policy leadership, technical assistance, and funding support for understanding, protecting, and managing water and aquatic resources of the National Park System. Through the application of science in a planning, stakeholder negotiation, policy, regulatory, technical, or administrative context, WRD's programs help our parks succeed in enhancing the overall condition of their water and aquatic resources. In addition to direct support to parks, the Division provides support to regional offices, networks, and the Washington office in addressing water resources issues facing the Service. The WRD is part of the National Park Service Natural Resource Program Center and is located in Fort Collins, Colorado, with additional offices in Denver, Colorado, and Washington, D.C.

As you read this report, you will discover the incredible richness and diversity of water resources in the National Park system and the variety and complexity of the water and aquatic resources issues confronted by our National Park managers. Oceans, desert springs, wetlands, lakes, streams, and reservoirs all contribute to the biological habitats, scenery, and recreation opportunities protected by the National Park System. It is with a sense of professionalism and commitment to parks that the Water Resources Division provides leadership and expertise to activities as varied as the development of the National Park Service (NPS) Ocean Action Plan and the protection of marine resources, the restoration of

wetland resources, the protection of stream flows and park water quality, and the assessment of major events, such as floods and hurricanes. In 2006, WRD initiated an exciting new program that will enable parks to synthesize interdisciplinary information and to summarize the overall condition of park watershed resources. This is an important investment in translating science developed on park resources into a park planning and natural resource management context.

As we look forward, issues on the horizon—such as global climate change, emerging aquatic contaminants, increasing demands for water supplies, and the rapid development of watersheds and aquifers external to parks—will present challenges to the stewards of our National Parks. We are fortunate to have the expertise and leadership exemplified by the Water Resources Division available to help our parks develop the knowledge and strategies needed to address these and many other important park water resources issues. ♥

Comments from the Division Chief

Bill Jackson, Ph.D.



This is the fifteenth consecutive annual report of the National Park Service Water Resources Division (Division), part of the Natural Resource Program Center. While

at times there seem to be excessive reporting requirements placed on our organization, this is one report we choose to prepare specifically for parks and the rest of the National Park Service in order to highlight and account for the activities and accomplishments of the Division. And, I might add, it's a report we take great pleasure in producing. As you read through it, I hope you'll gain an appreciation for the diversity and complexity of the water resources issues being addressed throughout the National Park system and the great degree of skill and sophistication with which the agency and its partners as a whole, not just the Division, are addressing these issues.

In 2006 the Division continued to provide program leadership, project support, technical assistance, and policy guidance in our long standing program areas of: water rights protection, water quality management, hydrology and watershed management, water resources planning, wetlands protection, ocean resources, and fisheries management. Significant accomplishments are highlighted in both short articles and tables provided throughout this report.

This year also saw the official launching of a new Natural Resource Challenge program to conduct assessments of ecological conditions in park watersheds for 275 natural resource parks. We view these natural resource condition assessments, which are being developed by cooperators working with parks, regions, the Inventory and Monitoring

(I&M) Networks, and the Natural Resource Program Center, as investments in the syntheses and interpretation of existing NPS science and translation of that information to parks for use in park planning, natural resource management, and reporting. Formal program guidance was developed and 17 "prototype" condition assessment projects were initiated in FY2006. Beginning in FY2007, project funding transfers to the regions should be adequate to initiate roughly 35 additional condition assessment projects annually throughout the National Park Service.

The Division provided servicewide leadership in 2006 to the coordination of ocean policy and the development of an NPS Ocean Stewardship Action Plan, which will be officially announced by the Director in early FY2007. The Division also coordinated NPS related U.S. Coral Reef Task Force activities and helped secure final approval of a Memorandum of Understanding with NOAA and the U.S. Fish and Wildlife Service (USFWS) for a seamless network of ocean parks, marine wildlife refuges, marine sanctuaries, and estuarine reserves. We hope in FY2007 to continue to pursue opportunities in coordination with the Natural Resource Program Center to increase our capabilities to better serve coastal and marine parks in the protection of ocean resources.

Finally, this year we were fortunate to have Gary Rosenlieb assume the position of Water Operations Branch Chief. Gary, who had long headed up the branch's water quality management program, will contribute solid leadership both to the branch and as part of the Division management team.

The sidebar to these comments highlights

what I think are a few of the more interesting and significant activities of the Division in FY2006. The short articles that follow were prepared by Division staff and by field based staff to highlight the diversity and complexity of the many water and aquatic resources issues being addressed by the National Park Service. Complete listings of all Division project and technical assistance activities are provided in the appendices, along with accomplishments of the 15 aquatic resource professional positions in parks supported by the Division. Also provided in the appendices are summaries of the Division's budget and a full accounting for the use of those funds.

As always, we appreciate your feedback and suggestions. We want to be as useful and relevant to parks as possible. And, while we take great pride in the talent and professionalism of our staff, we know there are always things we can do better. We look forward to working with you in 2007. ♥



Fern Canyon, Redwood National and State Parks (Goughis,1992).

Highlights of FY2006 Accomplishments Water Resources Division

- Assisted with the feasibility assessment, design, and/or implementation of 15 wetland restoration projects at Rocky Mountain National Park, Golden Gate National Recreation Area, Channel Islands National Park, Saugus Iron Works National Historic Site, Ebey's Landing National Historical Reserve and 8 other park areas.
- Provided leadership to efforts to help preserve the Devils Hole pupfish by detailing expertise to Death Valley National Park, supporting research and monitoring efforts, and serving as the NPS representative to the Devils Hole Pupfish Unified Command Team.
- Participated in five water rights hearings before state water permitting authorities, one in Oklahoma on behalf of Chickasaw National Recreation Area and four in Nevada on behalf of Lake Mead National Recreation Area, Death Valley National Park, and Great Basin National Park. Completed three settlement agreements (one, each, on behalf of Death Valley National Park, Great Basin National Park, and Chickasaw National Recreation Area) that resolved issues related to two of those hearings.
- Continued to support, as part of the Natural Resource Challenge watershed condition assessment program, a servicewide project program to summarize the natural resource conditions of coastal park water resources and the variety of threats coastal park waters face, and published coastal resource condition assessment reports for ten additional NPS coastal units.

- Fully funded and administered a program to conduct water quality vital signs monitoring in all 32 networks. Assisted all networks in program design, reviewed program plans, and reviewed detailed water quality monitoring protocols for four networks.
- Continued to co-administer, with the USGS, the national USGS / NPS water quality assessment partnership program. Thirteen new projects were initiated, bringing to 27 the total number of projects in parks to be supported by this program in 2007. In addition, an official liaison position was established by USGS to be located in our Fort Collins office, effective October 1, 2006, for the purpose of strengthening collaborations between the two agencies.
- Developed scientific evidence to support water right claims filed in general adjudications in Arizona for Montezuma Castle and Tuzigoot National Monuments and in Colorado for Great Sand Dunes National Park. ♥

WASHINGTON PROGRAM COORDINATION OFFICE

Sharon Kliwinski



As Heraclitus is purported to have said, “There is nothing permanent except change.” And there was plenty of change in the Washington office in 2006.

In October, Mary A. Bomar became the 17th Director of the National Park Service, filling the position after a 5-year stint by Fran Mainella. Director Bomar previously served as the Northeast Regional Director and worked at various NPS sites. We welcome her and look forward to working with her in the coming years.

After a controversial public and internal review process that lasted 2 years and resulted in more than 45,000 public comments, the NPS unveiled its final management policies in August 2006. The revised policies restore the consistent 90-year history of NPS policies that emphasize preserving our national parks unimpaired for the enjoyment of future generations. This was a major victory for the national park system. ♥

PLANNING AND EVALUATION BRANCH HIGHLIGHTS

Mark Flora, Chief

Planning and Evaluation Branch (PEB) activities in FY2006 were focused upon providing servicewide policy and guidance for the protection of wetlands, fisheries, and marine resources; providing programmatic oversight and funding accountability for WRD and NRPC funded projects; expanding our efforts to implement a new suite of water resources planning products that better respond to needs created by the new Park Program Planning Standard; continuing our efforts to develop coastal resources / coastal watershed condition assessments for coastal NPS units; and providing direct support to NPS units in the areas of water resources planning, wetlands restoration, fisheries management, and marine resources protection.

In the policy and regulatory arena, PEB wetlands protection and fisheries management specialists expended considerable effort during the fiscal year to provide review and comment on the wetlands protection and fisheries management aspects of the 2006 revisions to the *NPS Management Policies*. In addition, PEB wetlands specialists were also involved in addressing wetland / riparian zone considerations in the development of NPS *Director's Order #77-3: Domestic and Feral Livestock Management* and also provided extensive policy review to the Army Corps of Engineers and Environmental Protection Agency (EPA) regarding a proposed rule for "Compensatory Mitigation for Losses of Aquatic Resources." During the year, PEB marine resources specialists continued to provide leadership in the NPS coordination of Ocean Policy and Program Planning, including securing final approval of an interagency agreement for the Seamless Network of Parks, Wildlife Refuges, Marine

Sanctuaries, and Estuarine Reserves. In the regulatory arena, PEB wetlands specialists were requested to provide expanded technical support regarding wetlands compliance issues associated with an increase in interest and activity relating to proposed oil & gas operations affecting Big Thicket National Preserve, Padre Island National Seashore, and Lake Meredith National Recreation Area. In addition, staff have continued to be active in guiding NPS efforts to assure compliance with *Executive Order 11990* (Wetlands Protection) and *Executive Order 13158* (Marine Protected Areas), providing an NPS perspective to the U.S. Coral Reef Task Force and the Marine Protected Area Interagency Committee, working with the Aquatic Nuisance Species Task Force, and recommending strategies to streamline wetland compliance procedures for Federal Highways road projects within National Parks.

During the course of FY2006 PEB staff provided programmatic oversight, technical review, and guidance for 89 active WRD or NRPC funded projects relating to water resources planning, wetlands protection and restoration, fisheries management, and marine resource protection. Included were fiscal oversight, accountability, and quality control for approximately \$9.8 million of Natural Resource Challenge funding (multi-year total) allocated to support these projects.

In addition, the PEB provided technical advice and policy review and served as lead for the regulatory review of 25 wetlands statement of findings / wetland compliance reviews, provided servicewide review and comment on 12 EIS/EA environmental compliance documents, and provided policy review of the water related aspects of 10 NPS planning documents, including general management plans, special resource studies, and other planning studies.

Accomplishments during the year were numerous, and several are highlighted in the

following short articles. During FY2006, the PEB provided oversight for: the development of water resources management plans at Mammoth Cave National Park and Isle Royale National Park; a water resources information and issues overview report for the Mississippi National River and Recreation Area; water resources foundation reports at Golden Gate National Recreation Area, Effigy Mounds National Monument, and Ozark National Scenic Riverways; and the initiation of water resources stewardship reports for Point Reyes National Seashore, Denali National Park and Preserve, Monocacy National Battlefield, and Death Valley National Park.

During the year, PEB's Wetlands Protection and Restoration Program participated in wetlands restoration feasibility assessment, design, and/or implementation activities at Rocky Mountain National Park, Golden Gate National Recreation Area, Channel Islands National Park, Lake Roosevelt National Recreation Area, Sequoia National Park, Grand Teton National Park, Sand Creek Massacre National Historic Site, Minute Man National Historical Park, North Cascades National Park, Saugus Iron Works National Historic Site, and Ebey's Landing National Historical Reserve.

In FY2006, PEB's Fisheries Management and Marine Conservation Program participated in the Upper Colorado River Endangered Fishes Recovery Implementation Program; represented the NPS in the Flaming Gorge EIS affecting Dinosaur National Monument and Canyonlands National Park; participated in efforts to prevent the extinction of the Devils Hole pupfish; assisted in the planning for native trout restoration in Great Basin National Park, Great Sand Dunes National Park, and Rocky Mountain National Park; and participated in the development of Fisheries Management Plans for Amistad National Recreation Area, Biscayne National Park, and Isle Royale National Park. In addition, a new program to assess the condition of

coastal resources and coastal watersheds continued in its "production" phase with the completion of coastal resources and coastal watershed condition assessments for 10 NPS units, including Channel Islands National Park, Cabrillo National Monument, Kaloko-Honokōhau National Historical Park, Pu'uhonua o Hōnaunau National Historical Park, Fort Pulaski National Monument, Cape Hatteras National Seashore, Wrangell-St. Elias National Park and Preserve, Glacier Bay National Park and Preserve, Klondike Gold Rush National Historical Park, and Sitka National Historical Park. In addition, funding was allocated for additional coastal resource assessments, focusing this year on coastal units of the Northeast and Southeast Regions.

PEB staff members are also proud of the numerous opportunities this year to directly serve parks by providing technical support at the request of regional, network, and park staffs. In FY2006, the PEB provided project oversight and/or technical assistance to all seven NPS regional offices, 4 Inventory & Monitoring Program network offices, and 104 individual units of the National Park system. The Planning and Evaluation Branch is proud to be part of the National Park Service and looks forward to being of continued service to the units of the National Park system throughout FY2007! ♥

The New Water Resources Planning Program

*Don Weeks, Hydrologist
David Vana-Miller, Planning
Program Leader
Planning and Evaluation Branch*

With flat-lined budgets and escalating issues, parks are struggling to manage natural resources as intended by their enabling legislation and other state, federal, and local laws and regulations specific to park resources. It is critical for the NPS Natural Resource Program Center (NRPC) to stay connected with these park needs, offering resources that fill the voids for adequate park resource management. In response to this, a workshop was held in 2006 with staff from the NPS Denver Service Center (DSC) and the various NRPC programs. At the meeting there was strong endorsement by the DSC Chief of Planning, and others, of the Water Resources Division's (WRD's) new planning approach—to get involved early in a park's planning process.



Confluence of the Yellow and Mississippi Rivers, Effigy Mounds National Monument, Iowa (NPS, 2006).

WRD's framework to meet park water resource needs is the 2004 Park Planning Program Standards. This planning framework is the new roadmap that NPS units are required to follow in managing natural

resources. We used to ask, "What resources are fundamental at their park?" Now we ask, "What are the desired conditions for the fundamental resources?" and "How do we achieve or maintain the desired conditions?" as the park moves through the planning framework.

"Thank you for your excellent professional work in preparing the Water Resources Foundation Report for Golden Gate National Recreation Area. Your participation and insight during the General Management Plan workshops and coordination with our Natural Resources staff have been invaluable in laying the groundwork for this 5-year planning process."

Brian O'Neill, Superintendent,
Golden Gate National Recreation Area

For park water resources, WRD's Planning Program now offers two very different, but useful, products that target specific elements in the new park planning framework. These new products replace the older reports (Water Resources Scoping Reports and Water Resources Management Plans). First, WRD offers the Water Resources Foundation Report, designed to address the water resource aspects of the general management planning process and, in particular, a park's Foundation Statement, where resources fundamental and important to the park are identified. The second new product is the Water Resources Stewardship Report, designed specifically to address the water resource needs in a park's Resource Stewardship Strategy (draft *Directors Order 2.1*), where strategies are developed to achieve or maintain the desired conditions for the park's fundamental and important resources.

A third WRD product, Water Resources Information and Issues Overview, provides a flexible design that serves a park's unique water resource needs that extends outside the formal planning framework.

An overview of this “new” WRD planning program, which incorporates existing NPS efforts (e.g., NPS Watershed Condition Assessment and Vital Signs programs), has been presented to the DSC planning staff in 2005 and to the NRPC staff and the Alaska, National Capital, Northeast, and Pacific West regional offices in 2006.

Several of WRD’s existing projects were caught in transition between the old and new design. As such, elements of both the old and new planning paradigm are captured in the reports. One report, *Mammoth Cave National Park Water Resources Management Plan* (WRMP), was completed in 2006. Denali National Park and Preserve is another transitional project, where the original WRMP project was modified into two reports: a Water Resources Information and Issues Overview Report, completed in 2005, and a Water Resources Stewardship Report, completed in December 2006.

“The Water Resources Foundation Report prepared for Effigy Mounds National Monument was very useful in developing both the Monument’s Foundations Statement and portions of the General Management Plan. The comprehensive information and level of detail were highly appropriate and immediately usable in both of these documents.”

Matthew Safford, DSC

The first two Water Resources Foundation Reports were completed in 2006:

Golden Gate National Recreation Area : California : Water Resources Foundation Report. Technical Report NPS/NRWRD/NRTR-2006/348. For Golden Gate National Recreation Area, water resources were found to be “fundamental,” supporting one of the largest concentrations of rare, threatened, and endangered species in the NPS.

Effigy Mounds National Monument : Iowa : Water Resources Foundation Report. Technical Report NPS/NRWRD/NRTR-2006/350. For Effigy Mounds National Monument, water resources were found to be “important,” supporting the early inhabitants where examples of American Indian mound building (the national monument’s fundamental resources) are preserved.

The following park products are currently in progress:

Point Reyes National Seashore: California : Water Resources Stewardship Report

Monocacy National Battlefield : Maryland : Water Resources Stewardship Report

Ozark National Scenic Riverways : Missouri : Water Resources Foundation Report

During preparation of each product, WRD staff works closely with DSC, regional, and park staff. All completed WRD planning reports for parks, including an informative fact sheet, are posted on the WRD website: <http://www.nature.nps.gov/water/planning>. ♡

Parks and Refuges Sign Oceans Agreement with NOAA

*Cliff McCreedy,
Marine Management Specialist*

On August 21, 2006, senior officials from the Department of the Interior and the National Oceanic and Atmospheric Administration (NOAA) signed a new “Seamless Network” oceans agreement to increase their coordination of marine protected areas. National Parks, Wildlife Refuges, Marine Sanctuaries, and Estuarine Reserves conserve a rich assemblage of coastal, ocean, and Great Lakes resources located from above the Arctic Circle to below the Equator in both hemispheres. Although they were created under separate authorities, these programs share similar resource management concerns.

“The General Agreement mandates that we work together to protect these invaluable natural and cultural resources,” said Kameran Onley, Assistant Deputy Secretary, Department of the Interior. “We will now be more effective in our ability to attain greater results through the exchange of agency resources.”

WRD Marine Resources Program Leader Cliff McCreedy worked with the Department and the White House Council on Environmental Quality to develop this initiative as part of the President’s U.S. Ocean Action Plan. The agreement will directly benefit parks by enabling parks, refuges, sanctuaries, and estuarine reserves to exchange funding, assets, information, and technical support where they overlap or adjoin with each other or confront similar issues. Many parks and sanctuaries currently share resources in a variety of ways. The Seamless Network is designed to facilitate and enhance scientific understanding and conservation of coastal and marine resources

and increase coordination with state, public, and private partners.

During the first year of this agreement, plans will be developed to address priorities identified in the agreement, including research, monitoring, enforcement, education, and outreach. In addition, a pilot regional workshop will be conducted to identify local priorities and projects, consistent with the areas of focus in the agreement. Agencies will explore how to coordinate and facilitate the financial and administrative process to allow a timely transfer of funds and effective sharing of facilities, vessels, equipment, personnel, and other resources.



Sitting left to right: NOAA Deputy Assistant Secretary Timothy Keeney, DOI Assistant Deputy Secretary Kameran Onley, and NPS Director Fran P. Mainella. Standing left to right: NOAA Sanctuaries Director Dan Basta, NOAA Ocean and Coastal Resource Director David Kennedy, NOAA Assistant Administrator for Oceans and Coasts Jack Dunnigan, and FWS Assistant Director for Refuges Geoff Haskett (NPS, 2006). ♥

Oil and Gas Mining in Wetland Resources

Kevin F. Noon, Ph.D., Wetland Scientist
Planning and Evaluation Branch

There are numerous variables that affect the price of oil, including international demand, OPEC controls, our refining capacity, climate change, and wars. The net affect of change in these variables has led to recent and significant increases in energy costs and the increased pursuit of the fossil fuel resources everywhere, including National Parks. Prices for West Texas Intermediate crude, for example, went from \$20 per barrel in 2002 to over \$70 in 2006. Prices are expected to range around \$65 over the next few years. Once prices rose above \$25 per barrel, the profits exceeded the costs of mining, and oil and gas development became profitable. In addition, the 2005 Energy Bill was enacted to support the development of domestic oil and gas reserves. The Bill, for example, directs the Secretary of Energy to, expeditiously as practicable, acquire petroleum in amounts sufficient to fill the Strategic Petroleum Reserve to the 1,000,000,000 barrel capacity.



Ditching through park wetlands is a primary concern when dealing with oil and gas production (NPS, 2006).

The Statement of Findings is comprised of several major components, including a map (showing the location of the delineated wetlands, areas of impact, hydric soils, and existing access roads); a discussion of the impacts to wildlife, fish habitat, and other functions; justification for the selected alternative; and proposed compensation for the lost wetland area and functions.

According to the Independent Petroleum Association of America, in the U.S. there are now about 5,000 independent oil and natural gas producers that operate in 33 states and in areas offshore. We are extremely dependent on the independents since they drill 90 percent of the wells in the U.S. and produce 68 percent of America's oil and 82 percent of domestic natural gas. These companies vary in size from small family to publicly traded—some of the largest companies in the world are oil and gas companies.

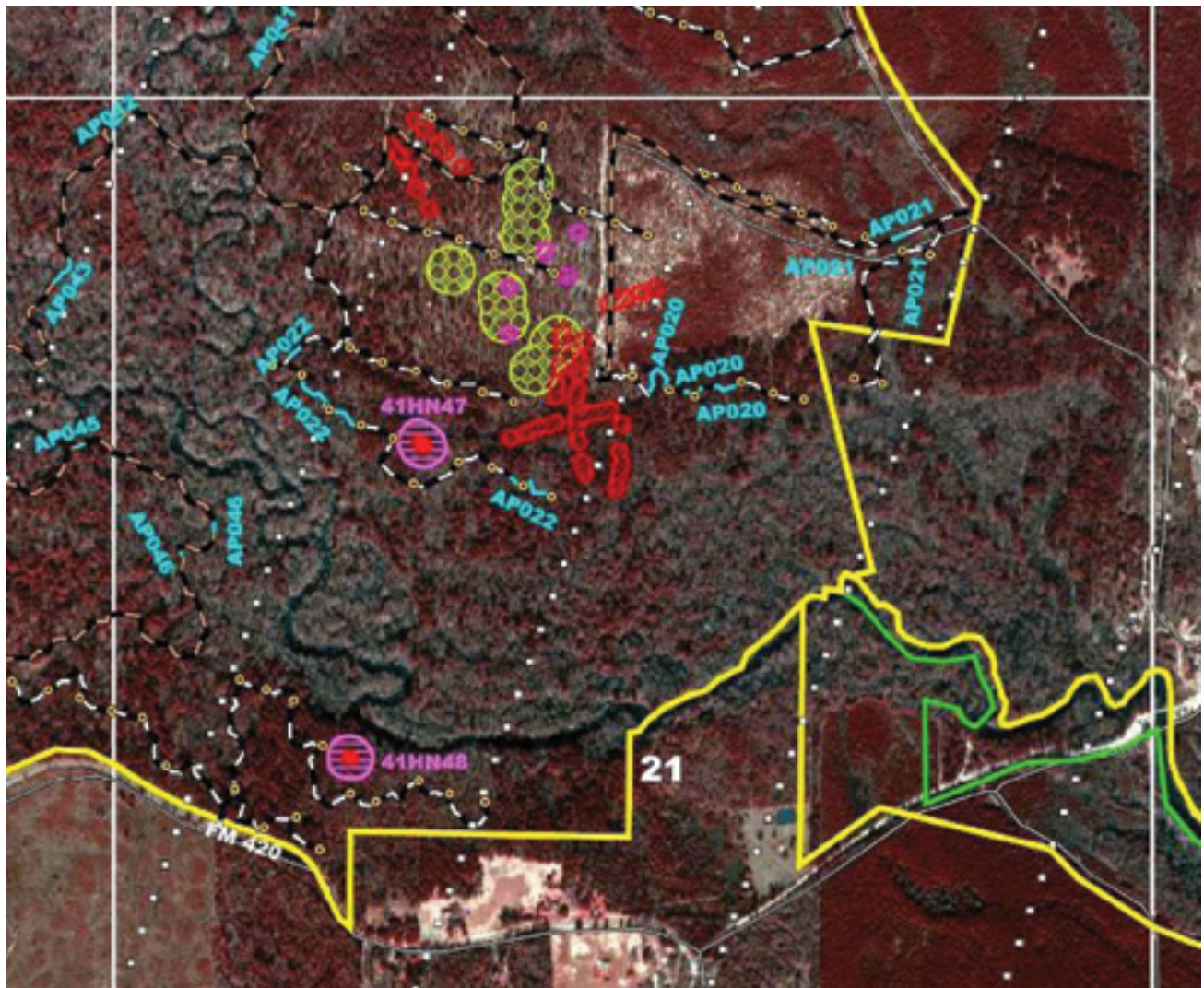
Our dependence on oil and gas, the high prices, the increase in the number of independent drilling companies, and the opportunity for investors to profit from high prices have increased oil and gas exploration and mining beyond private land and into our national parks. In over 70 parks mineral rights are not owned by NPS, and there is the potential for oil and gas development by independents. To respond to the increased interest in parks, Water Resources Division staff now assists parks in maintaining compliance with *Directors Order 77-1: Wetland Protection*. WRD staff members have also been involved with oil and gas exploration permit requests, operation restorations, pipeline installations, and the review of Bureau of Land Management (BLM) oil shale and tar sands leasing programmatic environmental impact statements. Work in 2006 concentrated primarily at Big Thicket National Preserve, Lake Meredith National Recreation Area,

Padre Island National Seashore, Big Cypress National Preserve, and Big South Fork National River and Recreation Area.

Operators who propose to complete seismic activities or to drill wells first complete field work in the park, where they gather information on wetlands and other resources. During this process, we request that the operators complete wetland delineations around all areas of proposed impact, including access and pipeline routes and drill pads. Water Resources staff provide comments on the adequacy of the delineation. If the delineation shows that wetland impacts cannot be avoided, the

operator must complete a Wetland Statement of Findings as required under *Director's Order 77-1*.

In summary, we guide park staff and operators through the wetland compliance process and, at the same time, explore ways of avoiding, minimizing, and compensating for impacts to wetland resources. We consider the project a success if we can avoid creating tire ruts through the soft hydric soils, avoid damaging vegetation, and avoid depositing mud from the drill holes into the wetlands. ♡



Sample resource inventory map including drill sites, access routes, wetlands and cultural resources.

***Binational Cooperative Fisheries
Management Plan Helps Unite
Fisheries Management at Amistad
National Recreation Area***

***James Tilmant, Fisheries Program
Leader, Planning and Evaluation Branch***

***David Larson, Chief of Resources
Management, Lava Beds***

National Monument

***Rick Slade, Chief of Science and Resource
Management, Chattahoochee National
Recreation Area***

Amistad National Recreation Area, with technical assistance from the Water Resources Division's Fisheries Program, completed a five-year effort to establish a formal Cooperative Management Plan for the fishery resources of Amistad Reservoir during 2006. There are two U.S. Federal agencies, one U.S. State agency, one Federal Mexico agency, one Mexico Federal National Fisheries Commission, and one Mexico State agency with interest and management responsibility for the fishery resources of Amistad Reservoir. Prior to completing this plan, there was no common management agreement in place. Both the US and Mexico promoted and regulated fish harvest, and carried out independent fish stocking practices with no coordinated management goals. Different harvest regulations, management goals, and agency missions had lead to potentially conflicting management actions.



Bass Tournament at Amistad National Recreation Area (NPS).

The completed plan provides a mechanism for coordination between each of the agencies with management interest and responsibility. Through the Binational Fisheries Management Plan, coordinated management of fish stocks, consistent and complementary harvest regulations, coordinated biological and chemical monitoring, and coordinated fish stocking and habitat management actions can begin. The plan lays out agreements for communication protocols, management goals and strategies, law enforcement assistance, joint public education and information efforts, public access, and important scientific studies.

The need for a joint fishery management plan first became evident in 1998 when natural resource staff from Amistad NRA and fisheries management staff from Mexico's Secretaria de Medio Ambiente, Recursos Naturales, y la Pesca (SEMARNAP), and the Instituto Nacional de la Pesca (INP) met on the shores of Amistad Reservoir near Playa Tlaloc, Mexico. The visit was arranged to observe cooperative commercial fisheries activities and learn about the monitoring project SEMARNAP was conducting on their commercial fish cooperatives. Many questions and requests for information were shared and developed between participants at this meeting, showing a need for improved communication between management agencies. Over the following months, it was

decided by area State and Federal Managers that a cooperative management plan would be pursued. During 1999, a jointly developed proposal to fund the creation of a Binational Fisheries Management Plan received funding approval through the U.S. Department of the Interior U.S. - Mexico Border XXI program initiative for FY2000 and FY2001. A series of meetings among all agencies involved were held over the following two years in both Mexico and the U.S. during which details of the plan were worked out, drafts completed, and site visits were made to the various agency offices, facilities, and hatcheries. The final international meeting was held in Ciudad Acuna, Mexico, in February 2001. Following this series of meetings, several years were required to move both translations of the plan through government agency review, revision, and final approval.



Fishery Management Planning group's visit to the La Rosa Fish Hatchery near Saltillo, Mexico. Fish raised at the La Rosa hatchery are stocked in Amistad Reservoir by the Mexican authorities (Wullschleger, 2001).

The final plan captures the current status of the reservoir fisheries, documents its stocking and harvest history, identifies major issues of concern, establishes seven common goals for management of the fishery resources and fishing opportunities, and sets management protocols for improved communication and coordination. The plan also identifies 12 high priority studies or actions that are needed to improve knowledge and/or management of the fishery resources within Amistad Reservoir. ♥

A Collaborative Approach to Assessing Watershed Conditions in Coastal National Parks

*Kristin Keteles, Coastal Watershed Condition Assessment Coordinator
Texas A&M University*

The NPS Watershed Condition Assessment Program (WCAP) began initiating scientific assessments of coastal parks through the Natural Resource Challenge in FY2003. Reports from these assessments characterize the relative health or status of marine, estuarine, and Great Lakes resources within the National Park System. As of FY2006, WRD has initiated assessments in 41 parks and plans to complete assessments for a total of 55 parks through FY2010.

These assessments integrate the physical and biological sciences with geospatial databases to increase understanding of coastal resources and reveal factors that may cause degradation. The assessment reports provide valuable tools to guide resource management planning as well as support the development of Vital Signs Monitoring Plans by NPS Inventory and Monitoring Networks. Academic partnerships with universities in the Cooperative Ecosystem Studies Units and collaborations with federal agencies are providing essential expertise in oceanography, ecology, hydrology, marine and estuarine sciences, and geographic information systems (GIS). Beginning in FY2006, the Scope of Work for the remaining coastal/marine assessments was modified to include the evaluation of the condition of upland resources within coastal park boundaries. Expanded "Natural Resource Assessments" were initiated in Dry Tortugas National Park, Acadia National Park, Fire Island National Seashore, Sagamore Hill National Historic Site, and Gateway National Recreational Area.

To date, final reports have been published for a total of 15 parks. In FY2006, reports were published for Cabrillo National Monument, Channel Islands National Park, Glacier Bay National Park and Preserve, Klondike Gold Rush National Historic Park, Sitka National Historic Park, Wrangell-St. Elias National Park and Preserve, Kaloko-Honokohau National Historical Park, Pu'uhonua o Hōnaunau National Historical Park, Fort Pulaski National Monument, and Cape Hatteras National Seashore. Completed reports are available at http://www.nature.nps.gov/water/watershed_reports/WSCondRpts.cfm.

Results of these assessments are being integrated into park and servicewide databases and will be used to guide DOI land health goal reporting as prescribed by the Government Performance and Results Act of 1993. GIS databases and synthesis reports produced from this program will provide parks with an integrated, overall evaluation of current resource conditions for the DOI land health goals.

WRD is working with the parks to implement the recommendations presented in the reports and hopes to form partnerships with states, federal agencies, academia, local watershed groups, and programs such as the National Coastal Assessment in order to investigate resource problems and fill information gaps identified in the assessments. In 2006, WRD began facilitating "Implementation Workshops" by bringing the investigators, park staff, I&M staff, and other interested stakeholders together to discuss report findings and identify the next steps in addressing the recommendations from the reports. The integration of the Coastal Watershed Condition Assessments with Vital Signs and monitoring/assessment programs at other agencies enables the NPS to prioritize natural resource management concerns and strengthens partnerships among various stakeholders to produce collaborative monitoring efforts at coastal parks. ♣



Devils Hole Pupfish Recovery Effort Continues

*John Wullschleger, Fisheries Biologist,
Planning and Evaluation Branch
Mike Bower, Fisheries Biologist, Death
Valley National Park*

In the last several years, the NPS Fisheries Program Office, Death Valley National Park, the USFWS, the Nevada Division of Wildlife, and others have been engaged in an urgent effort to prevent the extinction of the Devils Hole pupfish (*Cyprinodon diabolis*). The Ash Meadows - Devils Hole Recovery Team was formed in 2002 as biologists became convinced that a decline that began in 1995 was continuing. The spring 2005 removal of 1.7 m³ (60 ft³) of sediment from a shallow shelf that is critical for spawning and feeding appeared to increase larval production but did not prevent a net decrease in population size over the course of the year. In December 2005, a science panel convened by the Recovery Team recommended suspending activities in Devils Hole, expanding an existing refuge population at Hoover Dam, and initiating captive propagation. These measures were implemented from March through August 2006.

Measures to increase the size of the Hoover Dam Refuge population focused on increasing primary productivity through a reduction in shading and improving the quality and quantity of the spawning substrate. While reproductive success was observed, the population did not exhibit the anticipated positive response; numbers remained at about 20 fish throughout 2006. An exotic snail (*Melanoides tuberculatus*), which proliferated in the Refuge, is believed to have monopolized food resources and reduced hatching success by disturbing the substrate and ingesting eggs.

Captive propagation was attempted with fish from Devils Hole (2 males) and Hoover Dam Refuge (2 males and 2 females) were transferred to the Shark Reef Aquarium in Las Vegas for artificial propagation in aquaria. Although spawning occurred, the resulting eggs failed to hatch. Backcrossing, using male Devils Hole pupfish and closely related, female hybrids, also failed to produce larvae.

In August 2006, the agencies held a decision workshop to review ongoing activities and provide a structured basis for decisions regarding next steps. The agencies decided to move the remainder of the Hoover Dam Refuge population (18 fish) to Willow Beach National Fish Hatchery for captive propagation, to continue preparing the Hoover Dam and the Point of Rocks refuges (the latter is near Devils Hole) to receive fish, and to conduct energy augmentation in Devils Hole to improve over-winter condition and survival.

A pupfish specialist from Mexico assisted with captive propagation at Willow Beach. Early results were encouraging: a number of eggs hatched and 4 larvae survived to maturity. Unfortunately, it was not been possible to duplicate this early success, and all of the fish that were brought into captivity in August died by mid-December. While the mortality of these fish may be related to age, histological analysis found symptoms consistent with a form of leukemia. The underlying cause is unknown, but an ongoing investigation is focused on possible exposure to contaminants and the search for a retrovirus.

Recognizing that a new approach was needed, the agencies decided to attempt to establish a population in the Point of Rocks Refuge. The Refuge supported a reproducing population of 50 – 80 pure Devils Hole pupfish from 1992 to 2000. In mid-December 2006, 12 fish (6 males and 6 females) were transferred from Devils

Hole to Point of Rocks. Since then, food resources are being augmented with leaf litter and native amphipods, and prepared feed is being provided every other day. Water quality is monitored continuously, and project personnel visit the site daily. If a reproducing population can be established, it will create opportunities to learn more about the biology of this species and provide some security in the event that the Devils Hole population continues to decline.

The agencies also decided to provide supplemental feed to the Devils Hole population during the winter of 2006 / 2007. While there is conflicting evidence on whether Devils Hole is energy limited, there are number of biologists who believe that over-winter survival, condition, and reproductive success could be improved through some form of energy augmentation.

There are no guarantees that the introduction of fish into the Point of Rocks Refuge or supplemental feeding will be successful. While project personnel are hopeful that they can reverse the ongoing decline, the existence of the Devils Hole pupfish is likely to remain tenuous for the foreseeable future. ♥



A Devils Hole pupfish (Cyprinodon diabolis) in Devils Hole (Wullschleger, 2005).



Devils Hole: the shallow shelf before (Manning, October 2004) and after (Wullschleger, February 2005) sediment removal.



Willow Beach National Fish Hatchery aquaria used for captive propagation of Devils Hole pupfish (Wullschleger, 2006).

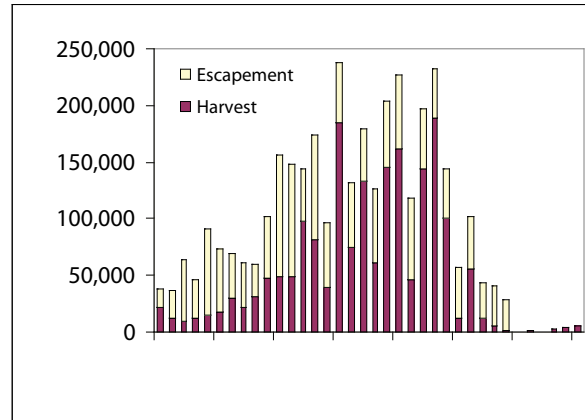


Point of Rocks Refuge after being restored and prior to the introduction of pupfish (Wullschleger, August 2006).

Has Ecosystem Capacity to Support Salmon Changed with Post-Glacial Uplift in Glacier Bay National Park?

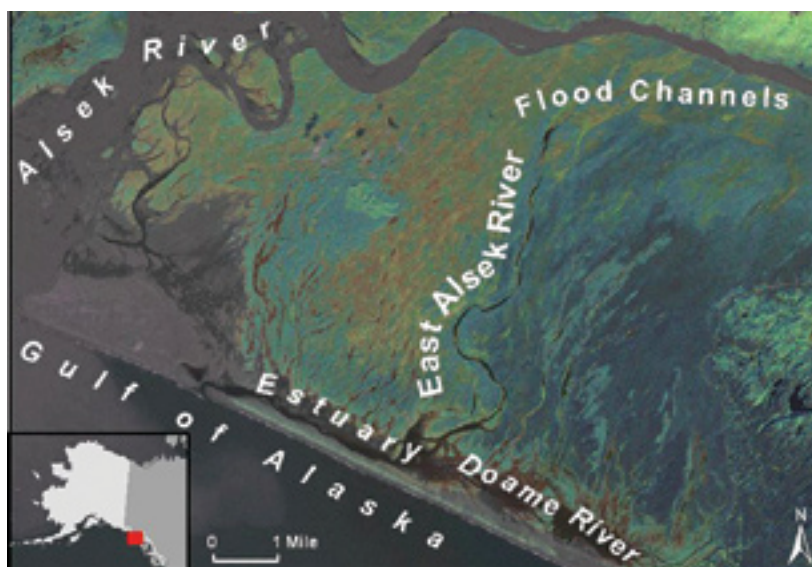
*James Tilmant, Fisheries Program Leader, Planning and Evaluation Branch
Chad Soiseth, Fisheries Biologist, Glacier Bay National Park*

The East Alsek River in Glacier Bay National Park was once the largest sockeye producer in the Yakutat region of Alaska with annual commercial harvests of nearly 200,000 fish. Harvests declined by the mid 1990's to less than 60,000 fish, and the fishery was closed for four years beginning in 1999 because returning salmon failed to exceed a 26,000 fish minimum escapement goal. Sockeye returns have since failed to rebound despite the closure and a new, state-established, minimum escapement goal of 13,000 fish. Consistently poor sockeye returns have lead local fishermen to question whether the East Alsek River is still capable of producing large returns, and requests have been made for the NPS to study and resolve the problem.



Commercial harvest and escapement estimates for sockeye salmon on the East Alsek River (Alaska Department of Fish and Game).

Rapid physical and biological change as a result of glacial retreat induced landform uplift is the most likely explanation for declining salmon productivity. Up until 1989, the larger, nearby Alsek River periodically overflowed into the East Alsek River, scouring fine sediment and vegetation from spawning habitat. Uplift rates approaching 20 mm annually have likely caused both the Alsek and East Alsek River channels to become much more incised—by as much as 3 m since 1989. This is typical of rivers with decreased frequency and probability of flooding. Human induced



Glacier Bay Preserve study site, including Alsek River, East Alsek River, and common Doame River/East Alsek River estuary (Eichenlaub, 2006).

erosion and sedimentation in aquatic habitats from all terrain vehicle use in the preserve may also be contributing to productivity declines. Determining whether East Alsek River sockeye declines are natural or human-induced is paramount for future management decisions.

The Water Resources Division and Biological Resources Division have jointly provided funding and technical assistance to help the park address hydrological and biological aspects of this issue. Two lines of investigation exist: one examines sockeye productivity while the other seeks to evaluate present and historical land use, vegetation, hydrological and geological information for evidence of change.

Hydrological records for the Alsek and Tatshenshini Rivers indicate that flooding events since 1989 have actually been of larger magnitude than those of the previous two decades; flooding into the East Alsek River should have occurred. Yet, recent Alsek River floods have not impacted the East Alsek River, supporting the hypothesis of incised streams and increasing floodplain elevation. A comparative analysis of four sets of aerial photography, spanning a 48 year period from 1948 to 1996, suggests significant land cover changes have occurred, including loss of many deciduous and herbaceous areas to coniferous growth. This corroborates the hypothesis of reduced flooding and declining ground-water levels as a result of land uplift. In addition, the comparison shows the East Alsek River wetted-channel area has declined more than 40%, while total area and density of aquatic vegetation has increased. Although high coliform bacteria counts were documented through water quality sampling, these could not be linked to human causes.

To determine if there is biological evidence for a reduction in the ecological capacity of the river to produce salmon, researchers from the University of Alaska Fairbanks

have quantified spawning habitat availability, documented spawner habitat use, and evaluated juvenile sockeye growth rates (both currently and historically, as evidenced within scale annuli). Field data were collected during the summers of 2005 and 2006. Biological sampling has shown that spawning habitat does not appear to be limiting; therefore, declines in spawning habitat quantity or quality fail to explain reduced salmonid productivity.

Although an explanation for declining sockeye salmon in the East Alsek River is not yet complete, results will likely be applicable to other glaciated coastal areas in Alaska. As glaciers retreat, landscape changes and increased human use can confound our ability to discern natural versus human caused influences on ecosystem productivity. The Glacier Bay studies will help the NPS address these issues. ♥



Spawning sockeye salmon in East Alsek River, Glacier Bay National Park (Derek Faber, 2006).

Battle Road Stream Restoration at Minute Man National Historical Park

*Chris Davis, Natural Resource Specialist,
Minute Man National Historical Park*

*Alan C. Ellsworth, Hydrologist,
Northeast Region*

*Mike Martin, Hydrologist,
Water Operations Branch*

*Kevin F. Noon, Ph.D., Wetland Scientist,
Planning and Evaluation Branch*

Battle Road Stream was once a free-flowing, riverine wetland and tributary to a critical Massachusetts State fishery. The wetland conditions influenced troop movements during the battle of 19 April 1775 in the Battle Road Unit of Minute Man National Historical Park (MIMA). During the last century, land owners channelized a long section of the stream to create agricultural land and later buried the creek in a culvert to permit construction of a housing development. More recently, drainage through the area has failed during storm events, and flooding has become an issue along the local road.

This restoration was a successful effort to improve drainage and restore ecological functions of the degraded riparian and wetland complex. Another important benefit was recreation of the 1775 historic scene, which improves visitor interpretation by restoring environmental conditions that influenced troop movements during the battle.

This watershed restoration project exemplifies a successful collaboration of park and WRD resource experts in working towards a common goal. WRD and MIMA staff cooperated in evaluating the feasibility and scope of daylighting (exposing and restoring) a 300-foot section of stream and adjacent wetlands that had been conveyed

through a concrete culvert. The authors 1) assessed the ecologic, hydrologic, and geomorphic conditions of the stream system, fill areas, and wetland areas above the stream system, 2) evaluated historical aerial photographs for changes in land use, land form, drainage, and vegetation, 3) identified alternatives for restoration, 4) refined goals and objectives for the stream restoration project, 5) identified tasks necessary to complete the proposed restoration project, and 6) reviewed final grading and planting plans.



Concrete outfall before restoration (NPS, 2003).

Construction drawings were prepared cooperatively with funding provided by the Massachusetts Department of Fish and Game. The Notice to Proceed with construction was issued in September 2006, and the project was completed in October 2006. Project objectives were accomplished in full, and the daylighted section of stream

is functioning naturally. Within days of construction, frogs had recolonized the site, water temperatures had decreased, and dissolved oxygen had increased. In addition, the project removed approximately one acre of non-native, invasive plants and established native vegetation throughout the construction area.



A portion of the daylighted stream after grading and planting (C. Davis, 2006).

The net loss of wetland and riparian areas in the surrounding urbanized environments has increased the importance and cooperative nature of this restoration project. Supporting partners that committed funds or expertise to the project include the Army Corps of Engineers, EPA, Massachusetts Department of Fish and Game, and the adjacent Town of Lincoln. This cooperative interest is a confident acknowledgement of the benefits to the watershed and surrounding community. In addition, without the \$54,000 in funding for construction provided by the WRD Watershed Condition Assessment Priority Project Funding, the restoration project would have been postponed and the auxiliary funding would have been put at risk. ♡

Marine Reserves Receive Scientific Scrutiny and USGS Funding

*Cliff McCreedy, Marine Management Specialist
Planning and Evaluation Branch*

Recent reports by the U.S. Commission on Ocean Policy and the Pew Oceans Commission have drawn the attention of state and federal policymakers to the beauty, value, and rapid decline of ocean resources. Pollution, overdevelopment, ocean warming, and overfishing are outpacing the ability of resource management agencies to coordinate science based solutions to these problems. The National Park System is not immune to these threats. Fishing occurs throughout most ocean parks. NPS servicewide policies allow recreational fishing consistent with NPS and state fishing regulations (unless specifically prohibited) and commercial fishing (where authorized by enabling statute or regulation). However, these policies have generally failed to maintain fish population sizes and structures to ensure ecosystem health or sustain recreational fishing opportunities in many ocean parks.

Recently, marine reserves (reserves), i.e., marine protected areas in which extractive uses are prohibited entirely or restricted to a few pelagic or other species, were established in and around five national parks in an effort to restore depleted fish populations. On November 14th, 2006, the State of Florida concurred with NPS regulations to establish the Dry Tortugas National Park Research Natural Area (RNA), a marine reserve occupying 46 square miles of the park. The Dry Tortugas National Park RNA and the reserves established at Buck Island Reef National Monument and Virgin Islands Coral Reef National Monument share similar objectives—to sustain tropical marine

ecosystems and to protect fragile coral reefs, seagrass beds, and the marine species they support from fishing and anchor damage. Channel Islands National Park in California and Glacier Bay National Park in Alaska also established similar reserves.



USGS Caribbean Field Station biotechnicians Tony Spitzak and Erinn Muller conduct coral monitoring at Virgin Islands National Park (NPS, 2006).

The National Park Service has a clear mandate to employ the best available science to evaluate the performance of these new reserves and to adapt its management and monitoring programs according to changes observed in resource condition. In expressing support for the Dry Tortugas National Park RNA, the Florida Fish and Wildlife Conservation Commission's Chairman Rodney Barreto said, "While we agree with a closure to fishing and its scientific importance, we must also ensure the objectives of a fishing closure are met and we will monitor this area closely for progress and success."

Programs such as the kelp forest monitoring program at Channel Islands National Park and the NOAA Biogeographic Assessments of coral reefs, fish, and invertebrates are yielding critical information to meet these adaptive management goals. However, important research and monitoring questions remain. For example, what are expectations

for fisheries to rebound in light of pressures from fishing outside these reserves? Will marine reserves help reverse declines and restore ecosystem structure and function in spite of stresses other than fishing?

In July 2006, the Water Resources Division (WRD) and the USGS held an international workshop on St. John, U.S. Virgin Islands, to identify opportunities for future research and monitoring in these new "no-take" marine reserves. Organizers included Gary Davis, WRD's Visiting Chief Scientist for Ocean Programs, and Cliff McCreedy, WRD's Marine Program Leader, Dr. Caroline Rogers of the USGS Caribbean Field Station, and Dr. Daniel Suman of the Rosenstiel School of Marine and Atmospheric Sciences, University of Miami. In addition to staff from the Virgin Islands parks and the NPS South Florida/Caribbean Inventory and Monitoring Network, workshop participants included the staff from the NOAA Center for Coastal Monitoring and Assessment and the NOAA Florida Keys National Marine Sanctuary, and thirty other scientists and managers from the United States, Mexico, and the wider Caribbean. Funding was provided by the NPS International Affairs Office.

The workshop succeeded in establishing goals and specific questions for evaluating the performance of the Dry Tortugas and Virgin Islands reserves. Biological goals include understanding, documenting, and projecting changes in marine biodiversity, as well as trophic dynamics and population sizes of fish in and around reserves. Social goals identify the need for engaging local and regional communities in monitoring programs and for measuring and incorporating attitudes and perceptions toward fishing closures. The experiences shared by managers and scientists from different countries enriched the dialogue. The workshop report is available online at <http://www.nature.nps.gov/water/marine.cfm>.

Perhaps the most valuable outcome of the July 2006 workshop (and several meetings between WRD and USGS staff) was the announcement by the USGS Eastern Region that it will dedicate over \$300,000 annually to support competitive research grants to evaluate the Dry Tortugas and Virgin Islands park reserves. State supported agencies and academic institutions will apply for the grants, and the July workshop report will provide guidance to applicants for structuring research proposals and tailoring approaches to management regimes and resources in these reserves. ♥



Acropora coral, *War in the Pacific National Historical Park* (Minton).



Leptoria coral, *War in the Pacific National Historical Park* (Minton).

WATER OPERATIONS BRANCH HIGHLIGHTS

Gary W. Rosenlieb, Chief

First, I am pleased to be reporting this year's accomplishments as the official Chief of the Water Operations Branch. I am proud and honored to be entrusted with this position, and I plan to maintain branch focus on providing service to the field. In 2006, the Water Operations Branch continued making tremendous progress in implementing its hallmark servicewide programs, as well as providing high quality, issue specific, technical assistance to dozens of individual parks.

Funded servicewide programs managed by the Branch include the Watershed Assessment Program, the Vital Signs Water Quality Monitoring Program, and the USGS/NPS Water Quality Partnership. As described in the article by Jeff Albright, the Watershed Assessment Program has officially launched in the field through the initiation of 9 projects involving 17 park units in 5 regions. The Vital Signs Water Quality Monitoring Program provided support and full funding to 32 networks in FY2006. In addition, as described in Dean Tucker's article, important strides for the management of water quality information and data was made by the release of NPSTORET v.1.00, a database that allows parks and networks to document water quality monitoring projects in a manner compatible with the National Water Quality Monitoring Council's core water quality data elements in a format amenable for upload to the EPA's STORET database. Finally, Barry Long's article provides a nice summary of projects supported by the USGS/NPS Water Quality Partnership and a report on the successful endeavor this year to establish a USGS liaison in WRD in conjunction with that program.

WOB participated in several successful field efforts during the past year. Rick Inglis reports on some encouraging developments for ecosystem recovery at the Missouri National Recreational River. Gary Smillie and Pete Penoyer provide interesting articles on the utility of real-time hydrologic and water quality monitoring networks at Haleakala and Yellowstone National Parks, established for visitor protection and water quality standards compliance purposes. Last, but not least, Mike Martin describes the use of complex hydrologic monitoring techniques for the restoration of wetland and fluvial systems at Prisoners Harbor at Channel Islands National Park.

The branch continued to provide technical assistance on a myriad of hydrology and water quality issues. A complete listing of the assistance is provided in Appendix A. Some of the more high-profile efforts included:

Numerous requests for assistance on floodplain statement of findings and floodplain mapping were addressed by the branch's Hydrology Group at Natchez Trace National Historical Park, Cuyahoga Valley National Park, Stones River National Battlefield, Delaware Water Gap National Recreation Area, Mammoth Cave National Park, Fire Island National Seashore, Saint Croix National Scenic Riverway, Lake Mead National Recreation Area, Colonial National Historical Park, and the USS *Arizona* Memorial.

Numerous ground-water management and supply issues were addressed, including those at Big Bend National Park (rehab and construction of new wells at Panther Junction), Capitol Reef National Park (investigation of the source of ground-water flooding at a campground), Carlsbad Caverns National Park (assessment of hydrogeology and potential water quality concerns at Rattlesnake Springs), and Coronado National Memorial

(identification of alternatives to replacing a water supply well damaged during massive floods).

The Branch's Water Quality Group provided assistance for the initiation of site assessments and remedial investigations for metal contamination at Lake Roosevelt National Recreation Area and continued to provide assistance with contaminant and water quality assessments for oil and gas contamination and CERCLA site investigations at Big Thicket National Preserve and Indiana Dunes National Seashore. ♡



Gower Gulch, Death Valley National Park (Smillie, 2004).



Mancos River, Mesa Verde National Park (Inglis, 2000).

Update on the Watershed Condition Assessment Program

*Jeff Albright, Watershed Condition Assessment Program Coordinator
Water Operations Branch*

During Fiscal Year 2006, the Watershed Condition Assessment (WCA) Program initiated a set of pilot projects to evaluate different approaches to conducting a “park-wide, ecological resource condition assessment”. These projects (9 projects involving 17 park units across 5 regions) encompass a range of parks in terms of park size, primary management purposes and objectives, ecological settings, and resource management issues and concerns.

The pilots serve as lead-in for a type of natural resource assessment that will be done for each park in a NPS Inventory & Monitoring Network. The timeframe planned for funding an assessment at each of the 270-plus parks: Fiscal Years’ 2006-2014. Each assessment will evaluate overall resource conditions for park-managed watersheds and habitats, and identify critical data gaps and highlight some existing or emerging influences on resource condition status (i.e., threats, stressors). Geospatial products will be emphasized to facilitate use of findings in park resource planning processes—General Management Plans, Resource Stewardship Strategies—and for use in park reporting to the Department of Interior’s Strategic Plan “land health” goals.

In some cases the assessments will provide new insights to park managers about resource conditions, most significant and/or vulnerable park watersheds or habitats, and strategies for effective protection and restoration of park resources. In other cases, the strength of the assessment will be in providing park managers the scientific

documentation they need to seek funding and to develop project plans related to resource protection and restoration.

In addition to initiating a set of pilot projects, in Fiscal Year 2006 the WCA Program continued an ongoing effort to fund assessment projects that characterize the relative health or status of marine, estuarine, and Great Lakes resources within the National Park System.

Additional information on the WCA Program can be found at the program’s NPS Intranet web site: <http://www1.nrintra.nps.gov/wrd/Watershed/index.cfm>. ♥

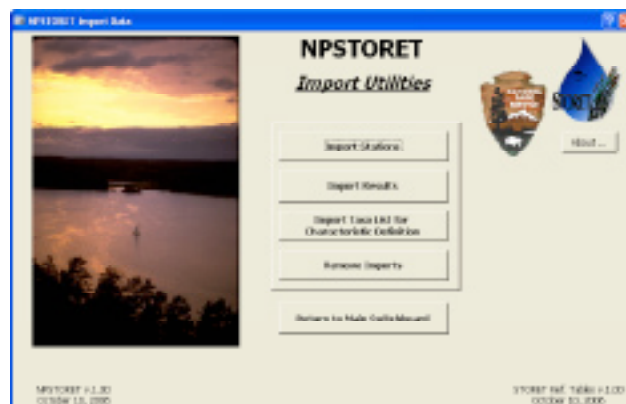
NPSTORET Gets Integrative

*Dean Tucker, Natural Resource Specialist
Paula Galloway, Research Associate
Water Operations Branch*

NPSTORET v.1.00 (<http://www.nature.nps.gov/water/infoanddata/index.htm>), a full-featured, decentralized, Microsoft Access-based, water quality database management system, was released in October 2006. The software allows parks, Vital Signs Networks, and others to enter, store, analyze, report, and export physical, chemical, and biological water quality data in a format that is compatible with the EPA's STORET database. New to this version of NPSTORET is the ability to import water quality data from other database management systems, including the three largest national water quality data repositories: (1) EPA Legacy STORET Data Center (<http://www.epa.gov/storpubl/legacy/gateway.htm>); (2) EPA Modern STORET Data Warehouse (http://www.epa.gov/storet/dw_home.html); and (3) USGS National Water Information System (NWIS) (<http://nwis.waterdata.usgs.gov/usa/nwis/qwdata>).

Water quality data are often entered into Excel spreadsheets, rudimentary Access databases, or other database management systems. Unfortunately, many of these database management systems often lack standardization, analytical capability, and report generation, which can render their data useful only to the original collectors. To ameliorate this situation, NPSTORET v.1.00 includes new import routines that allow users to integrate data from their own historical spreadsheets, databases, and other sources into one consistent format without having to re-enter the data manually. At present, users can import station definitions and visit/activities/results (results) from their own files or from the national water quality data repositories.

The process of importing stations and results from the user's own data files entails matching fields in the user's file with NPSTORET fields that contain the same data. The field matching can be saved for subsequent import of similarly formatted files. Before importing results from their own files, the user must create a project, enter one or more station definitions (perhaps by importing them), and enter metadata that fully describes the results to be imported. Once fields from the user's file have been matched to NPSTORET fields, NPSTORET validates the contents of the import file and reports back any warnings or errors. When the user is satisfied with the validation, the stations and results are quickly loaded into NPSTORET.



The process of importing stations and results from Legacy STORET, Modern STORET, and NWIS is more straightforward. At present, importing data from these national systems requires first creating a project in NPSTORET to house the data, importing the stations, and then importing the results. Since NPSTORET knows their database structure, no field matching is necessary. Metadata creation (characteristic definition) is done semi-automatically. As NPSTORET is based on the Modern STORET data model, import from this system is the most seamless because the characteristics are already completely defined. When importing results from Legacy STORET and NWIS, NPSTORET translates the parameter code

definitions from these systems to Modern STORET's normalized characteristic definition format. Some user intervention in the mapping process may be necessary to map ill-defined parameter codes to characteristic definitions. NPSTORET learns from user parameter code mappings so that subsequent imports don't require intervention for the same parameter codes.

NPSTORET can also import taxa lists to create automatically the metadata characteristic definitions for each taxon that may be observed during a multi-taxon population census. Once these taxa are created as characteristics, the number of each taxon observed during sampling can then be entered manually or imported.

Importing data from disparate database systems can be complicated. Detailed step-by-step analog instructions, context-sensitive help, and tutorial videos are included in NPSTORET to help guide users in the process. Future enhancements to the import routines will allow one-step import of stations and results from the national water quality data repositories and support for various types of update imports. ♥



Blue Creek, Curecanti National Recreation Area (Malick, 2001).

New Horizons for Partnering with the U.S. Geological Survey

Barry Long, Hydrologist Water Operations Branch

The year 2006 marked the ninth year that NPS has been engaged in a water quality partnership with the USGS. The partnership began with a prototype collaboration with the USGS National Water Quality Assessment Program. Eventually, the program was formalized and funded by the Clean Water Action Plan. Currently, the partnership program is administered by the USGS Office of Water Quality.

Parks and regions have benefited greatly from the exchange of expertise and cooperation between the two agencies. To date, approximately \$18 million has been allocated for 136 projects in 103 national park units. In addition, other water resource projects were initiated in parks, stemming from relationships formed between scientists and managers on partnership projects. Both agencies view the water quality partnership as a positive example of the progress that can be achieved by working together to solve resource management problems. USGS support to networks for vital signs monitoring is an example where this collaboration is paying dividends to NPS.



Electrofishing for smallmouth bass in Abrams Creek, Great Smoky Mountains National Park (NPS, 2003).

Because of the success of the water quality partnership, the NPS and USGS Water Resources Divisions are exploring ways to expand the program and address other water resource needs in parks. These discussions culminated in the establishment of a liaison position designed to facilitate increased communication and exchange of technical information between the agencies and to help develop new opportunities for water resource collaborative project work in parks. Glenn Patterson, from USGS Headquarters, has been assigned to the liaison position and he will be located part-time in the NPS-Water Resources Division office in Fort Collins, Colorado, in FY2007.

Potential collaborative projects are:

- locating more stream gages in parks,
- establishing more programmatic approaches to ocean park resource inventory and monitoring,
- investigating the affects of application and transport of new and current use pesticides in and near parks,
- studying the impacts of atmospheric deposition of nutrients and contaminants on sensitive aquatic habitats, and
- increasing water availability for humans and ecosystems in arid parks.

The results from these and other collaborations with the USGS would help answer resource questions and enable managers to make better informed choices. It is hoped that a concerted effort through partnering will result in additional support to address the most critical water resource needs in parks. ♥

Missouri National Recreational River and Army Corps of Engineers Preserve Natural River Conditions

Rick Inglis, Hydrologist

NPS staff at the Missouri National Recreational River and WRD had a demanding year with meetings and field trips with the Army Corps of Engineers. These activities are related to protecting the outstandingly remarkable values along a 98-mile stretch of free flowing river that has not been inundated by a reservoir or dredged for navigation. Major issues in 2006 included in-depth reviews and extensive comments on the Missouri River Bank Stabilization Cumulative EIS that has led to major revisions to the Army Corps of Engineers' method of analysis. At the same time, the Army Corps of Engineers and NPS worked with Nebraska State Parks to develop a river habitat friendly bank stabilization project at Ponca State Park. Additionally, after a period of long deliberation with stakeholders from the entire basin, a spring rise program was developed that modified releases from the reservoirs to provide spawning cues for the endangered pallid sturgeon, following a mandate from the biological opinion of the USFWS. The park was also involved in extensive restoration activities for the development of habitat for the federally listed least tern and piping plover. ♥



A small gap in bank revetment on the Missouri River allows increased habitat values (NPS 2006).

Installation of Real-Time Hydrologic Monitoring System Pools of Ohe'o Area, Haleakala National Park

Gary Smillie, Hydrologist

The Pools of Ohe'o are spectacular natural features and a favorite visitor attraction in Haleakala National Park (HALE). Located in the lush southeast part of Maui, the stream system here is a series of waterfalls, plunge pools, riffles, and short swift runs. The tropical setting and beautiful clear water entices visitors to approach and enter the stream and pools. There several spectacular waterfalls and numerous pools visible from trails paralleling the streams beginning at Waimoku Falls on Pipiwai Stream downstream past the confluence with Palikea Stream and ending at the mouth of the stream at the Pacific Ocean. Most visitors go to the lower pools which are located a short walk from the parking lot and Kipahulu Visitor Center. During late morning and afternoon hours, the lower pools often have several tens of visitors at one time with some of these people wading across the usually shallow riffle to the far side of the pool and some swimming in the pool itself. Substantially fewer people walk upstream along the 1.5 mile trail to Waimoku Falls, with a few visitors going off the established trail to access some of the remote upper pools or waterfalls. Several visitor safety incidents have occurred in the past both in the lower pools and the more remote streams and waterfalls near the Waimoku Falls Trail.

While the setting is very appealing to park visitors it is also deceptively hazardous with rocky uneven hillslopes, hidden underwater rocks, and the potential for dangerous hydraulic conditions. Just downstream of the lowest pool, the mouth of the stream is located in an area with significant surf, strong currents, and jagged volcanic coastline making for very dangerous conditions. The

stream is capable of flashy behavior with rapid increases in flow resulting from intense rainfall upstream. These factors make managing risk to visitors unaware of natural hazards a difficult task for the NPS. Safety issues can be caused by rapidly changing flow conditions catching visitors by surprise or by visitors simply using poor judgment and taking inappropriate risks.

In the past, visitor protection activities at the Pools of Ohe'o have consisted of a combination of information dissemination and active management of pool access. Information regarding the general hazards present in the area is provided to visitors via numerous signs located in the visitor center area, near the lower pools, and along the Waimoku Trail. More active management of risk to visitors is provided by closing access to the lower pools by closing and locking the gate at the top of the access trail and flipping open the closure sign when a specified flow criteria is met. Flow information was obtained in near-real time from a USGS gaging station via the USGS web-site.

In 2006 the NPS contracted with Pacific REMS of San Diego, California to install a hydrologic monitoring system (HMS) in the watershed of the Pools of Ohe'o. The HMS was designed to provide more comprehensive and timely information about hydrologic conditions in the basin. The monitoring system consists of seven rainfall and three stream stage gages with radio telemetry transmitting hydrologic data in real-time down to a "base station" at the Kipahulu Visitor Center. This system will provide a wealth of new information on the climate and hydrology of southeast Maui, an area of sparse hydrographic data. It is also hoped that the monitoring system will provide information useful to park staff related to predicting stream flow in the area of the lower pools. Having enhanced knowledge of hydrologic conditions may be helpful in alerting visitors of changing flow conditions

that make swimming or wading in riffles dangerous. ♥



Rainfall measurement and radio transmitting station in the Pools of O'heo area of Haleakala National Park (NPS, 2006).

Continuous Real-Time Water Quality Monitoring as an Environmental Compliance Tool at Sylvan Pass, Yellowstone National Park

*Pete Penoyer, Hydrologist, Water Operations Branch
Henry Heasler, Supervisory Geologist, Yellowstone National Park
Gary Rosenlieb, Chief, Water Operations Branch*

When confronted with the need to rapidly respond to episodic water pollution events, continuous real-time monitors can be an invaluable tool for environmental compliance officers and other professionals charged with insuring adherence to water quality standards. Such a system was designed and installed in Yellowstone National Park at Sylvan Pass. Sylvan Pass is a topographic divide located at 8500 feet near the eastern border of the park. The pass is a narrow, U-shaped glacially-carved valley in 50 million year old andesitic volcanic rocks. Cliffs form the highest portions of the pass and spatially extensive talus aprons form the sides of the pass. Permafrost underlies a portion of the pass, although its spatial extent has not been determined. Sylvan Pass is both a topographic divide and a hydrologic divide with some surface water flowing west into Yellowstone Lake and some surface water flowing east towards Cody, Wyoming.

The road through Sylvan Pass was built in 1903 and upgraded through the years to become one of the five major access routes into Yellowstone. In 1992, Yellowstone National Park began using Sylvan Pass as its major gravel source for road construction. Since 1992, over 1.3 million tons of rock has been mined at Sylvan Pass. Along with the mining, gravel processing (including crushing, washing, and separation of fines) has occurred on the pass.

In August 2004, a plume of white turbidity extended out of Yellowstone National Park for many miles into the Shoshone River. The turbidity plume was traced back to Mammoth Crystal Springs located on the northeast side of Sylvan Pass. Dye tracing to better understand ground-water movement within the Sylvan Pass talus was conducted by the park and USGS. That study established ground-water flow in a southwest to northeast direction beneath the pass (counter to the topographic slope on the southwest side of the pass) and beneath the gravel mining, washing, and operational waste disposal areas located on talus and permafrost. This underground flow surfaced from the talus and served as the source water for Mammoth Crystal Spring, one mile northeast of the pass and over 600 feet lower than the pass.

To address questions related to the occurrence, source, and severity of the turbidity source and to provide a means to rapidly respond, inspect, and correct future turbidity events, WRD assisted Yellowstone National Park in contracting with the USGS to provide telemetered continuous turbidity monitoring of the Sylvan Pass hydrologic system at five surface-water sites in an effort to more precisely quantify turbidity events at Sylvan Pass. Surface-water monitoring (continuous turbidity, specific conductance, temperature, water level, and regular manual discharge) measurements were made at five sites across the Sylvan Pass hydrologic system. Sites included 1) an upstream location (above Crecelius Cascade) on the southwest side of the pass before surface flow disappeared into talus at the base of a waterfall, 2) the inflow to Mammoth Crystal Spring where the ground water first discharges from talus on the northeast side of the pass, 3) the unnamed short stream outfall to Mammoth Crystal Spring, 4) an upstream site on Middle Creek that served as a control site located just above the confluence with the unnamed stream, and 5) Middle Creek below the confluence.

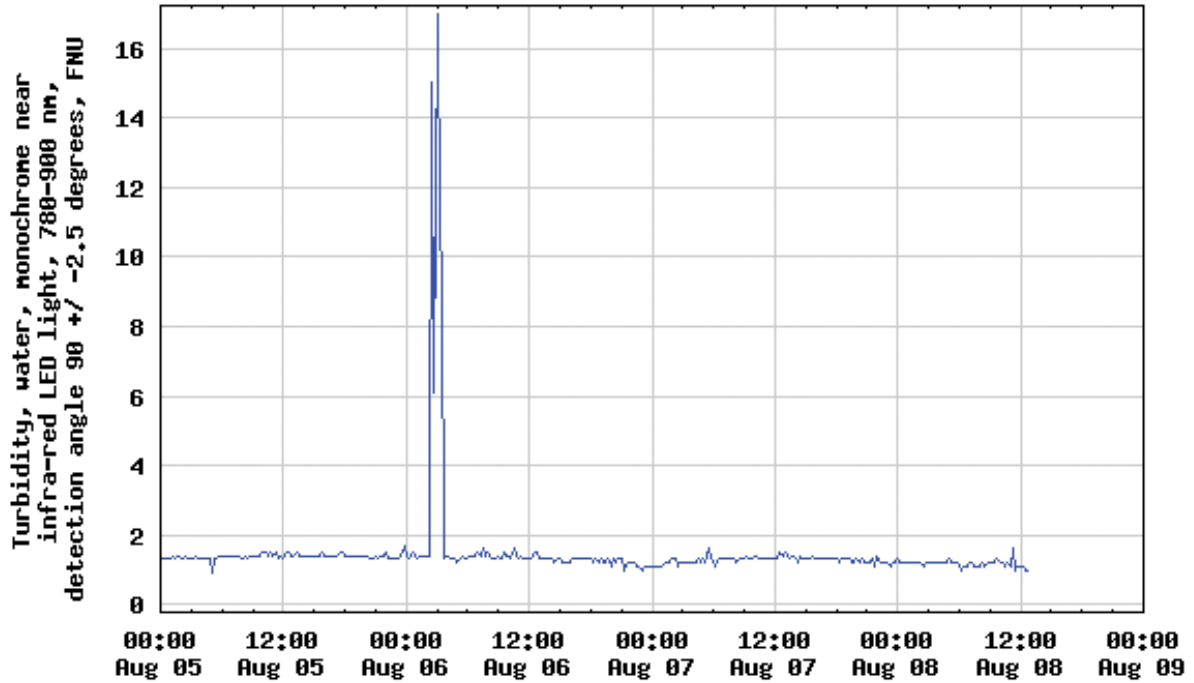


Data collection platform, telemetry system, and weather station at Sylvan Pass (Heasler, 2006).

Monitoring data was collected at 15 minute intervals using water quality sondes (YSI 600 OMS) connected by cable to a data collection platform. Data was then transmitted (hourly) via the GOES telemetry system to the USGS NWIS web site for near real-time observation. A weather station co-located at one stream monitoring site made it possible to correlate precipitation events with the changes to in-stream monitoring parameters being collected throughout the Sylvan Pass hydrologic system. Due to the dry summer, precipitation events were rare and of low intensity throughout the first summer of monitoring. Snowmelt, coupled with peaking of the hydrograph next spring along with the monitoring of more intense precipitation events next summer, should help address most of the resource protection concerns as they relate to the potential for remobilization of any residual fines in the talus and the impacts to resources from unnatural turbidity in the hydrologic system.

Continued monitoring in the coming year, coupled with the results of biological studies and core analyses collected from Mammoth Crystal Springs last summer, should assist in quantifying the level of continued impact to park water resources. ♥

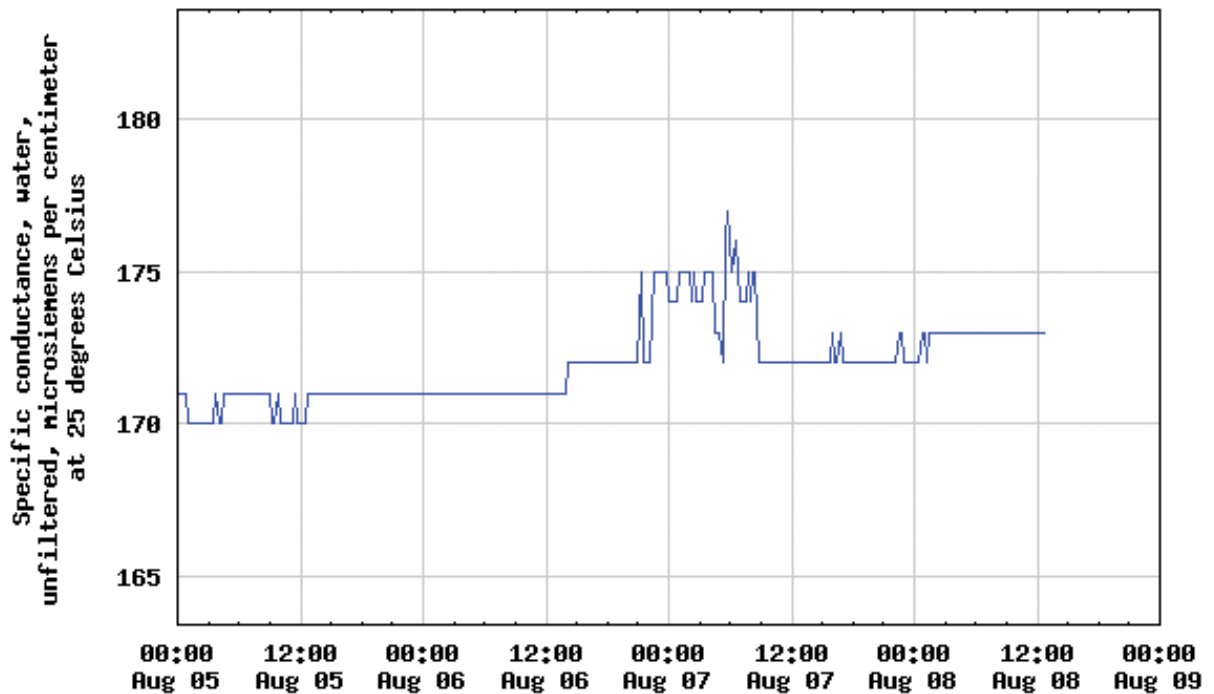
USGS 442727110064501 Mammoth Crystal Spgs inf nr Sylvan Pass YNP (SP2)



----- Provisional Data Subject to Revision -----

3.5 days of continuously recorded Turbidity (15 minute intervals) at Mammoth Crystal Springs inflow near Sylvan Pass.

USGS 442727110064501 Mammoth Crystal Spgs inf nr Sylvan Pass YNP (SP2)



----- Provisional Data Subject to Revision -----

3.5 days of continuously recorded Specific Conductance (15 minute intervals) at Mammoth Crystal Springs inflow near Sylvan Pass.

Assessing Proposed River Restoration through Numerical Modeling, Santa Cruz Island, Channel Islands National Park

*Mike Martin, Hydrologist
Water Operations Branch*

Cañada del Puerto Creek on Santa Cruz Island, has been subjected to substantial manipulation over the past century and a half (Figure 1). It was the focus of this analysis to assess how one particular manipulation, a 400 foot levee, has affected fluvial processes and how these effects would change with levee removal.



Figure 1. Overview photo of the lower reach of Cañada del Puerto Creek, Santa Cruz Island. The approximate location of the channel and floodplain cross sections are depicted as black lines and labeled XS0 through XS5. The thick blue line is the approximate location of the left bank levee (Noon, 2006).

The watershed supporting the creek is about 13 square miles (Figure 2). While the creek is primarily ephemeral, intense frontal storms are capable of producing substantial runoff events. Large flows are relatively common.



Figure 2. Oblique aerial view of Prisoners Harbor, showing the study site and part of the lower watershed (Noon, 2005).

We utilized HEC-RAS, the Army Corps of Engineers numerical model to assess two hydraulic/fluvial conditions:

- 1) the frequency of flood required to overtop the channel banks and access the floodplain both with and without the levee and
- 2) the extent of the regulatory, 100-year flood in relation to existing infrastructure and assess how removing the levee may affect the elevation of this flood.

Modeling results indicate that the channel adjacent to the levee is capable of containing flows in excess of the 100-year flood (Figure 3a). Specifically, it would require a flow of about 3500 cfs to overtop the levee. This discharge is about 35 percent greater than the 100-year flow of 2590 cfs. Conversely, modeling runs with the levee and associated fill “removed,” indicate that the channel is only capable of containing flows up to the 10-year flood of about 550 cfs (Figure 3b).

Cross Section 3 - existing levee

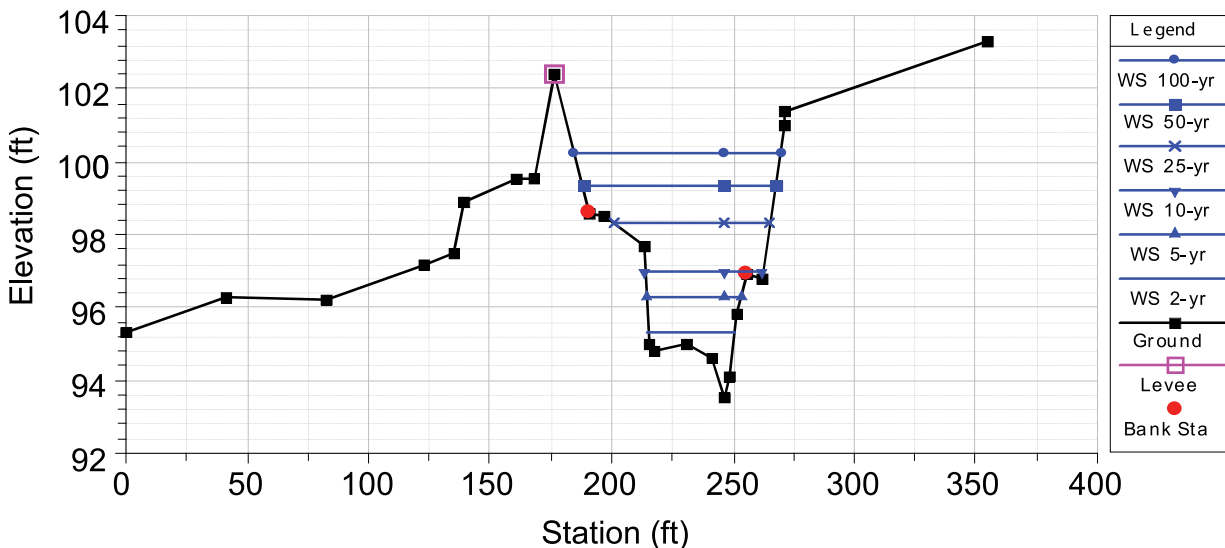


Figure 3a. HEC-RAS output of cross section 3, demonstrating that the channel with the levee can easily contain flows exceeding the 100-year flood.

Cross Section 3 - no levee

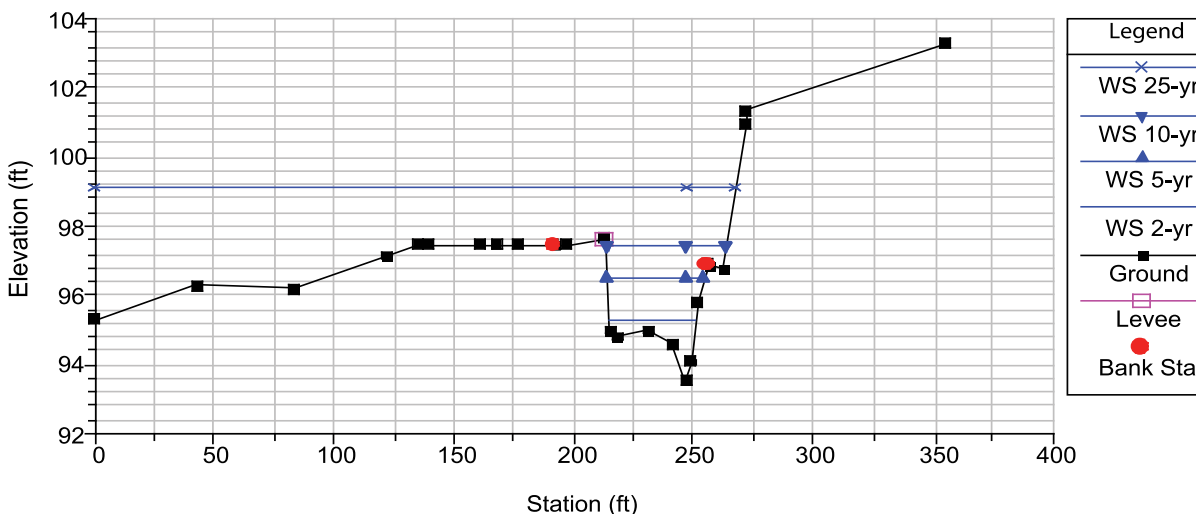


Figure 3b. HEC-RAS output of cross section 3, demonstrating that the channel without the levee can only contain flows up to the 10-year flood.

Modeling results indicate that the cross section through the road crossing is not capable of containing flows that approach the 100-year flood magnitude (Figure 4b).

We suspect that a backwater effect caused by the levee may increase flood elevations at the road crossing. Subsequent modeling

runs with the levee “removed” supported this hypothesis, and in fact, the model predicted a fairly substantial reduction (about four feet) in the elevation of the 100-year flood at this cross section (Figure 4b). This reduction in stage is enough to maintain flow within the channel and essentially keep the 100-year flood from reaching nearby infrastructure.

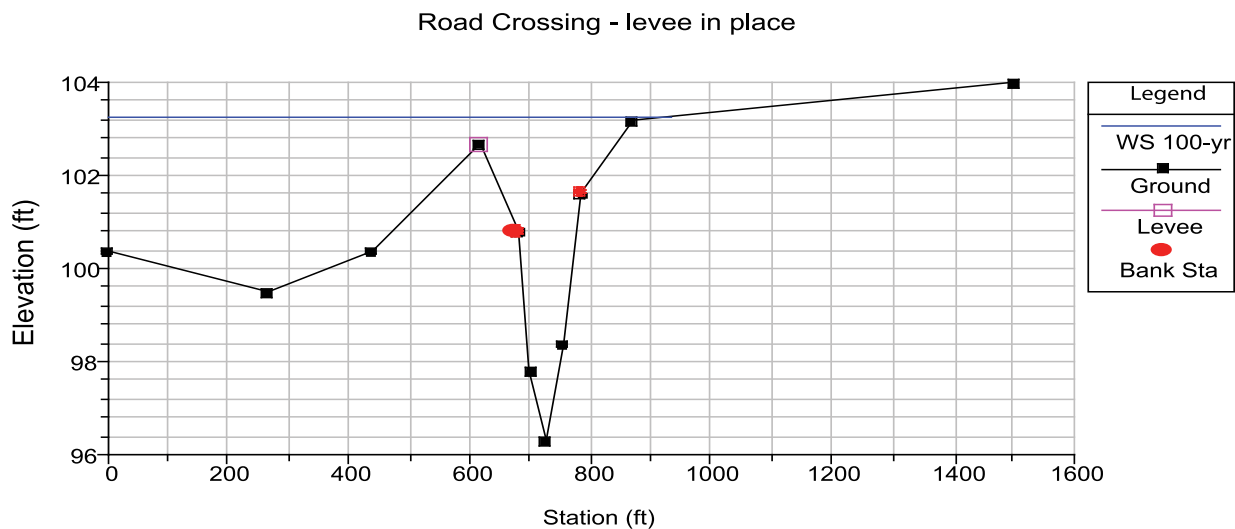


Figure 4a. HEC-RAS output of cross section, demonstrating that the 100-year flood exceeds channel capacity at this cross section and has the opportunity to flow down the road to the warehouse.

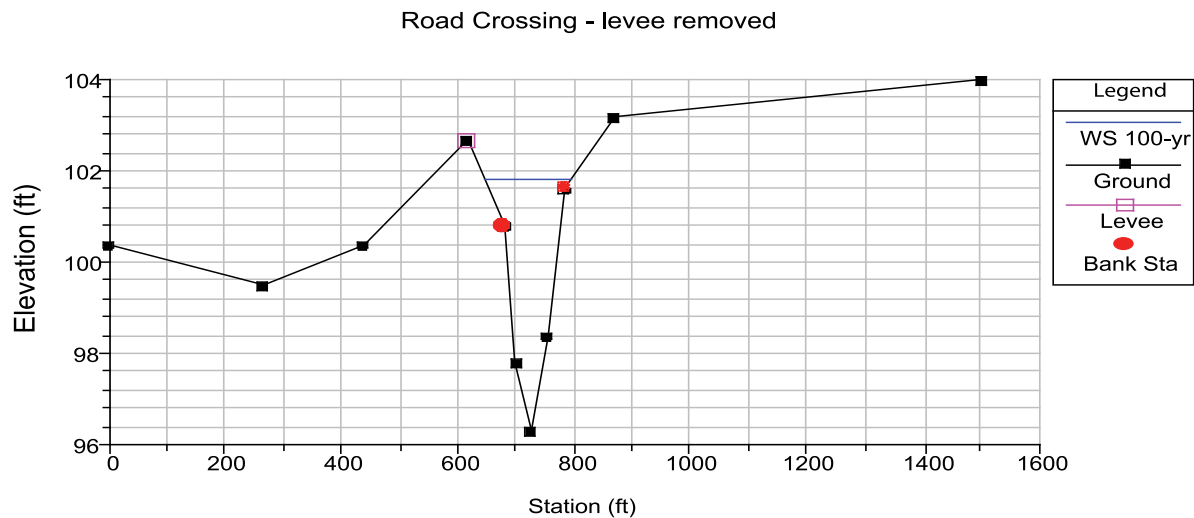


Figure 4b. HEC-RAS output of cross section 5, demonstrating that the 100-year flood may be contained by the channel if the left bank levee immediately downstream is removed, thus reducing the backwater effect.

The presence of the levee causes the channel to contain high magnitude floods exceeding the 100-year flood. The same channel configuration with no levee would only contain up to the 10-year flood. Consequently, the riparian system of the left bank only rarely (if ever) receives hydraulic input directly from the river, whereas, under natural conditions it would occur roughly once every 10 years.

The frequency that flood waters would leave the channel in the vicinity of the road crossing, flow down the road, and affect park infrastructure would be substantially reduced with the removal of the levee. Under the present conditions, floods approaching the 100-year magnitude are predicted to overtop the bank. Removal of the levee reduces the back water affect and allows the channel at the road crossing to contain the 100-year flood.

WATER RIGHTS BRANCH HIGHLIGHTS

Chuck Pettee, Chief

The Water Rights Branch (WRB) has continued to participate in hearings in state administrative proceedings, support NPS claims in court proceedings, settle issues via stipulated agreements, collect and analyze hydrologic and water related resource data, and assist parks by being indirectly involved in non-NPS led National Environmental Policy Act assessment proceedings.

In 2006, new applications for ground-water supply wells were filed by the Southern Black Hills Water Supply in the vicinity of Wind Cave National Park. WRB staff assisted the park in determining if they pose a threat to park water related resources and participated in hearings before the South Dakota Water Resources Commission to express NPS concerns and our need to continue to be involved as further data collection and analyses occur.

In response to an application for a ground-water use permit by Meridian Aggregates, Inc., the NPS and Meridian executed a stipulation agreement requiring specific monitoring at Meridian's mine near Chickasaw National Recreation Area. The new data and pumping test results will be incorporated into the State-Federal Study of the Arbuckle Simpson Aquifer; NPS asked the Oklahoma Water Resources Board to adopt this monitoring plan and direct its implementation in lieu of the NPS participating in a hearing. Subsequently, the Board adopted the plan and is directing its implementation. WRB also participated in four hearings held by the Nevada State Engineer during FY2006 concerning ground-water applications of concern to Death Valley National Park, Great Basin National Park, and Lake Mead National Recreation Area.

In two of these, the NPS reached stipulation agreements, which were presented at the hearings in lieu of a case. Our objective in pursuing agreements is to enhance the certainty of the science, which will enhance the protection of NPS resources. In each of these stipulations, specific monitoring management and mitigation tasks will be implemented and the NPS did not give up any of its options for bringing enforcement actions, including (if necessary) requesting enforcement by the Oklahoma Water Resources Board or Nevada State Engineer.

The WRB has continued to collect scientific information to support claims for water rights under state and federal law. Examples are: 1) information collected for a claim previously filed on Rincon Creek in Saguaro National Park, 2) information collected in preparation for the adjudication of water rights at Montezuma Castle National Monument, and 3) information collected where a claim has been filed, pursuant to the Great Sand Dunes Protection Act, for the in-place use of ground water at Great Sand Dunes National Park. The WRB also continued to work with partners in several states to collect and analyze hydrologic data in several areas that will improve the science available to decision makers so park water related resources can be protected.

As always, any successes accrued by the WRB would not be possible without the professional work of park management and staff. We encourage field managers to call on WRB whenever water rights issues are, or could be, affected by management decisions or proposals by park neighbors. ♥

NPS Reaches Agreement with Meridian to Settle Water Rights Dispute in Oklahoma

*Jennifer Back, Hydrologist,
Water Rights Branch*

On November 18, 2002, Meridian Aggregates Company (a subsidiary of Martin Marietta Materials) filed water right application 2002-602 with the Oklahoma Water Resources Board (OWRB) for a permit to use 1400 acre-ft/year of ground water from the Arbuckle-Simpson aquifer. The water was proposed to be used for mining purposes for an aggregate mining operation located in Johnstown County, Oklahoma. The NPS was concerned that ground-water withdrawals from the Arbuckle-Simpson aquifer would adversely affect springs and streams at Chickasaw National Recreation Area, approximately 6 miles from the mine. An administrative hearing was set for December 14, 2005.

Prior to the hearing, the NPS and the USFWS reached an agreement with Meridian that requires monitoring of ground-water levels, streamflow, precipitation, and water use in the vicinity of the mine operation. The goals are to gather information to evaluate potential impacts before federal resources are affected and to assist in the management of the aquifer in a sustainable manner in the future.

In Oklahoma, water right permits for ground water are considered temporary permits until the completion of a state sponsored hydrologic study for the ground-water aquifer in question. Since Meridian's application was filed prior to the completion of the Arbuckle-Simpson Hydrologic Study, any permit granted by OWRB for Meridian would be a temporary permit and must be renewed on an annual basis until a determination is made of how much water is available from the aquifer. The federal

agencies reserve the right to protest the renewal of the temporary permit if there is evidence to suggest that a negative effect to federal resources is imminent and a management solution cannot be reached. ♡



Antelope Springs, Chickasaw National Reservation Area (Back, 2005).

Water Rights Branch Supports Investigation on the Role of Major Faults as Potential Flow-paths to Springs at Chickasaw National Recreation Area

*Jennifer Back, Hydrologist,
Water Rights Branch*

The USGS conducted a geophysical investigation of the subsurface extension of major faults beneath Chickasaw National Recreation Area (CHIC) to better understand whether geologic structure controls ground-water movement to springs in the park. This new research has important water right implications for both freshwater and mineralized springs and provides new information to assist NPS in efforts to protect spring flows in the park. The research was published in USGS Open-File Report 2006-1083.

Past investigators have suggested that the Sulphur Fault may play an important role in the movement of water to freshwater springs in the eastern portion of the Travertine District of CHIC. However, this investigation suggests that Sulphur Fault likely deviates to the south of the freshwater springs. On the other hand, the South Sulphur Fault appears to extend linearly through the southern Travertine District of the park and to lie directly beneath the historic location of Bromide and Medicine Springs. More detailed characterization of the South Sulphur Fault will require additional geophysical methods to verify the findings in this report. ♥

Water Rights Branch Advances Scientific Understanding of Devils Hole in Death Valley National Park

*Paula Cutillo, Hydrologist,
Water Rights Branch*

New research, having important water-right and endangered species implications for Devils Hole in Death Valley National Park, was published in peer-reviewed scientific journals in 2006. The publications contribute to a growing body of scientific literature on this unique geologic feature and aid efforts to protect NPS' right to maintain a water level adequate to preserve the endangered Devils Hole pupfish and the scientific value of the pool in Devils Hole.

The Water Rights Branch of WRD collaborated with the University of Colorado to quantify how earthquakes and earth tides influence the stage of the pool at Devils Hole. "Analysis of strain-induced ground-water fluctuations at Devils Hole, Nevada" was published in *Geofluids*. The Water Rights Branch also funded analyses by two former USGS hydrogeologists of the effect of regional ground-water development on the stage of the pool at Devils Hole. "Analytical regression stage analysis for Devils Hole, Death Valley National Park, Nevada" was published in the *Journal of the American Water Resources Association*. Collectively, the works distinguish between long-term water-level trends, attributable to regional ground-water pumping, and short-term stresses, which appear to have no lasting effect on pool stage. Links to abstracts: <http://www.blackwell-synergy.com/doi/abs/10.1111/j.1468-8123.2006.00150.x> and <http://www.awra.org/jawra/papers/Jo4211.htm> ♥

*Update on the Status of the
Adoption of the Water Rights
Compact between the National
Park Service and the State of
Montana by the Montana Court*

*Jeffrey C. Hughes, Hydrologist,
Water Rights Branch*

In 1994, the United States and the State of Montana (State) signed an historic Water Rights Compact (Compact) that defined the federal reserved water rights for Big Hole National Battlefield, Bighorn Canyon National Recreation Area, Glacier National Park, Little Bighorn Battlefield National Monument, and the Montana portion of Yellowstone National Park. Water rights for Grant-Kohrs Ranch National Historic Site were not included in the Compact because GRKO has no lands reserved from the public domain and was not entitled to federal reserved water rights.

After the Compact was signed by the parties, the Montana Water Court (Court) must still issue a final decree. Before the decree can be issued, the NPS was required to submit more information to the Court to clarify its claims. In 2005, the WRD worked with the Department of Justice to complete two tasks:

First, a list of NPS water rights to be dismissed from the adjudication was assembled. These included State based water right permits, certificates and claims to water rights, and the claims initially filed by the NPS for federal reserved water rights for consumptive uses and instream flows for the parks. The Compact created federal reserved rights to replace most of these rights and claims. There were 198 State based rights submitted to be dismissed.

The second task was a corrected description of each “new” federal reserved water right. These descriptions, known as water right

abstracts, list all the basic properties of an individual water right, including the rate of diversion, place of use, point of diversion, and purpose of use. The NPS had an opportunity to review the abstracts initially prepared for the Court, which were submitted before modern GIS technology was available to efficiently and accurately verify water source locations. WRD, working with staff from each park, obtained new data for many of the locations of the points of diversions and places of use and corrected the original abstracts. All 366 abstracts were checked, corrected, and submitted to the Court in FY2005.

The NPS is now waiting for the Court to issue the final decree. Until that time, the State and the NPS have implemented the Compact provisions as if the final decree were final. ♥



Yellowstone National Park (Lord, 1999).

Interior Reaches Agreement with Southern Nevada Water Authority on Proposed Ground-Water Development

Dan McGlothlin, Supervisory Hydrologist, Water Rights Branch

The Southern Nevada Water Authority (SNWA) proposes to develop about 91,000 AFY of ground water in Spring Valley immediately west of Great Basin National Park and has agreed to protect park resources from effects due to its project. As a result, the NPS, along with the USFWS, BLM, and Bureau of Indian Affairs, entered into an agreement with SNWA to withdraw protests to SNWA water right applications in the Spring Valley hydrographic basin.

NPS protested the 1989 applications because of the potential to adversely impact park resources through ground-water pumping and the construction and operational activities associated with the well-field and pipeline project. The NPS believes there may be some ground water available but that sustained pumping of the full amount requested by SNWA will probably have adverse effects on park resources. NPS has no water rights in the Spring Valley hydrographic basin. However, water dependent habitat areas located in Spring Valley are important to park wildlife and scenic resources.

A stipulated agreement was negotiated over several months and finalized immediately prior to the commencement of a hearing scheduled for the applications. NPS did not participate in the hearing because of the terms and conditions included in the agreement that will serve to protect park resources. The agreement creates a hydrological and biological monitoring, management, and mitigation process (a 3M plan) designed to collect additional data that will be used to determine if pumping will affect federal re-

sources and, if so, what actions are necessary to avoid these effects. The 3M plan is intended to be dynamic and will require cooperative review and revision to respond to data obtained through the monitoring process.

The agreement does not set a precedent for how NPS will approach SNWA applications in other basins. NPS will address these applications on a case-by-case basis, depending on the NPS resources at risk in each basin. For more information on our understanding of the resources at risk, see the following article on a USGS study of the susceptibility of park resources to large scale pumping. ♡



Great Basin National Park (Van Liew, 2000).

*Susceptibility of Surface-Water
Resources in Great Basin
National Park to Ground-Water
Withdrawals in Adjacent Valleys*

*Bill Van Liew, Hydrologist,
Water Rights Branch*

Great Basin National Park (GRBA) is situated in eastern Nevada in the Basin and Range physiographic province. This region is characterized by north-south trending mountain ranges with intervening flat, semi-arid valleys. The park encompasses much of the Southern Snake Range (including Wheeler Peak, over 13,000 feet in elevation) and is flanked by Snake Valley on the east and Spring Valley on the west (both about 5,000 to 6,000 feet in elevation). Precipitation is greater at higher elevations, resulting in several roughly parallel streams that flow eastward and westward off the crest of the Southern Snake Range toward the adjacent valleys. Lehman Caves, on the east side of the park, were formed by water in limestone bedrock, and many springs emanate from limestone aquifers within and outside the park. Ground water occurs in fractured bedrock and glacial deposits in the mountains and in basin-fill deposits in the valleys. The water resources in the sparsely populated area around GRBA are being considered as potential sources of supply for the rapidly growing population in southern Nevada. Several applications for large-scale, ground-water withdrawals in both valleys adjacent to GRBA are pending before the Nevada Division of Water Resources.

NPS is interested in understanding if long-term, large-scale pumping of ground water in the valleys adjacent to GRBA could cause depletion or complete cessation of the flow of any streams and springs uphill within the park. In 2002, the Water Resources Division commissioned a four-year study by the USGS to 1) quantify the discharge

of the major streams and springs within GRBA before large-scale ground-water development occurs nearby, 2) assess the natural variability in the discharge, so that it can be distinguished from the effects, if any, from ground-water pumping at a later time, and 3) evaluate areas where streams and springs would be susceptible to ground-water withdrawals in adjacent valleys. In this initial study, no attempt was made to quantify the magnitude or timing of depletion from adjacent pumping that might occur.

The study consisted of 1) installation and monitoring of a network of 12 continuous discharge-measurement sites in eight major watersheds that drain the park, 2) correlation of the discharge data to climate data from a weather station in the park, 3) a series of intensive gain/loss runs along the major stream in each of six of these major watersheds, to delineate ground-water/surface-water interactions, and 4) correlation of the gain/loss-run results to underlying geology. Two criteria were used to define areas as susceptible to ground-water pumping in adjacent valleys. First, the stream or spring must be hydraulically continuous with ground water in bedrock beneath it. Second, ground water in bedrock beneath the stream or spring must be hydraulically continuous with the basin-fill aquifer in the adjacent valley. If both criteria were satisfied, the area was defined as “likely susceptible.” If there was uncertainty regarding either of the two criteria, then the area was defined as “potentially susceptible.”

The results of the study have been published in a USGS report (Elliot et. al. 2006). The report indicates that within GRBA, streams flowing off the steeper, west side of the park toward the Spring Valley are neither likely susceptible nor potentially susceptible to ground-water pumping in the adjacent valley. Further down-slope, however, on USDA Forest Service (USFS), BLM, and private land, some streams and springs are

likely susceptible to adjacent ground-water pumping. In contrast, on the gentler sloping, east side of the park, an area that contains several large springs (including Rowland Spring) and reaches of Lehman and Baker Creeks within the park are likely susceptible to adjacent pumping; a reach of Snake Creek within the park is potentially susceptible to adjacent pumping. Further down-slope on Snake Creek and out into Snake Valley, on USFS, BLM, and private land, several streams and springs are likely susceptible to ground-

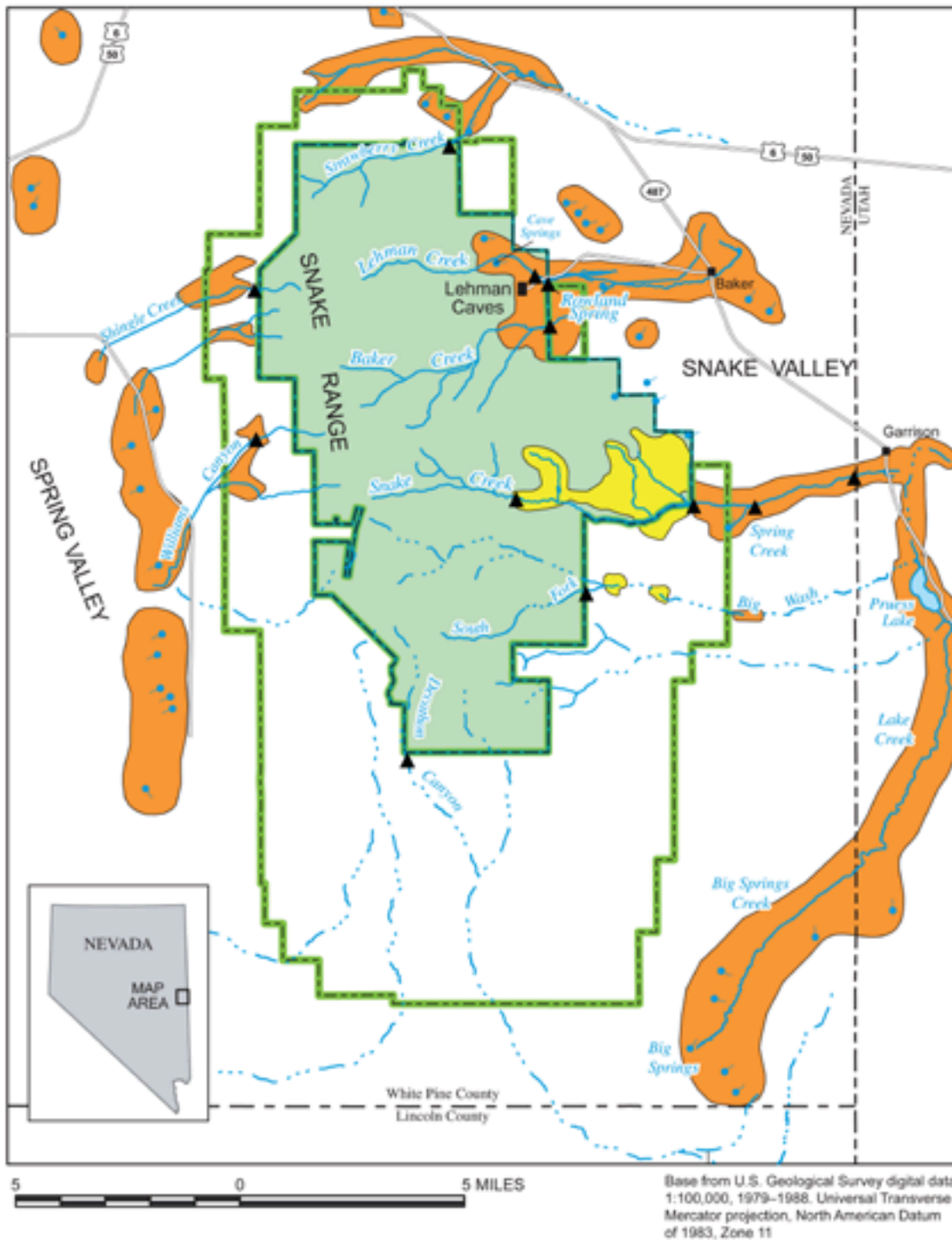
water pumping. The knowledge gained from the results of the USGS study will help GRBA protect and manage its water resources more efficiently. ♥

Reference

Elliott, P. E., Beck, D. A., and Prudic, D. E. 2006. Characterization of surface-water resources in the Great Basin National Park area and their susceptibility to ground-water withdrawals in adjacent valleys, White Pine County, Nevada. U.S. Geological Survey Scientific Investigations Report 2006-5099. 157 pp. <http://pubs.usgs.gov/sir/2006/5099>.



Rowland Spring emanating from glacial deposits overlying limestone bedrock, Great Basin National Park (David A. Beck, 2003).



EXPLANATION

<ul style="list-style-type: none"> Area where surface-water resources likely are susceptible to ground-water withdrawals Area where surface-water resources potentially are susceptible to ground-water withdrawals 	<ul style="list-style-type: none"> Humboldt National Forest boundary Great Basin National Park USGS continual-recording gage Spring
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Generalized areas where surface-water resources are likely or potentially susceptible to ground-water withdrawals in adjacent valleys, Great Basin National Park area, Nevada (modified from Elliott, Beck, and Prudic, 2006).

*Tavasci Marsh and Shea Springs
Tuzigoot National Monument,
Arizona*

*Paul K. Christensen, Hydrologist
William R. Hansen,
Supervisory Hydrologist
Water Rights Branch*

On March 28, 2006, the management of Tavasci Marsh was passed to the National Park Service, making the marsh officially part of Tuzigoot National Monument. Included with the marsh were Shea Springs. The acquisition of the marsh and springs occurred through a land exchange with the Phelps Dodge Corporation, one of the largest copper producers in the world.

Tavasci Marsh, one of the largest marshes in Arizona, was declared by the National Audubon Society as an Important Bird Area. The marsh is also a focus of an annual birding and nature festival.

The marsh has supported human habitation for thousands of years. Ruins of a Sinaguan pueblo, inhabited from 1,000 to 1,400 CE, lie on a hill near the marsh. Later, in the 20th century, the marsh served as pasture.

Through the land exchange, the NPS acquired a water right for Shea Springs with a priority date of 1911. The NPS is mandated to protect this water right as well as a yet-to-obtained water right for the marsh. To begin the protection process, the NPS plans to collect several years of baseline hydrologic data, as well as to conduct a hydrologic investigation to determine potential threats to the marsh, the springs, and other monument water resources. ♡

**NATURAL RESOURCE
CHALLENGE AQUATIC
RESOURCE FIELD
PROFESSIONALS HIGHLIGHTS**

With support from the Natural Resource Challenge, 16 aquatic resource professional positions were established in the field in 2004. These 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 positions were designed and justified so that they could provide locally-based expertise to address water resource, fishery, and/or other aquatic issues that are substantial and ongoing in a particular watershed or area. The positions are unique in that they are field positions designed to support issues in multiple parks. Table 5 in Appendix B lists all 16 positions, and a summary of accomplishments stemming from these positions is included in Appendix A. The articles that follow provide examples of two issues being addressed out of these new positions.



*Nonvianuk Lake, Katmai National Park and Preserve
(Joe Miller, 2002).*

Discovery of Native Fish in Tsaile Creek, Canyon de Chelly National Monument

*Melissa Trammell, Fisheries Biologist,
Intermountain Region*

In Canyon de Chelly National Monument, above the world-renowned vistas of deep canyons and prehistoric dwellings nestled in seemingly unreachable alcoves in the cliffs, a small trickle of water eases down through tumbled boulders and grassy glades in a narrow side canyon called Canyon del Muerto. Before this tiny trickle vanishes into the sands of Chinle Wash, it gathers in small pools separated by shallow riffles, sometimes briefly disappearing under the stones of the canyon. Shadowed by overhanging cliff walls and tall Ponderosas, tiny Tsaile Creek unexpectedly provides habitat for a few native fishes.

At the head of the canyon, a small reservoir provides water for the Navajo Nation as well as recreational fishing for local anglers. Tsaile Lake has been stocked with native and nonnative trout (*Oncorhynchus spp.*) and nonnative catfish (*Ictalurus punctatus*). Nonnative green sunfish (*Lepomis cyanellus*) and fathead minnow (*Pimephales promelas*), introduced as bait fish, have become abundant.

The Bureau of Reclamation (BOR) manages the dam and has determined that the reservoir must be drained and the dam extensively repaired. Work on the dam is slated to begin in 2010; however, the reservoir has been drawn down to very low levels in the interim to ensure safety. After the dam is repaired, the outlet was scheduled to be shut down until the reservoir refilled, eliminating the flow of water to Tsaile Creek for several weeks to months in order to refill the reservoir quickly. In 2006, the BOR commissioned a fish survey of Tsaile Creek to

determine what resources might be affected by the dam closure.

In September 2006, Dr. Paul Marsh (Arizona State University) and Robert Clarkson (BOR), accompanied by John McGlothlen (BOR), Arthur Benally (NPS), and the author, conducted a fish survey of Tsaile Creek. Approximately 2 km of the creek downstream of the dam were sampled, using a small seine pulled through short runs and pools. The most abundant fish captured was the fathead minnow, although a few green sunfish were also collected. Crayfish (*Orconectes virilis*) were common-to-abundant through the sampled reach. Also encountered were three terrestrial garter snakes (*Thamnophis elegans*). Most surprising was the capture of two native fish species: two adult speckled dace (*Rhinichthys osculus*) and two adult bluehead sucker (*Catostomus discobolus*). The bluehead sucker is one of three species covered in a recently completed conservation agreement (Utah, 2005). The Range-Wide Conservation Agreement for roundtail chub (*Gila robusta*), bluehead sucker, and flannelmouth sucker (*Catostomus latipinnis*) was signed by six states and several federal agencies, including NPS and USFWS.

No fish survey had ever been conducted in Tsaile Creek in the park before this effort. The two species, presumed to be native, are common to abundant in the San Juan River downstream of the park. Although fish in Canyon de Chelly National Monument are isolated from the river most of the year because Chinle Wash is dry, except during spring runoff and major summer rain storms. Bluehead suckers, captured in a nearby creek in the park a few years ago, are being genetically analyzed to determine if they are the subspecies Zuni bluehead sucker (*Pantosteus. d. yarrowi*), which is listed as endangered in the state of New Mexico and as a candidate species by the USFWS. The native range of the Zuni bluehead sucker is limited to the Little Colorado

River, so it would be surprising if fish from the monument were found to be the Zuni subspecies.

Documenting the presence of native fish in the creek below the dam resulted in a recommendation from the BOR biologists to change the planned post-repair dam closure. Now, the recommendation will be to maintain flow in the creek during and after the dam repair. Less than one cubic feet per second will be necessary to keep the stream wet and the fish alive. The important discovery of native fishes in this small stream from a survey done in partnership with the BOR, NPS, and Arizona State University ensures the mysterious turns and twists of Canyon del Muerto will continue to provide a cool and beautiful refuge for native fishes.

Utah Division of Wildlife. 2005. Range-wide conservation agreement for roundtail chub (*Gila robusta*), bluehead sucker (*Catostomus discobolus*), and flannelmouth sucker (*Catostomus latipinnis*). Salt Lake City, Utah. ♡



Dr. Paul Marsh (Arizona State University) and Robert Clarkson (Bureau of Reclamation) sampling Tsaille Creek (Trammell, 2006).



Speckled dace captured in Tsaille Creek, Canyon de Chelly National Monument (Trammell, 2006).



Adult bluehead sucker from Tsaille Creek, Canyon de Chelly National Monument (Trammell, 2006).

Seeking Sustainability for a Desert Spring Ecosystem

*Colleen Filippone, Hydrologist,
Intermountain Region*

*Larry Martin, Hydrogeologist, Water
Resources Division*

*Mary Kralovec, Chief of Resources,
Organ Pipe Cactus National Monument*
*Ami Pate, Biological Technician, Organ
Pipe Cactus National Monument*

With its rich cultural and ecological heritage, the Quitobaquito oasis in Organ Pipe Cactus National Monument is one of the crown jewels of the Sonoran Desert. Modern day pressures and an evolving understanding of desert spring ecohydrology present both challenges and opportunities to NPS to conserve this unique area and its inhabitants.

Quitobaquito, adjacent to the U.S.-Mexico border, is a system of desert springs and a pond that have been a focal point of human migration and occupation for thousands of years. “Quitobaquito” means NPS acquired the wetland from the last Hia’ced O’odham inhabitant in 1958. Since then, the monument has faced the challenge of managing a human manipulated landscape as wilderness with special cultural attributes. In recent years, Quitobaquito has become a rest stop along Mexico Route 2 and is heavily used as a border crossing point for smugglers and illegal immigrants (Tibbitts, 2000).

Quitobaquito is designated critical habitat for the endangered Quitobaquito Desert pupfish. Other inhabitants include the Sonoran Mud Turtle, an endemic spring snail, four species of foraging free-tailed bat species, and a diverse assemblage of other flora and fauna unique to the Sonoran desert (Pate and Conner 2004). Declining spring discharge and pond levels in the last decade have intensified the importance of identifying

new strategies for resource management. Discharge from the springs is no longer sufficient to maintain full pool, and the pond now reaches extremely low levels during the summer months.

Monument resource managers are working with Intermountain Region Natural Resource Challenge and Water Resources Division staff to identify management approaches to achieve ecological sustainability at Quitobaquito. Technical assistance by NPS hydrologists and funding from the Sonoran Desert Inventory and Monitoring Network provided renewed continuous monitoring of spring discharges and documentation of changes in spring discharge. NPS hydrologists identified an immediate need to conduct maintenance on one of the spring collection systems. But, long-term management at Quitobaquito is constrained by the need for improved understanding of relationships between human activities, climate, aquifer water levels, spring flows, pond levels, and vegetation.

Paradoxically, experience around the world has shown that protection of desert springs can lead to complete drying of surface waters due to transpiration of rapidly growing aquatic and riparian vegetation (Kodric-Brown, 2003). Smaller springs associated with the Quitobaquito system have already met this fate, and the main springs and pond are becoming increasingly vegetated. However, questions about vegetation management are only one piece of the ecohydrologic puzzle at Quitobaquito.

The Organ Pipe Cactus National Monument Ecological Monitoring Program collects climate, pond level, water quality, and instantaneous spring discharge data. In addition, monitoring in the source area for the springs is needed.

Long-term threats to water sources and the potential effectiveness of alternative management actions are uncertain, but

progress is being made to identify and assess management alternatives at Quitobaquito. ♡

References:

Kodric-Brown, A., J. H. Brown, and E. P. Pister. 2006. Native fish, exotic mammals, and the conservation of desert springs. *Conservation Biology* in press.

Pate, Ami C. and Charles W. Conner. 2004. Fish and free trade, cultures and conservation: management challenges at a historic border oasis. Conference proceedings, Spring-fed Wetlands: Important Scientific and Cultural Resources of the Intermountain Region, May 7-9, 2002. Las Vegas, Nevada. Publication No. 41210. State of Nevada University : Desert Research Institute : Division of Hydrologic Sciences.

Timothy Tibbitts. A refugium for the Quitobaquito pupfish. NPS proposal. Organ Pipe Cactus National Monument.



Quitobaquito pond circa 1950, looking northwest (photographer unknown).



Quitobaquito pond today, looking southeast (Filippone, 2006).



Monitoring spring discharges at Quitobaquito (Pate, 2005).

APPENDIX A

TECHNICAL ASSISTANCE

TECHNICAL ASSISTANCE SERVICEWIDE

Strategic Planning

Supported the implementation and coordination of the following NPS Natural Resources Strategic Planning Goals: 1a1D, Riparian; 1a1C, Wetlands; 1a1F Marine and Coastal: 1a4A Rivers and Streams Water Quality; 1a4B Marine, Estuarine and Lake Water Quality; and 1a4C Water Quality.

Served as a member of the NRPC Government Performance Results Act Scorecard Task Group.

Water Resources Planning

Continued to develop the breadth and context of the new paradigm for water resources planning. Maintained frequent contact and dialog with NPS Park Planning, Denver Service Center, and the Resource Stewardship Strategy development team to assure appropriateness and consistency of the new WRD planning products.

Coordinated WRD activities pertaining to water resources planning, including water related assistance requested in the development of Foundation Documents, General Management Plans, and Resource Stewardship Strategies.

Identified and implemented strategies for developing water related “Desired Conditions” in response to Government Performance Results Act and planning related requirements.

Attended meeting to discuss the Nature Serve resource assessment and mapping program and how these efforts may be useful to the NPS.

Provided initial WRD review and triage for more than 400 external environmental documents, which could affect the operation of the National Park Service. Arranged for in-house review of those documents with the greatest relevance to NPS water resources management and consolidated review comments.

Began planning a wilderness lakes management telecast session to be presented at the National Fish and Wildlife Training Center, involving wilderness lakes management policies and actions within National Parks and other federal lands.

Co-authored NRPC generated material submitted to the Department of State on behalf of NPS for consideration in a comprehensive document on desertification.

Watershed Condition Assessment

Developed Watershed Assessment Program implementation guidance to assist regions with longer term project planning and project management tasks.

Collaborated with regions and Vital Signs monitoring networks to select appropriate parks for a pilot year project class (12 parks in 5 NPS Regions).

Water Quality Management

Continued to coordinate the USGS/NPS Water Quality Partnership Program as part of the Clean Water Action Plan funded by Congress. Reviewed proposals and final work plans for 10 project proposals selected for funding in FY2006 and 13 proposals selected for funding in FY2007.

Served as co-chair of the interagency work group for the USGS/NPS Partnership Program. Contacted all USGS scientists participating in the partnership program and updated worksheet tracking final completion reports from projects conducted in FY1999-2006.

Reviewed and commented on USGS pesticides project plan and participated in setting research priorities for future pesticides projects in parks.

Served as an official member of the National Water Quality Monitoring Council representing the National Park Service.

Revised Part B guidance and a shorter checklist of items (“Part B lite”) that is widely used by NPS Vital Signs and monitoring networks.

Continued updating and distributing handouts on subjects such as deicers, dust suppressants, diel variation, CERCLA detection limit issues, and chlorophyll.

Attended the National Water Quality Monitoring Council Conference in San Jose, California, during May and made presentations on Vital Signs Water Quality Data Management in the National Park Service and on pre-mobilization water quality instrument check procedures.

Provided review and comment on the development of the Water Quality Designated Use and Impairment Database and brought National Hydrography Dataset data glitches to the attention of the USGS.

Wetlands Protection

Provided servicewide program guidance and coordinated NPS activities undertaken in response to *Executive Order 11990: Wetlands Protection*.

Served as the primary NPS representative for the Wetlands Subcommittee of the Federal Geographic Data Committee and coordinated servicewide responses to interagency wetland data and information calls.

Completed an interagency agreement with the USFWS for completing digital wetland

maps for 16 quadrangles (5 parks) for the Watershed Condition Assessment Program.

Provided technical assistance in the identification, review, and assessment of wetlands related restoration needs for NPS units damaged by Hurricane Katrina and Hurricane Rita.

Provided wetlands related policy review in the development of the NPS 2006 Management Policies, NPS *Director’s Order #77-3: Domestic and Feral Livestock Management*, the Army Corps of Engineers’ and the EPA’s proposed rule for “Compensatory Mitigation for Losses of Aquatic Resources,” and other policies, regulations, and rules which affect the protection and management of wetlands within the National Park Service.

Provided technical and policy review and evaluation of the EPA proposed amendments to the National Pollutant Discharge Elimination System regulations for storm water discharges associated with oil and gas exploration, production, processing, or treatment operations.

Provided technical and policy review and evaluation of the BLM’s Oil Shale and Tar Sands Leasing Programmatic Environmental Impact Statement (PEIS). Recommended that the PEIS analysis include hydrologic and hydraulic monitoring of park lands and surrounding areas in order to maintain the integrity of wetland and riparian systems within parks.

Provided peer review of the draft report *Status and Trends of Wetlands in the Conterminous United States, 1998-2004*.

Participated in Livestock and Landscapes, a workshop for NPS employees with grazing management responsibilities. Presented a poster entitled “Recovery of Riparian Communities Following Removal of Cattle,

Santa Rosa Island, Channel Islands National Park” and led a breakout session on livestock issues in wetland and riparian areas.

Prepared and submitted NPS 2005 wetlands budget and performance data to DOI for *The President’s Earth Day 2006 Wetlands Report*.

Reviewed information on the Coastal Impact Assistance Program (part of the Energy Policy Act of 2005) and advised management on applicability to the NPS.

Participated in a workshop with The Nature Conservancy regarding applicability of their Ecological Integrity Assessment Framework to NPS land health condition assessments.

Worked with the NPS Inventory and Monitoring Program’s GIS Office to acquire and analyze National Wetland Inventory digital data for WRD’s Watershed Condition Assessment Program.

Provided technical and policy review and evaluation of the draft *Recommendations for Streamlining Wetlands Compliance on FHLP [Federal Lands Highway Program] Projects*.

Served as WRD representative on a multi-division team called the NRPC External Team, which evaluates impacts of energy related projects that are external to park boundaries and recommends opportunities for parks to minimize or deal with impacts.

Worked with staff from the Office of the NRPC Director to redefine the biological inventory project vascular plant mapping project GIS using National Wetland Inventory map data and classification categories.

Contributed to the draft report *Potential Hydroelectric Development at Existing Federal Facilities* in response to Section 1834 of the *2005 Energy Policy Act*.

Fisheries Management

Provided internal comment and review concerning the draft rewrite of *National Park Service Management Policies* as related to NPS-state cooperative management of fishing and fish stocking activities.

Coordinated with other federal, state, and tribal fisheries management and regulatory agencies, and the national conservation / sport fishing organizations regarding NPS fisheries management programs, issues, needs, and initiatives.

Represented NPS on the Executive Committee of the Western Regional Panel of the Aquatic Nuisance Species Task Force.

Served as NPS representative to the National Partnership Board for the Management of Wild and Native Cold Water Fisheries.

Provided review and comment on proposed USFWS rule for placement of Silver and Largescale Carp on the federal list of injurious fish, thereby prohibiting importation and interstate transfer of these species.

Provided review of Council of Environmental Quality list of Klamath River Basin park projects that could contribute to conservation of resources of importance to the Natural Resource Conservation Service.

Participated in a USFWS/USGS Decision Analysis Seminar at the National Conservation Training Center. Provided a presentation and guidance for a case study of the Devils Hole pupfish.

Marine Resources Management

Provided servicewide program development, policy, and guidance for marine resources management issues.

Secured final approval of interagency agreement for Seamless Network of Ocean

Parks, Wildlife Refuges, Marine Sanctuaries & Estuarine Reserves under NOAA and DOI, pursuant to the *U.S. Ocean Action Plan*.

Participated on the U.S. Coral Reef Task Force Steering Committee. Assisted NPS, DOI, and NOAA with preparations for October 2006 Coral Reef Task Force meeting in St. Thomas, USVI.

Served as co-chair of Coral Bleaching Working Group of the U.S. Coral Reef Task Force.

Organized and chaired workshop on sustainable tourism at U.S. Coral Reef Task Force meeting.

Represented NPS on interagency working group for implementation of *Executive Order 13158: Marine Protected Areas*.

Represented NPS at Senior Ocean Policy Retreat. Prepared presentation for NPS Deputy Director describing NPS ocean programs and goals.

Attended a meeting of the national vegetation mapping oversight committee and discussed the need to incorporate marine and sub-surface freshwater habitats in the NPS vegetation mapping efforts.

Represented ADNRSS on the NPS Dive Control Board, which reviewed OSHA diving requirements and implementation of these standards within NPS dive operations.

Information and Data Management

Coordinated the joint NPS-USGS effort to acquire the high-resolution National Hydrography Dataset (NHD) for watersheds containing national park units, including acquiring and quality assuring NPS data incorporated into NHD.

Oversaw detailed Scope of Work for contracting the redevelopment of the

software procedures employed to produce baseline water quality data inventory and analysis reports for parks, including providing highly specific guidance on mapping parameter codes to characteristics, generating and using unique characteristic permutations, unit conversions, criteria comparisons, and providing feedback on interim products.

Continued development of NPSTORET - a series of Microsoft Access templates/forms for entering and documenting the results of water quality monitoring projects as per the National Water Quality Monitoring Council's guidelines in a format compatible with uploading to new STORET using the STORET Import Module.

Maintained the Water Resources Division's STORET infrastructure—a data entry workstation STORET containing NPS' production data and servers hosting copies of Legacy STORET, National STORET, and the STORET Data Warehouse.

Released NPSEDD v1.00, the NPS Electronic Data Deliverable specification to be used by parks and networks for contributing water quality data for inclusion in STORET.

Maintained version NPSCol2Row v2.11, a data formatting utility used to prepare data for the STORET Import Module, on the NPS' Vital Signs Water Quality Data Management and Archiving website and EPA's STORET Tools website (<http://www.epa.gov/storet/otherapps.html>) for anyone to download.

Maintained NPS Water Right Dockets filing system. Distributed docket files in CD-ROM format to parks, regions, and the Office of the Solicitor on an as-requested basis.

Initiated contract to update docket project application to scan, store, and distribute water right records.

Wild and Scenic Rivers

Co-chaired the Wild and Scenic River Task Force established to review wild and scenic river policies and vulnerabilities and to provide recommendations to the National Leadership Council.

Provided technical input on Section 7 reviews of several project proposals for non-NPS rivers protected by the Wild and Scenic Rivers Act.

Reviewed and commented on the Wild and Scenic River Sec. 7a determination on the Little Miami River (a State of Ohio managed river outside of the National Park Service).

Outlined a procedure for determining the existence of major rivers in national park units for the NPS Rivers, Trails, and Conservation Assistance Program.

Planned the Eastern Rivers Summit.

Miscellaneous

Attended the 5th Annual Inventory and Monitoring Meeting of the Networks in San Diego, California. Made presentations on: flow monitoring, Vital Signs Water Quality Data Management, and marine mapping needs.

Attended Alert Users Group flood warning workshop.

Assisted the NPS Park Facility Management Division's Dam Safety Program by determining what water impoundments from three different data sources were within ten miles of Alaskan national park units and provided maps.

Attended meetings to coordinate WRD's reference collection and the agency wide database of bibliographic citations (NRBIB).



Kaweah River, Sequoia National Park (Goughis, 1996).

TECHNICAL ASSISTANCE VITAL SIGNS MONITORING NETWORKS

Appalachian Highlands Network

Provided network staff with advice on how to estimate minimum detectable differences for paired sampling designs when fixed sites were revisited.

Provided advice on the data flow from parks to networks, content rich station IDs, and importing macroinvertebrate data into NPSTORET.

Chihuahuan Desert Network

Reviewed and commented on draft phase II water quality monitoring plan.

Cumberland / Piedmont Network

Provided advice on how to estimate minimum detectable differences for paired sampling designs when fixed sites are revisited.

Quality assured and edited NPSTORET back-end database.

Uploaded all water quality data through 2005 from NPSTORET to STORET.

Incorporated recommended enhancements into NPSTORET.

Great Lakes Network

Reviewed various draft documents (including the draft protocol narrative for large river sampling, its associated standard operating procedures and quality assurance drafts, and SOPs for the inland lakes protocol) and provided technical input on numerous technical issues, including minimum detectable differences and nutrient issues.

Provided guidance on configuring NPSTORET, entering tissue data, and

conducting an NPSTORET training session.

Provided advice and support on querying a local copy of the STORET Data Warehouse operated by the Water Resources Division from the Great Lakes Natural Resources Gateway ArcIMS server.

Incorporated recommended enhancements into NPSTORET.

Greater Yellowstone Network

Assisted by providing guidance on the best options for statistical analyses of pH data.

Conducted on-site training for NPSTORET.

Restructured network's NPSTORET setup into three organizations and provided quality assurance.

Incorporated recommended enhancements into NPSTORET.

Reviewed Data Management Standard Operating Protocol.

Gulf Coast Network

Reviewed draft network protocols and SOPs and provided network staff with advice on how to estimate minimum detectable differences for paired sampling designs.

Heartland Network

Reviewed and commented on a report entitled *Water Quality Analysis for the Heartland Inventory and Monitoring Network (HTLN) of the US National Park Service: Ozark National Scenic Riverways*.

Reviewed various draft documents (including analyses of past water quality data). Provided newly revised deciding sample sizes optimal for determining differences of concern.

Mediterranean Coast Network

Reviewed drafts of water quality related documents, the administrative report, and the annual work plan. Continued serving as main WRD contact with planning for Vital Signs monitoring.

Mojave Desert Network

Gave project oversight to WRD funded project, "Assessment of Groundwater Resources in the Mojave Network: Hydrogeological Framework."

Provided status of the National Hydrography Dataset for network parks.

Provided assistance for the development a field level I water quality inventory.

National Capital Region Network

Provided advice on how to handle statistical outliers.

Provided guidance on how to use NPSTORET to perform customized water quality criteria analyses.

Provided baseline water quality data inventory and analysis reports and associated data files in digital format.

North Coast and Cascades Network

Provided numerous technical comments on the draft large inland lake protocol narrative.

Provided network staff with comments on quality control progress being made by Oregon State Low Level Nutrient Lab.

Northeast Coastal and Barrier Network

Provided updated information on nutrient monitoring, including tradeoffs of monitoring various individual nitrogen and phosphorus parameters.

Northeast Temperate Network

Provided advice on how to estimate minimum detectable differences for paired

sampling designs.

Reviewed and commented on the network's draft conceptual ecological models (wetland, aquatic, and tidal systems) and on the vital signs selected for assessing wetland conditions.

Northern Colorado Plateau Network

Helped review draft network protocols and SOPs and advised network staff how to estimate minimum detectable differences for paired sampling designs.

Provided advice on the implementation and capabilities of NPSTORET.

Northern Great Plains Network

Provided advice on monitoring plan development tasks. Continued review tasks as WRD network contact, including review of Annual Report and Annual Work plan.

Provided overview and status of the water quality and water resource inventories for network parks.

Hosted an NPSTORET training session in Fort Collins, Colorado, for network and South Dakota State University staff.

Assisted South Dakota State University staff in configuring NPSTORET, importing results, and quality assuring the data.

Pacific Island Network

Met with network staff and reviewed water quality technical documents related to analyses of past data. Advised network on minimum detectable difference calculation options and reviewed phase III of the water quality monitoring plan.

Rocky Mountain Network

Assisted in acquiring Elevation Derivatives for National Applications data for network parks from the USGS.

San Francisco Bay Area Network

Reviewed draft protocol and SOPs revisions for water quality monitoring.

Provided advice and guidance on entering NPSTORET metadata.

Sierra Nevada Network

Provided advice on how to estimate minimum detectable differences for water quality protocols, ideal minimum sets of nutrient parameters, and quality control issues related to total phosphorus analyses.

South Florida / Caribbean Network

Traveled to South Florida to participate in the South Florida / Caribbean Network Vital Signs Monitoring Workshop.

Provided baseline water quality data inventory and analysis reports, associated data files, and tips for additional data mining/evaluation.

Attended Vital Signs Scoping Workshop, went over numerous technical monitoring issues with network staff, reviewed network planning and technical documents, and gave extensive advice related to nutrient issues, analysis of past data, statistical power, and national perspectives.

Southeast Alaska Network

Provided baseline water quality data inventory and analysis reports, associated data files, and tips for additional data mining/evaluation.

Southeast Coast Network

Reviewed network planning and technical issues and gave extensive advice related to nutrient issues.

Provided advice and guidance on using the NPS Electronic Data Deliverable (NPSEDD) specifications and furnishing automatic data logger data in a format compatible with STORET.

Southern Colorado Plateau Network

Reviewed Phase III report.

Southern Plains Network

Participated in the Southern Plains Network Vital Signs Prioritization Workshop. Reviewed and prioritized vital signs for monitoring the health of wetland and riparian systems as a member of the Water Quality and Aquatic Systems Panel.

Assisted contractor in deciphering the meaning of replicate/duplicate samples in STORET prior to conducting trend analysis.

Southwest Alaska Network

Reviewed Phase III report.

Imported data from 20 projects from the modern STORET Data Warehouse data into NPSTORET.

Imported network data from Kenai Fjords National Park and provided detailed instructions on mapping the network's water quality database to NPSTORET.

Assisted park staff on technical issues related to long-term monitoring of salinity.

Upper Columbia Basin Network

Provided advice on how to estimate minimum detectable differences for paired sampling designs. Helped analyze hints of trends and issues of concern from past data from LARO.



Kukaklek Lake, Katmai National Park and Preserve (Joe Miller, 2002).

TECHNICAL ASSISTANCE REGIONS AND PARKS

ALASKA REGION

Reviewed state pollution mixing zone 2005 proposed regulations for Alaska parks.

Presented a poster on repeat photography of glaciers in Alaskan national parks and forests to the 2006 Hydrology Days Conference on Global Warming and Water Resources at Colorado State University.

Western Arctic National Parklands

Assisted in technical assistance request related to a diesel spill.

Aniakchak National Monument and Preserve

Obtained, entered, reformatted, and quality assured / quality controlled a variety of water quality data for upload to new STORET.

Cape Krusenstern National Monument

Provided technical and policy review and evaluation of the draft *Environmental Impact Statement for Navigation Improvements at the DeLong Mountain Terminal in Alaska*.

Denali National Park and Preserve

Provided technical review and comment on the draft *Water Resources Stewardship Strategies Report for Denali National Park & Preserve*.

Reviewed and signed the final *Wetland Statement of Findings for the Construction of a New Savage River Area Rest Stop*.

Reviewed and signed the final *Statement of Findings for Executive Order 11990: Protection of Wetlands for C-Camp Improvements*.

Advised park and regional office staff on wetland compliance issues for an environmental assessment addressing ORV

use by subsistence hunters.

Completed a review and provided comments on a gravel extraction plan for an area on Moose Creek in the Kantishna hills.

Completed a review and provided comments for a proposed coal-bed methane extraction operation adjacent to park boundaries.

Coordinated the editing and preparation for publishing of a report on a WRD funded investigation of a state proposed access corridor through the park.

Provided park staff and consultant with technical comments on a proposed dust suppressant product, EK35.

Obtained, entered, reformatted, and quality assured / quality controlled a variety of water quality data for upload to new STORET.

Glacier Bay National Park and Preserve

Provided policy and technical review of the final report entitled *Assessment of Coastal Water Resources and Watershed Conditions at Glacier Bay National Park & Preserve (Alaska)*.

Reviewed and provided comment on progress reports and coming year study plans for the WRD and the Biological Resources Division funded East Alsek River fish habitat and sockeye salmon studies.

Provided technical review and comment on the Bartlett River Coho Creel Survey report.

Provided review and comment on a state proposal to prohibit pollution mixing zones for point source discharges within salmon spawning habitat and the proposed exceptions to this rule.

Assisted regional office staff in setting up an agreement with the USFWS to correct digital

National Wetlands Inventory data for the park.

Katmai National Park and Preserve

Provided programmatic oversight for the draft *Katmai National Park Water Resources Management Plan*.

Kenai Fjords National Park

Conducted floodplain and channel stability assessment at two sites within the park and provided recommendations for mitigation.

Performed riparian assessment of a small stream within the park subject to upstream diversions.

Klondike Gold Rush National Historical Park

Provided policy and technical review of the final report entitled *Assessment of Coastal Water Resources and Watershed Conditions at Klondike Gold Rush National Historical Park (Alaska)*.

Sitka National Historical Park

Provided policy and technical review of the final report entitled *Assessment of Coastal Water Resources and Watershed Conditions at Sitka National Historical Park (Alaska)*.

Reviewed Indian River water quality proposal to be submitted for NPS-USGS partnership program funding in FY2007.

Wrangell-St. Elias National Park and Preserve

Provided policy and technical review of the final report entitled *Assessment of Coastal Water Resources and Watershed Conditions at Wrangell – St. Elias National Park & Preserve (Alaska)*.

Provided technical assistance in evaluating management options for addressing an introduced population of rainbow trout at Summit Lake.

Reviewed and signed the final *Statement of Findings for E.O. 11990 (Protection of Wetlands): Twin Lakes Campground Rehabilitation and Expansion*.

Advised park and regional office staff on wetland compliance issues for a programmatic environmental assessment for sustainable access to inholdings in the Cantwell area.

Continued assisting on laboratory and other technical issues related to a project on estimating effects of salmon returns on chlorophyll and other environmental cofactors.

Updated park on progress on quality control improvements at the Oregon State nutrient lab that has produced past data for the park.

Uploaded water quality data from an aquifer protection study for the McCarthy Area Council to new STORET.

Uploaded water quality data from a hazardous waste audit of the Kennicott Mine to new STORET.

Obtained, entered, reformatted, and quality assured / quality controlled other water quality data for upload to new STORET in preparation for producing a baseline water quality data inventory and analysis report.

Yukon-Charley Rivers National Preserve

Obtained, entered, reformatted, and quality assured / quality controlled a variety of water quality data for upload to new STORET.

INTERMOUNTAIN REGION

Provided written technical comments on the potential adverse effects to park water resources from proposed oil shale development in northwestern Colorado, southwestern Wyoming, and eastern Utah.

Represented NPS in the cooperating agencies group for the Flaming Gorge Dam Operations EIS.

Represented NPS in the cooperating agencies group for the Aspinall Unit Re-operations EIS.

Provided support to the Department of Justice regarding the *Montana Reserved Water Rights Compact*.

Assisted the Office of the Solicitor and Department of Justice in preparing a motion for formatting hydrographic survey reports for NPS units in the Gila River General Adjudication.

Served as members of the Colorado River Technical Group and Steering Committee.

Continued to follow the Department of Energy's initial and interim remedial action ground-water remediation progress at the Moab Site through review of progress reports and site Data Validation releases.

Monitored the Department of Energy's progress toward laying the ground work for removal of the tailings pile, vicinity property remediation, and the establishment of a new repository at the Crescent Junction site.

Provided comments on two drafts of the *Record of Decision for the Operation of Flaming Gorge Dam EIS*.

Provided review and comment on the New Mexico Environmental Division's proposal to change state surface-water quality regulations to allow piscicide use, provided a state permit was obtained.

Amistad National Recreation Area

Provided policy / technical review and comments on the draft *Amistad National Recreation Area General Management Plan / EIS*.

Assisted in the completion and publication of the *Binational Fisheries Management Plan for Amistad Reservoir*.

Arches National Park

Provided oversight and funding for spring flow measurements in Sevenmile Canyon and Courthouse Wash in support of water right negotiations.

Prepared project scope of work and agreement to contract with Utah Geological Survey (UGS) to age-date ground water in the Moab Member and Navajo Sandstone aquifers. Assisted UGS with collection of ground-water samples and analysis/ interpretation of results.

Continued negotiations with the State of Utah to complete a water rights settlement.

Performed site investigation associated with flooding of several arroyos and damage to a road and crossings.

Uploaded water quality data from a spring survey in the Colorado River Drainage to STORET.

Aztec Ruins National Monument

Provided assistance to investigate the source of moisture in soils adjacent to ruins, which threatens the stability and preservation of the ruins.

Bent's Old Fort National Historic Site

Conducted a preliminary scoping of water resource issues and information in anticipation of the development of a water resources issues and information overview report in FY2007.

Evaluated water rights applications in Water Division 2 to determine impact of diversions on water rights.

Conducted a survey of park ponds and marsh waters for the presence and distribution of

fish species.

Big Bend National Park

Assisted in preparation of a request to the Texas Water Resources Development Board to evaluate impacts due to groundwater development on the Rio Grande Wild and Scenic River and reviewed resultant *Groundwater Availability Model Report 06-16*.

Provided technical and policy review and evaluation of the proposed waterline construction project.

Provided assistance regarding rehabilitation and testing of existing wells and construction and testing of a new well at Panther Junction.

Conducted an assessment of boat ramps and invasive riparian plants and provided detailed observations and recommendations for long-term management.

Provided technical assistance in the field on a WRD funded project investigating vegetation encroachment on the channel of the Rio Grande due to flow reduction and invasive plants.

Provided floodplain guidelines interpretation for Denver Service Center staff overseeing development in the Rio Grand Village area.

Big Hole National Battlefield

Submitted annual water use report as required by the *NPS-Montana Water Rights Compact*.

Big Thicket National Preserve

Provided resource impact evaluation, restoration, and management strategies in response to hurricane damage at the region sponsored Hurricane Damage Assessment and Restoration Workshop.

Provided technical and policy review and evaluation of the proposed *Davis Brothers Application for an Exemption under §9.32(e)*

for its Salisbury #1 Oil Well in Jack Gore Baygall Unit.

Provided technical and policy review and evaluation of the proposed *Davis Southern Operating Company Application for an Exemption under §9.32(e) for the A-Montgomery Wells No. 1, 2, 3, and 4 in the Neches Bottom and Jack Gore Baygall Unit of the Big Thicket National Preserve.*

Provided technical and policy review and evaluation of the proposed Union Gas Operating Company Rice University directional wells under the preserve.

Provided technical and policy review and evaluation of the proposed *Kerr McGee Oil and Gas Onshore LP's Draft Plan of Operation and Environmental Assessment for the Kountze 3-D Seismic Survey within Big Thicket National Preserve.*

Provided assistance for the assessment of petroleum contaminated sites.

Bighorn Canyon National Recreation Area

Submitted annual water use report for park as required by the *NPS-Montana Water Rights Compact*.

Provided information to the Department of Justice concerning park water rights in the Bighorn Basin Phase II decree.

Black Canyon of the Gunnison National Park

Evaluated water rights applications in Water Division 4 to determine impact of diversions on park water rights.

Provided technical input to the park and region pertaining to flow recommendations for endangered fish and the *Aspinall Project EIS*.

Identified several issues related to surplus

irrigation draining into the park through Red Rock Canyon.

Traveled to park and provided assistance on an eroding irrigation ditch and river water quality issue.

Bryce Canyon National Park

Advise park staff on wetland compliance requirements for the proposed Utah Highway 12 repair project.

Canyon de Chelly National Monument

Worked with Colorado State University and USDA National Sediment Laboratory cooperators and park staff to prepare a proposal entitled “Measure the Influence of Riparian Vegetation on Channel Bank Stability, Canyon de Chelly NM, Arizona.”

Canyonlands National Park

Uploaded water quality data from a spring survey in the Colorado River Drainage to STORET.

Capitol Reef National Park

Continued project work related to quantification of state prior appropriation and federal reserved water rights.

Completed field review and provide input to park staff on potential approaches to reconnecting and restoring an abandoned oxbow on the Fremont River.

Reviewed and commented on a proposal to rebuild a diversion dam within the park. Concerns included fish passage and a high sediment transport that could render the dam ineffective.

Investigated source of ground-water flooding at campground and provided recommendations for correcting the problem.

Carlsbad Caverns National Park

Provided assessment of hydrogeology

and potential water quality concerns at Rattlesnake Springs.

Provided technical assistance in preparing the Rattlesnake Springs Management Plan by reviewing historic information, park legislation, and available hydrologic and biological data.

Provided project oversight to WRD funded project, “Delineate Watershed and Subsurface Channels Feeding Rattlesnake Springs Aquifer.”

Initiated analysis of pools in Lake of the White Roses in Lechuguilla Cave and nearby water levels in wells.

Continued oversight for stage gages in Lake of the White Roses.

Obtained, entered, reformatted, and quality assured / quality controlled additional water quality data for upload to new STORET in preparation for producing a baseline water quality data inventory and analysis report.

Chaco Culture National Historical Park

Compiled history of ground-water exploration and hydrogeologic conditions and provided recommendations for long-term monitoring to identify potential threats to ground-water resources.

Chickasaw National Recreation Area

Provided oversight for the operation of and data management of two monitoring wells completed in the Arbuckle-Simpson Aquifer.

Assisted Office of the Solicitor in negotiating resolution of NPS’s protest of ground-water applications by Meridian Aggregates. Participated in negotiations with USFWS and Meridian Aggregates (a subsidiary of Martin Marietta) and finalized an agreement to resolve water right issues concerning Meridian’s ground-water pumping.

Participated in technical review panel discussions on the monitoring and management plan being conducted by NPS, USFWS, Meridian Aggregates, and the Oklahoma Water Resources Board.

Provided technical advice and comment on the park's draft general management plan / environmental assessment.

Colorado National Monument

Evaluated water rights applications in Water Division 5 to determine impact of diversions on park water rights.

Coronado National Memorial

Advised park and regional staff on adequacy of Burned Area Emergency Response treatments to restore watershed resources after a wild fire in a remote section of the park. Additionally, provided input for a damage assessment after a flood passed through the interior of the park.

Provided assessment of water supply well damaged in flood and identified alternative water sources less vulnerable to flooding.

Craters of the Moon National Monument and Preserve

Provided technical and policy review edits to the wetland sections of the Geologic Resources Evaluation Report for the Craters of the Moon National Monument and Preserve.

Curecanti National Recreation Area

Provided input to the park, region, and WRB on flow recommendations for endangered fish and the Aspinall Project EIS.

Dinosaur National Monument

Worked with the Upper Colorado Basin Recovery Program for Endangered Fishes to revise, finalize, and publish a report on the WRD funded project "Effects of Operations at Flaming Gorge Dam on Colorado Pikeminnow in Lodore Canyon."



Colorado pikeminnow, Yampa River, Dinosaur National Monument (Trammell, 2006).

Evaluated water rights applications in Water Division 6 to determine impact of diversions on park water rights.

Reviewed flow recommendations for Colorado River fishes with respect to park resources and water rights.

Reviewed the draft final report for the Biological Resources Management Division funded project "Determine Interactions between Smallmouth Bass and Roundtail Chub in Yampa Canyon."

Reviewed the draft final report for a telemetry study of brown trout (*Salmo trutta*) in Lodore Canyon.

El Malpais National Monument

Assisted Office of the Solicitor and Department of Justice in responding to motions regarding the quiet title action and water right claim preparation for the Zuni River Adjudication.

Completed water resources inventories to support U.S. water right claims in the Zuni River Adjudication.

El Morro National Monument

Assisted Office of the Solicitor and Department of Justice in responding to motions regarding the quiet title action and water right claim preparation for the Zuni River Adjudication.

Completed water resources inventories to support U.S. water right claims in the Zuni River Adjudication.

Florissant Fossil Beds National Monument

Evaluated water rights applications in Water Division 1 to determine impact of diversions on park water rights.

Fort Bowie National Historic Site

Assisted in planning for rehabilitation of the water supply well.

Fossil Butte National Monument

Provided technical analysis of several hydrologic issues of concern to park staff.

Glacier National Park

Submitted water use report for park as required by the *NPS-Montana Water Rights Compact*.

Evaluated water right applications to determine impacts on park water rights pursuant to the *NPS-Montana Water Rights Compact* and filed objections when needed.

Reviewed Cline Mining Project proposal for coal mine in Canada (North Fork Flathead River) for potential water rights impacts. Initiated technical assistance concerning fisheries issues related to Canadian coal mine development proposals on the North Fork of the Flathead River.

Consulted with an engineering firm, the Federal Highways Administration, and park staff regarding the Going-to-the-Sun Highway and the Divide Creek Bridge in the St. Mary District.

Provided assistance to park related to the application for septic permit for an inholding along the North Fork Flathead River.



Swiftcurrent Creek at Many Glacier, Glacier National Park (Don Bischoff, USGS, 2006).

Glen Canyon National Recreation Area

Conducted a floodplain analysis and advised park of flood related hazards associated with the area proposed for new park facilities.

Attended the Lake Powell Technical Advisory Committee meeting.

Reviewed park hydrocarbon proposal for WRD “high priority” program funding consideration.

Grand Canyon National Park

Participated in water right settlement discussions for the Little Colorado River Adjudication.

Reviewed and commented on the geologic map for the 30’ x 60’ Valle Quadrangle prepared by the USGS.

Assisted park planning staff in evaluating impacts to surface-water hydrology from proposed development in Grand Canyon Village on the south rim.

Uploaded water quality data from a spring survey in the Colorado River Drainage to new STORET.

Obtained, entered, reformatted, and quality assured / quality controlled a variety of other water quality data for upload to new STORET.

Provided funding to USGS to map the geology of the Cameron Quadrangle.

Grand Teton National Park

Provided technical assistance to the park and to the Environmental Quality Division's Natural Resource Damage Assessment Program regarding the introduction of a non-native plant species (*Carex feta*) at the Snake River Gravel Pit reclamation site.

Helped install a hydrologic monitoring network for the abandoned Flagg Ranch development site on the Snake River floodplain. The hydrologic data will be used to develop a wetland/floodplain restoration plan for this highly disturbed site.

Served as key official and provided technical assistance to the park, the Federal Highways Administration, and contractors regarding data collection, design work, and regulatory issues for the Pond 5 wetland reclamation project.

Provided hydrogeologic analysis and recommendations for well construction at Flagg Ranch and at the Teton Science School.

Provided assistance to park in the development of strategies to secure and protect instream flows in the lower Gros Ventre River.

Installed and operated a stream gage on the lower Gros Ventre River.

Funded a study to evaluate the water budget of the lower Gros Ventre River.



Collecting flow data on the Gros Ventre River, Grand Teton National Park (Miller, 2006).

Reviewed Wyoming water law and provided park with information regarding water rights for Gros Ventre River diversions.

Provided technical assistance on instream flow issues and studies for the lower Gros Ventre River.

Completed inventory and summary report on vegetation and ground-water transects.

Reviewed WRD funded project implementation plan titled, "Baseline water quality of four western tributary streams in the Upper Snake River Basin."

Provided project oversight to WRD funded project "Hydrology and Geomorphology of the Snake River."

Grant-Kohrs Ranch National Historic Site

Provided guidance on water rights administration questions.

Finalized a report which was coauthored by a private consultant regarding NPS concerns associated with a FEMA flood improvement project in the town of Deer Lodge, Montana.

Great Sand Dunes National Park and Preserve

Completed peer review revisions for the September 2004 seepage run on Deadman, Sand, Big Spring, and Little Spring Creeks.

Collected field data and oversaw data collection/compilation for 13 shallow ground-water monitoring wells located in Big Spring, Little Spring, and Medano Creeks.

Assisted the Department of Justice in filing motions to resolve the NPS protest of the Beck water right application.

Coordinated evidence preparation to support the NPS in-place ground-water claim.

Attended Closed Basin ground-water model meetings.

Completed inventory and summary report for Colorado State University vegetation / ground-water transects.

Installed piezometers at Little Spring Creek interdunal ponds.

Completed inventory of flowing wells.

Completed elevation survey for flowing wells.

Completed interagency agreements and sole source contracts to retain expert witnesses.

Evaluated applications in Colorado Water Division 3 to determine impact of diversions on park water rights.

Provided technical review and comment on water related wetland sections of the draft general management plan and wilderness study environmental impact statement, including the draft wetland statement of findings.

Guadalupe Mountains National Park

Provided advice regarding potential for

impact to park resources from ground-water withdrawals in the Dell City area.

Evaluated wild fire restoration efforts by park crews. Made recommendations to revise burned area environmental response treatments and prioritize vegetative treatments.

Hovenweep National Monument

Submitted annual water use report for reserved water rights at springs to the State of Colorado.

Evaluated water rights applications in Water Division 7 to determine impact of diversions on park water rights.

Hubbell Trading Post National Historic Site

Participated in water right settlement discussions for the Little Colorado River Adjudication.

Lake Meredith National Recreation Area

Provided technical and policy review and evaluation of the *Pioneer Natural Resources F-1 Gas Gathering Pipeline Replacement Project Wetland Statement of Findings : Lake Meredith National Recreation Area*.

Little Bighorn Battlefield National Monument

Provided oversight for an agreement with the USGS to measure discharge at an NPS stream gage on the Little Bighorn River within the park. Maintained and operated the gage to monitor decreed flows.

Responded to a park request to develop water for an irrigation project.

Submitted annual water use report as required by the *NPS-Montana Water Rights Compact*.

Mesa Verde National Park

Evaluated water rights applications in Water Division 7 to determine impact of diversions on park water rights.

Provided technical oversight and funding for park operation of a stream gage on the Mancos River.

Assisted Department of Justice in the preparation of a protest of water right application on the Mancos River.

Assisted park staff in determining potential environmental impacts and regulatory compliance requirements for proposed water treatment plant discharges into adjacent stream channels and wetlands.

Assisted park with preparation of annual water use reports for the District Water Commissioner.

Minuteman Missile National Historic Site

Provided policy related review of the draft *Minuteman Missile National Historic Site General Management Plan /EIS*.

Montezuma Castle National Monument

Completed a hydrogeology report and geophysical investigation to determine source of water issuing from Montezuma Well.

Completed report for investigation to determine vulnerability of park water resources to ground-water withdrawals in the region and continued review of monitoring program.

Provided oversight for park operation of two stream gages at Montezuma Well and operation of a stream gage on Wet Beaver Creek and funded the operation of a USGS stream gage on Beaver Creek at the Castle Unit.

Continued preparation of project plan to quantify federal reserved rights for the *Verde River Adjudication*.

Continued investigation of the *Antiquities Act*, ethnological values, and establishment of Montezuma Castle.

Natural Bridges National Monument

Continued negotiations with the State of

Utah to complete a water rights settlement.

Organ Pipe Cactus National Monument

Provided hydrogeologic analysis and assessment of causes for springflow decline at Quitobaquito Springs and developed a ground-water monitoring plan.

Padre Island National Seashore

Provided technical review and comments on the *Final Report: Bird Island Basin Beach Restoration Project – Phase 1*.

Provided technical and policy review and evaluation of the wetland delineation and wetland impact assessment completed for the Kindee Oil and Gas Company's proposed Wilson drilling project.

Provided technical and policy review and evaluation of the draft *Wetland Statement of Findings for Kindee Oil and Gas Texas Wilson #1-3 Wells, Padre Island National Seashore*.

Provided technical and policy review and evaluation of the proposed *Plan of Operation for PGS Onshore Incorporated's ULOIK 2-d Seismic Survey at Padre Island National Seashore*.

Provided park with information on what inventory and monitoring networks and federal agencies (such as NOAA) do for routine estuarine monitoring.

Met with park resource management personnel to discuss request for technical assistance in addressing shark fishery harvest from park waters.

Pecos National Historical Park

Continued preparing a project plan to protect water rights.

Petrified Forest National Park

Participated in water right settlement discussions for the Little Colorado River Adjudication.

Pipe Spring National Monument

Provided technical assistance for on-going studies of geology and hydrogeology and causes of springflow reduction and assisted in planning for a new water supply well.

Provided advice on water right documentation for the replacement of a well located on tribal land.

Rocky Mountain National Park

Participated on the core case team in preparation of a claim for restoration costs from the breach of the Grand River Ditch in the park. Facilitated meetings of interdivisional and academic technical expertise on compensatory restoration proposals to utilize altered flows in the Colorado River.

Evaluated water rights applications in Water Divisions 1 and 5 to determine impact of diversions on park water rights.

Assisted park staff in modifying the WRD funded Fan Lake wetland / willow carr restoration project so that active alluvial fan processes adjacent to the site will not threaten the restoration's sustainability over the long-term.

Completed construction drawings and provided on-site construction guidance in completing the wetland restoration project at the Hidden Valley Ski Area.

Completed a field analysis of wetland conditions, functions, and boundary locations within two proposed two-mile-long trail alignment alternatives at Rocky Mountain National Park.

Provided advice and survey information for a wetlands restorations project located near the Roaring Fork / Fall River confluence.

Reviewed the completion report for the NRPP threatened and endangered project

“Restore a Population of Greenback Cutthroat Trout in Rocky Mountain National Park.” Helped coordinate the assignment of a park representative to the Greenback Cutthroat Trout Recovery Team Committee.

Participated in a briefing on the implications of a court ruling on Longdraw Reservoir for native cutthroat trout restoration.

Reviewed several draft documents related to potential environmental estrogen exposure in several species of trout. Provided information on possible sources of estrogenic contaminants: human sewage (pit toilets, back packers) and horse manure and urine.

Assisted in oversight of construction and testing, for a new well at Moraine Park.

Reviewed proposal to assess impacts of backcountry human waste disposal from privies on stream water quality.

Saguaro National Park

Provided policy level review of the draft *Saguaro National Park General Management Plan/EIS*.

Prepared draft report describing water rights and use along Rincon Creek to support the instream-flow water right application for Rincon Creek.

Continued oversight and funding for hydrologic, macroinvertebrate, riparian and emergent vegetation, and aquatic herpetofauna studies to support the instream flow water right application on Rincon Creek.

Provided technical assistance for rehabilitation of a water supply well for the Tucson Mountain District.

Operated three stream gages and monitored seven shallow wells on Rincon Creek to support the instream-flow water right application.

Salinas Pueblo Missions National Monument

Conducted a site visit to evaluate multiple erosion problems in the park and made recommendations to restore natural drainages and stabilize cultural resources.

Provided hydrogeologic analysis and recommendations for well construction at the ABO Unit.

Sand Creek Massacre National Historic Site

Provided on-site technical assistance, surveying roads and riparian trees located near the proposed visitor center building sites above the 500-year floodplain.

Provided on-site technical assistance and evaluation of fisheries resources, including fish species use of wetlands and wetland surface-water salinity levels.

Provided hydrogeologic assessment and information on water well construction.

Sunset Crater Volcano National Monument

Participated in water right settlement discussions for the Little Colorado River Adjudication.

Tumacacori National Historical Park

Participated in water right settlement discussions for the Santa Cruz Active Management Area.

Tuzigoot National Monument

Advised staff on wetland compliance requirements for two projects being addressed in the park general management plan, construction of an interpretive boardwalk and maintenance of Tavaschi Marsh for the benefit of threatened and endangered species and other wildlife.

Walnut Canyon National Monument

Participated in water right settlement

discussions for the Little Colorado River Adjudication.

Wupatki National Monument

Participated in water right settlement discussions for the Little Colorado River Adjudication.

Yellowstone National Park

Participated on a team that served as DOI lead in the Hydrogeology Work Group steering committee and provided review and comment on the New World Mine restoration project documents generated by the USFS.

Reviewed park plan/EIS and provided comment on project to restore native westslope cutthroat trout to Specimen Creek in the Gallatin River drainage.

Evaluated water right applications to determine impacts on park water rights and filed objections when needed.

Coordinated the effort to acquire, quality assure, and incorporate park GIS hydrographic edits in the National Hydrography Dataset.

Advised staff regarding NPS wetland delineation methods and requirements for road projects.

Filed an objection with Montana Department of Natural Resources and Conservation for a water right change application by Cooke City, Montana.

Assisted USFS legal counsel on a variety of water rights issues related to the *Reese Creek Water Rights Settlement Agreement*.

Submitted annual water use report to the State of Montana as required by the *NPS-Montana Water Rights Compact*.

Completed a hydraulic floodplain analysis for

a developed area in Cascade Canyon.

Completed a hydraulic floodplain analysis of the Tower Junction area.

Evaluated the effects of the shallow groundwater system at the Norris Geyser Basin on visitor safety.

Served as key official for interagency agreement with the USGS for implementation of a real time turbidity monitoring program at Sylvan Pass where a major gravel mining and aggregate crushing operation associated with the East Entrance road construction project is believed to have impacted park water resources.

Initiated and assisted with the Sylvan Pass Area 4 solid waste repository underdrain and collection sump design installed by Federal Highways Western Lands Division.

Coordinated monitoring efforts and reviewed continuous water level data collected from NPS financed monitoring wells installed at a proposed repository site being considered by the State of Montana for the McLaren Mill Tailings.

Briefed park management on USFS La Duke Hot Spring agreement and abandonment of the Royal Teton Ranch well.

Coordinated with park and USFS on water delivery issues under Reese Creek water rights settlement.

Provided oversight for an agreement with USGS to collect discharge measurements on Reese Creek to determine the accuracy of the upper flume.

Provided advice concerning a USFS proposal to irrigate USFS lands via diversion of Reese Creek.

Reviewed discharge measurements made by

park staff and analyzed distribution of Reese Creek water rights.

Participated in the annual meeting of the Technical Oversight Committee of the Yellowstone Controlled Groundwater Area.

Participated in a teleconference on the development of a Greater Yellowstone Area Aquatic Nuisance Species Protection Program.

Yucca House National Monument

Reviewed report, Hydrology and Geochemistry of *Yucca House National Monument and Surrounding Area, Southwestern Colorado*.

Zion National Park

Evaluated water rights applications to determine consistency with the *Zion Water Rights Agreement* and to evaluate impacts of diversions on park water rights.

Provided technical review and comment on the draft implementation plan for the NRPP project “Test Riparian Revegetation Methods along the Virgin River, Zion National Park.”

MIDWEST REGION

Agate Fossil Beds National Monument

Assisted in development of a ground-water monitoring plan.

Apostle Islands National Lakeshore

Reviewed progress report from University of Wisconsin Stevens Point cooperators regarding the current status of the park’s coastal resources / coastal watershed condition assessment.

Facilitated the incorporation of edits made to the park’s GIS hydrographic coverage into the National Hydrography Dataset.

Badlands National Park

Advised park and Denver Service Center staff on wetland compliance requirements for the Prairie Winds Overlook project.

Buffalo National River

Provided assistance to the park for their participation on the technical group for the Bear Creek Dam proposal.

Continued as project coordinator for investigation to characterize karst ground water and delineate recharge zones and performed related geologic mapping.

Reviewed the draft final report for the project “Assessment of Macroinvertebrate Communities at Buffalo National River Water Monitoring Stations.”

Provided programmatic oversight and technical review in support of freshwater mussel study on the Buffalo River.

Provided an analysis of a document reviewing the information content and hints of trends or issues of concern in park waters.

Cuyahoga Valley National Park

Provided technical assistance to park staff regarding proposed solutions for flood relief at the Greenhaven – Riverview Road intersection and related effects on the Fawn Pond wetland area.

Reviewed *Floodplain Statement of Findings for the Rockside Road Bridge Project*.

Provided technical and policy review and evaluation of the *Wetland Statement of Findings for the Rockside Boarding Area Parking Expansion and Class 1 Connector Trail and Bridge from Lock 39 Trailhead in Cuyahoga Valley National Park*.

Provided review and commented on study implementation plan for determining Ohio EPA Use Classifications for primary headwater streams within the park.

Provided consultation with the park on potential impacts of a proposed lake dredging project.

Imported long-term water quality monitoring dataset into NPSTORET and then uploaded the data to new STORET.

Reviewed water quality research proposal for National Science Foundation funding consideration.

Effigy Mounds National Monument

Completed and published the *Effigy Mounds National Monument, Iowa : Water Resources Foundation Report, Technical Report NPS/NRWRD/NRTR-2006/350*.

Fort Union Trading Post National Historic Site

Coordinated interdivisional reviews of a report by the Geologist in Parks program on the geomorphology of the Missouri River and bank erosion near the park.

Grand Portage National Monument

Uploaded results of 2000 Level I Water Quality Survey to new STORET.

Hot Springs National Park

Conducted hydrogeologic analysis and assisted in developing a plan to assess potential threats to the geothermal system.

Indiana Dunes National Lakeshore

Provided technical assistance during the Bailly Generating Plant RCRA facility investigation where ground-water sampling by the responsible party led to the delineation of several possible dissolved metals ground-water plumes beneath park lands from past fly ash disposal in up-gradient areas.

Continued to provide technical guidance to park staff in their dealings with EPA for the ongoing Town of Pines CERCLA investigation of a fly ash landfill where

historic releases of metals to ground water may threaten park wetlands.

Reviewed polycyclic aromatic hydrocarbons (PAHs), polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated dibenzofurens (PCDFs) and associated detection limit information in draft document *Pines AOC II -evaluation of PAHs, PCDDs/PCDFs*.

Reviewed progress report from Michigan State University cooperators regarding the current status of the project “Indiana Dunes National Lakeshore Coastal Resources / Coastal Watershed Condition Assessment.”

Provided data from the baseline water quality data inventory and analysis report and advice to a contractor working on a report for the park.

Isle Royale National Park

Assisted in the completion and publication of the *Isle Royale National Park Water Resources Management Plan*.

Met with park staff to reinitiate the effort to complete the *Isle Royale Fisheries Management Plan*.

Assisted in review of final report *Assess Hydrocarbon Threats to Park Waters*.

Minuteman Missile National Historic Site

Provided policy related review of the draft *Minuteman Missile National Historic Site General Management Plan /EIS*.

Mississippi National River and Recreation Area

Assisted in the completion of the draft *Mississippi National River Water Resources Information and Issues Overview Report*.

Missouri National Recreational River

Provided technical assistance in identifying potential impacts of emergent sandbar construction on aquatic organisms,

including the endangered pallid sturgeon (*Scaphirhynchus albus*) in support of a *NPS Wild and Scenic Rivers Act* Section 7 determination on the Missouri River.

Provided ongoing review and technical comments on the preparation of an EIS on the cumulative impacts of bank stabilization projects (Section 33 Program).

Provided extensive technical and policy assistance in hydrology related to releases from dams on the Missouri River and geomorphology pertaining to alternatives for bank stabilization proposals, including commenting on the USACE Annual Operating Plan, participating in meetings on the spring rise process, participating in the Missouri River Recovery Implementation Committee, evaluating contract moderators for the USACE spring rise process, and submitting design specifications for a natural woody debris stabilization concept for Ponca State Park within the park.

Gave technical assistance on the design review of a large bridge to comply with the *Wild and Scenic Rivers Act* and Federal Emergency Management Agency regulations.

Mount Rushmore National Memorial

Provided hydrogeologic assessment and recommendations for supplementing the public water supply.

Niobrara National Scenic River

Assisted park in the development of strategies to secure and protect flows in the Niobrara River.

Ozark National Scenic Riverways

Provided assistance regarding the local hydrogeology and potential impacts of lead mining in the watershed of the park.

Helped analyze and publicize network findings on bacteria from horses and provided new information on horse manure

as one potential source of estrogenic activity in park waters.

Conducted a geomorphic and bridge function assessment for the Cedar Grove Bridge.

Imported long-term water quality monitoring dataset into NPSTORET and then uploaded the data to new STORET.

Pictured Rocks National Lakeshore

Provided technical review and comment on the draft *Coastal Resources / Coastal Watershed Condition Assessment for Pictured Rocks National Seashore*.

Completed the development of Project Management Information System project statements in support of the park's water resources management program.

Reviewed and commented on a Coaster Brook trout study funding proposal for a proposed project.

Saint Croix National Scenic Riverway

Reviewed progress reports on WRD funded project, "Development of an Index for Mercury in Fish Tissues of St. Croix River Basin."

Reviewed *Floodplain Statement of Findings for the Camping Management Plan*.

Sleeping Bear Dunes National Lakeshore

Assisted with ongoing Glen Lake/Crystal River watershed planning activities, a stakeholder based process to define water levels needed for balanced protection of lake and river resources. Provided technical hydrology and water rights assistance related to Glen Lake/Crystal River water management issues.

Theodore Roosevelt National Park

Collaborated with the park to develop a water rights project plan.

Surveyed established cross sections on the Little Missouri River to detect floodplain evolution and channel movement.

Provided oversight of a USGS agreement to operate and maintain the Little Missouri River (near Watford City) stream gage.

Voyageurs National Park

Continued as project officer on "Impacts of Forest Fires on Levels of Mercury in Lake and Forest Environments." Helped analyze and publicize highlights of other research projects related to wetlands cofactors for mercury problems.

Wind Cave National Park

Evaluated potential impacts to ground-water levels in the park due to proposed pumping by the Southern Black Hills Water System.

Filed Petitions to Intervene in the matter of two water right permit applications filed by the Southern Black Hills Water System. Prepared technical and water rights evidence for a state administrative hearing on the applications.

Initiated water level data collection in Headquarters Well No. 1.

NATIONAL CAPITAL REGION

Provided a review of a request by USFWS to release radio tagged sterile short nose sturgeon into the Potomac River to enable tracking to wild congregations of this species.

Continued to provided consultation and review of a multi-year NRPP project looking at Dwarf Wedge Mussel habitat in multiple eastern parks.

Catoctin Mountain Park

Provided hydrogeologic analysis and recommendations for well construction.

George Washington Memorial Parkway

Provided technical review and comment on a draft *Wetland Statement of Findings for the Woodrow Wilson Bridge Replacement Project, Jones Point Park*.

Provided technical and policy review and evaluation of the “Jones Point Park Environmental Assessment, Woodrow Wilson Bridge Replacement Project.”

Monocacy National Battlefield

Conducted a scoping workshop at the park as the first step in the development of the *Monocacy National Battlefield Water Resources Stewardship Report*.

Rock Creek Park

Provided technical and policy review and evaluation of the *Final Wetland Delineation Report for the Reconstruction and Rehabilitation of Rock Creek, Potomac Parkway and Beech Drive, Rock Creek Park*.

Advised regional office staff on wetland compliance requirements for proposed stream crossings and riprap placement.

Advised on glyphosphate, an herbicide, in park waters.

NORTHEAST REGION

Initiated interaction with regional River and Trails Program to help assess potential migratory fish impacts by the development and operation of a proposed liquefied natural gas off-loading facility on the Taunton River, downstream of a proposed Wild and Scenic River Study Area.

Acadia National Park

Participated in review and selection of cooperator/s for the project “Assessment of Natural Resources and Watershed Conditions for Acadia National Park.”

Assisted park with fishery management issues

and help them work with the State of Maine Department of Inland Fish and Wildlife.

Advised park staff regarding wetland compliance requirements for the proposed Acadia Gateway Center.

Gave project oversight to WRD funded project, “Determining wetland susceptibility to hydrologic stresses in Acadia National Park.”

Reviewed and provided comment on the park’s response to the Eastern Brook Trout Initiative assessment questionnaire and brook trout study needs.

Advised staff on potential effects of increased horse use on the presence of estrogenic contaminants.

Facilitated updating the National Hydrography Dataset with the park’s spring coverage and several surveyed stream channels.

Provided advice on how to handle statistical outliers for alkalinity and other water quality parameters.

Assateague Island National Seashore

Provided technical and policy review and evaluation of the *Statement of Findings for Floodplains and Wetlands for Improvements to Island Facilities and Infrastructure*.

Cape Cod National Seashore

Provided assistance regarding potential impact of ground-water withdrawals from a municipal supply well adjacent to the Eastham vernal pools and wetlands.

Uploaded water quality data from the park’s long-term kettle pond monitoring program and ground-water monitoring program to new STORET.

Colonial National Historical Park

Advised park staff on wetland compliance requirements for proposed culvert improvements at Papermill Creek road crossings.

Reviewed *Floodplain Statement of Findings for the Parkway Redesign Project*.

Delaware Water Gap National Recreation Area

Provided technical consultation and assistance on an instream flow study being conducted by the Delaware River Basin Commission. Reviewed modeling results and provided suggestions for committee input and testing of specific river resources.

Provided review and comment on proposed extension of Dwarf Wedge Mussel habitat study.

Provided technical review and comment on the draft *Statement of Findings for Wetlands and Floodplains, New Jersey Swim Beach, DEWA*.

Provided technical review and comments on the *Draft Wetland Mitigation Report: State Road 2001 Sections 401, 402, and 405 Improvements Project*.

Reviewed *Floodplain Statement of Findings for the Swim Beach Improvements Project*.

Reviewed and provided comments for a proposed wetland restoration.

Submitted comments concerning the design of a wastewater treatment plant for a resort development proposed near the park.

Provided advice regarding development of a ground-water monitoring plan.

Eleanor Roosevelt National Historic Site

Provided a policy review on a draft *Project*

Agreement for the Roosevelt-Vanderbilt National Historic Sites General Management Plan / Environmental Impact Statement.

Facilitated the incorporation of edits made to the park's GIS hydrographic coverage into the National Hydrography Dataset.

Fire Island National Seashore

Participated in review and selection of cooperator/s for the park's natural resources condition assessment.

Reviewed *Floodplain Statement of Findings for the West End Entrance Station*.

Provided project oversight to NRPP funded project "Simulation of the Shallow Ground-Water Flow System at Fire Island National Seashore."

Flight 93 National Memorial

Provided technical and policy review and evaluation of the draft *Flight 93 National Memorial General Management Plan Environmental Impact Statement*.

Fredericksburg & Spotsylvania County Battlefields National Military Park

Provided technical advice and comment on the park's draft water resources management plan.

Facilitated the incorporation of edits made to the park's GIS hydrographic coverage into the National Hydrography Dataset.

Gateway National Recreation Area

Participated in review and selection of cooperator/s for the park's natural resources condition assessment.

George Washington Birthplace National Monument

Provided technical review and comment on the park's draft natural resources overview.

Provided technical review and comment on

the *Final Draft Report: Wetland Inventory and Mapping Project Report for George Washington Birthplace National Monument*.

Gettysburg National Military Park

Provided technical and policy review and evaluation of the *Wetland Statement of Findings for Landscape Rehabilitation at Gettysburg National Military Park*.

Home of Franklin D. Roosevelt National Historic Site

Provided a policy review on a draft *Project Agreement for the Roosevelt-Vanderbilt National Historic Sites General Management Plan/Environmental Impact Statement*.

Facilitated the incorporation of edits made to the park's GIS hydrographic coverage into the National Hydrography Dataset.

Minute Man National Historical Park

Coauthored the restoration project proposal *Battle Road Wetlands, Minute Man National Historical Park Watershed Condition Improvement*.

Morristown National Historical Park

Uploaded water quality data from a 1982-1983 monitoring project to new STORET.

Uploaded 1996-1998 bacteriological data collected to new STORET.

Obtained, entered, reformatted, and quality assured / quality controlled data from the park's ongoing water quality monitoring program and other historical projects for upload to new STORET.

New River Gorge National River

Continued as project coordinator for investigations to evaluate the park's water quality monitoring program.

Advised park staff on wetland compliance requirements for the "Brookside Infrastructure Project."

Sagamore Hill National Historic Site

Participated in review and selection of cooperator/s for the park's natural resources condition assessment.

Saratoga National Historical Park

Advised regional staff regarding options for protecting park wetlands from a proposed drainage project outside the park.

Reviewed polychlorinated biphenyls and associated quality control data.

Saugus Iron Works National Historic Site

Provided technical and policy review and evaluation of the *Draft Final Report : Natural Resources Function Assessment : Saugus River Restoration Project : Saugus Ironworks National Historic Site*.

Shenandoah National Park

Provided a technical review of the Shenandoah National Park Natural Resources Assessment.

Provided hydrogeologic analysis and recommendations for repair/rehabilitation of several water supply systems in the park.

Provided project oversight to NRPP funded project "Hydrology of Big Meadows, Shenandoah National Park, Virginia: Assessment of a Sensitive Wetland System in the Blue Ridge Mountains."

Upper Delaware Scenic and Recreational River

Provided advice related to the placement of a new visitor center in a floodplain.

Vanderbilt Mansion National Historic Site

Provided a policy review on a draft *Project Agreement for the Roosevelt-Vanderbilt National Historic Sites General Management Plan/Environmental Impact Statement*.

Facilitated the incorporation of edits made

to the park's GIS hydrographic coverage into the National Hydrography Dataset.

Valley Forge National Historical Park

Provided technical advice and comment on the draft *Valley Forge National Historical Park's General Management Plan/EIS*.

Facilitated the incorporation of edits made to the park's GIS hydrographic coverage into the National Hydrography Dataset.

PACIFIC WEST REGION

Provided briefing for the Assistant Secretary for Policy, Management, and Budget and the new DOI liaison to the Southern Nevada Water Authority (SNWA) on NPS activities with respect to ground-water development by SNWA.

Researched California water rights law and requirements to protect riparian rights and instream flows.

Reviewed water rights applications near California NPS units for potential to impact to park water rights and resources.

Updated region Vital Signs networks on new developments in WRD guidance at a meeting in Moscow, Idaho.

Provided a policy level review of the project agreement for "Special Resource Study of the San Gabriel Watershed."

Cabrillo National Monument

Provided policy and technical review of the final report *Assessment of Coastal Water Resources and Watershed Conditions at Cabrillo National Monument (California)*.

Helped park analyze U.S. Navy data summaries for San Diego Bay and reviewed watershed assessment draft report. Assisted park with an oil spill response while on-site.

Uploaded water quality data from the City of San Diego Ocean Monitoring Program to new STORET.

Obtained, entered, reformatted, and quality assured / quality controlled other water quality data for upload to new STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Channel Islands National Park

Provided policy and technical review of the final report *Assessment of Coastal Water Resources and Watershed Conditions at Channel Islands National Park (California)*.

Provided ongoing advice to park and Denver Service Center staff on flood hazards in the Prisoners Harbor and Scorpion Creek areas.

Completed an extensive hydrologic survey and modeling exercise for Prisoners Harbor on Santa Cruz Island.

Presented a conceptual wetland restoration design plan, construction tasks, excavation strategy, and potential areas for disposal to park staff for the Prisoners Harbor wetland restoration project.

City of Rocks National Reserve

Provided water related natural resources background information and an overview of historic WRD technical assistance activities pertaining to the reserve.

Assisted in preparing a proposal to remove stock dams.

Crater Lake National Park

Completed scope of work for construction of a water well in the South Yard. Reviewed test well bids, recommended contractor, and inspected construction of two test wells.

Advised park staff on studies needed to assess extent of mercury contamination in fish tissues.

Obtained, entered, reformatted, and quality assured / quality controlled additional water quality data for upload to new STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Death Valley National Park

Evaluated Nevada water right applications for potential impacts to park resources and water rights and prepared protests of applications where needed.

Continued discussions with Nye County, Nevada, and DOI bureaus for collaboration and coordination on water rights issues in the Death Valley region.

Coordinated the development and implementation of a technical and legal strategy with the Office of the Solicitor, park, and other federal agencies; submitted expert witness reports to the Nevada State Engineer; and presented testimony at a state administrative hearing in support of NPS protests of water rights applications in the Amargosa Desert.

Participated in the interagency effort to prevent the extinction of the endangered Devils Hole pupfish (*Cyprinodon diabolis*). Activities included conducting surveys of young-of-the-year fish, summary and analysis of data, presentations to the public and professional organizations, organization of a science workshop and structured decision meeting, and participation on the interagency “unified command committee” for recovery actions.

Helped draft NRPC comments and identify components and authorities needed to establish an incident command system for management of recovery actions related to the Devils Hole pupfish.

Assisted in the development of a work plan for the second phase of the *Death Valley Water Resources Stewardship Report*.

Provided oversight for the operation and data management of spring flow and water level monitoring gages at Devils Hole and Texas, Travertine, and Nevares Springs.

Provided oversight to an NPS contractor through a CESU agreement to conduct a study of crustal deformation in the Devils Hole area.

Compiled and evaluated water level and temperature data from the Department of Energy monitoring network in the Amargosa Desert.

Provided technical assistance for the draft *Environmental Impact Statement for Reconstruction of the Furnace Creek Water Collection System*.

Assisted in review of proposals for underground injection of contaminants and in review of nutrient and contaminants issues related to Devils Hole pupfish.

Managed a USGS agreement to complete work and provided interpretation of geologic logs for monitoring wells located near Devils Hole.

Provided oversight to NPS contractors to prepare and publish a journal article on water level declines in the Amargosa Desert.

Assisted in compiling and reviewing abstracts for workshop talks and participated in the 2006 Devils Hole Workshop.

Devils Postpile National Monument

Provided hydrogeologic analysis and recommendations for well construction.

Ebey's Landing National Historical Reserve

Provided technical review and comment on the draft *Ebey's Landing National Historical Reserve Coastal Resources / Coastal Watershed Condition Assessment*.

Provided technical and policy review and evaluation of the proposed project “Functional Assessment and Historical Analysis for Restoring Crockett Lake.”

Reviewed preliminary GIS based assessment. Worked with region and the NRPC Natural Resources GIS Program to obtain appropriate GIS format/structure guidelines.

Golden Gate National Recreation Area

Completed the *Water Resources Foundation Report for Golden Gate National Recreation Area*.

Provided a technical review of the draft *Coastal Water Resources / Watershed Condition Assessment for Golden Gate National Recreation Area / Point Reyes National Seashore*.

Worked with Colorado State University cooperators and park staff to prepare a proposal entitled “Data Collection and Detailed Restoration Design for the Rodeo Beach Wetland Complex.”

Approved the release of funds for the NRPP Disturbed Lands Project “Complete Restoration of Salmonid Habitat at Banducci” based on a presentation provided by the contractor.

Researched chain of title to park lands regarding the severance of water rights in support of wetland restoration project and continued assessment of alternatives for water rights exchange in support of wetlands rehabilitation.

Prepared a summary of permit requirements for installation and decommissioning of shallow monitoring wells for wetland studies in the park.

Provided water right guidance for the resolution and acquisition of land and water rights from the Zen Center on Green Gulch.

Continued assistance with park staff and private consultants to design an effective bridge for Redwood Creek in the Muir Beach area.

Reviewed and provided comments on the report *Evaluation of Fish and Habitat Characteristics Upstream and Downstream of a Well in Redwood Creek, Marin County*.

Provided consultation with San Francisco State University on NPS knowledge of past introductions of Diamond Turbot (Halibut) in and around Golden Gate National Recreation Area.

Provided technical assistance for a possible wetland restoration project at Stinson Beach.

Reviewed Crissy Field marsh proposal to be submitted for NPS-USGS partnership program funding in FY2007.

Continued technical assistance and document review related to pharmaceuticals and the active ingredients in personal care products in runoff from irrigation of Crissy Field with treated sewage. Reviewed draft report *Determining the Presence and Potential Estrogenic and Androgenic Activity of Chemicals Sequestered by a Polar Organic Chemical Integrative Sampler (POCIS) in the Golden Gate National Park*.

Great Basin National Park

Evaluated Nevada water right applications for potential impacts to park resources and water rights and prepared protests of applications where needed.

Completed technical oversight of USGS hydrologic study (to determine susceptibility of park water resources to ground-water pumping adjacent to the park) and the final USGS interpretive report.

Provided oversight of an agreement with USGS to operate and maintain the Lehman

Creek stream gage.

Continued negotiations with USDA Rural Development, regarding application by Baker Water and Sewer General Improvement District for a water supply well adjacent to the park, and NPS concerns about pumping effects on Lehman Caves.

Participated on the hydrology technical review team for the Clark, Lincoln, and White Pine Counties Ground-Water Development Project Environmental Impact Statement.

Participated in pre-hearing conference on Southern Nevada Water Authority (SNWA) ground-water applications adjacent to park.

Coordinated with the Office of the Solicitor, the regional office, and the park the development and implementation of a technical and legal strategy for state administrative hearing and negotiation discussions, for applications by SNWA for ground-water development in Spring Valley.

Submitted written expert witness reports that addressed the hydrogeology of the Spring Valley area and water rights of Great Basin National Park to the Nevada State Engineer in preparation of a state administrative hearing on SNWA applications.

Evaluated ground-water flow model developed by SNWA in preparation for a state administrative hearing on SNWA applications in Spring Valley and submitted expert witness rebuttal report.

Coordinated with Department of the Interior liaison on SNWA Spring Valley ground-water development project.

Negotiated a stipulated agreement with SNWA to secure protection of park resources and resolve the NPS' protests of

SNWA ground-water applications in Spring Valley through a comprehensive plan for monitoring, management and mitigation.

Review final report from a WRD funded project that inventoried and documented all springs and seeps in the park.

Uploaded water quality data from the aquatic spring survey and assessment to new STORET.

Reviewed and began revising a draft report on Bonneville cutthroat trout restoration submitted for publication in the WRD technical series.

Hagerman Fossil Beds National Monument

Developed a ground-water monitoring plan and assisted in planning for a new water supply well.

Provided advice on filing a change in ownership application for a NPS acquired well.

Haleakalā National Park

Served as contracting officer's technical representative for a contract for the installation of a hydrologic monitoring system in the Kipahulu area.

John Muir National Historic Site

Inspect bank erosion issue near the John Muir Gravesite.

Attended a meeting with stakeholders concerned about impacts to Alhambra Creek from a new storm water drain upstream from the park. Additionally, made recommendations for maintenance while inspecting another storm water drainage system inside the park.

Reviewed a geomorphic assessment report of the Mount Wanda watershed area that details stream measurements of channel shape and gradient.

Kaloko-Honokōhau National Historical Park

Provided policy and technical review of the final report entitled *Assessment of Coastal Water Resources and Watershed Conditions at Kaloko-Honokōhau National Historical Park (Hawaii)*.

Coordinated with the Hawaii Commission on Water Resources to monitor well construction and drilling activities in the vicinity of the park.

Evaluated current rate of ground-water development in the Kona area and compared it to that predicted by a 1999 USGS study.

Provided project oversight to WRD funded project, “Determining Subterranean Groundwater Nutrient Input to Kaloko-Honokōhau National Historical Park’s Coastal Ocean Ecosystem.”

Reviewed various technical issues and documents, including draft pollution prevention plan of an up gradient industrial park.

Evaluated Hawaii water right applications for potential impacts to park resources.

Advised park staff on available regulatory protections for wetlands along the park boundary.

Developed an analytical method to relate a reduction in freshwater discharge to a change in ground-water salinity.

Developed a draft project plan for protection of submarine ground-water discharge in the park.

Provided a water level and conductivity meter and trained park staff to monitor ground-water salinity.

Kings Canyon National Park

Inspected conditions associated with a poorly-engineered highway bridge near the Cedar Grove development. Provided recommendations to park staff on important elements needed for a new bridge.

Lake Mead National Recreation Area

Evaluated Nevada water right applications and filed protests to protect park water rights and resources.

Compiled water right summaries for selected hydrographic basins in the Colorado Groundwater Flow System of Nevada.

Provided technical oversight of work by GeoTrans, Inc., to develop a numerical ground-water flow model of the Lower Colorado Flow System (LCFS), which comprises selected areas of the ground-water shed for regional warm springs that discharge in the park.

Provided technical oversight of USGS geophysics study to delineate deep sedimentary basins in an area north and west of the park as part of effort to identify source of regional warm water springs that discharge in the park.

Completed technical oversight of USGS mapping projects and final published maps of surficial geology and geologic cross-sections of an area north and west of the park in the LCFS.

Provided technical oversight of USGS study to quantify evapotranspiration in an area north and west of the park in order to help determine the annual water budget of the LCFS.

Continued implementation of monitoring and ground-water management provisions of negotiated settlements with the Southern Nevada Water Authority (SNWA) and with Vidler Water Company, Inc.

Coordinated the development and implementation of a technical and legal strategy with the Office of the Solicitor, park, and other federal agencies; submitted an expert witness report to the Nevada State Engineer; and presented testimony at a state administrative hearing in support of NPS protests of water rights applications in Kane Springs Valley (Vidler Water Company).

Participated in the planning and organization of the annual conference of the Nevada Water Resources Association, including the presentation of a special session on issues regarding Coyote Spring and Muddy Springs that satisfied terms of an agreement with SNWA. Gave talk on the ongoing Department of Interior effort to develop a numerical ground-water flow model for the LCFS to predict effects of ground-water pumping on springs, streams and wetlands.

Provided technical oversight on USGS agreements to operate and maintain stream gages at Rogers and Blue Point Springs and Virgin River (near Overton).

Coordinated with Virgin Valley Water District on the development of a hydrologic monitoring and management plan for the lower Virgin River.

Reviewed *Floodplain Statement of Findings for the North Shore Road Project*.

Advised park on endocrine disruption and nutrient issues related to draft reports and proposed public information releases.

Lake Roosevelt National Recreation Area

Conducted a riparian restoration experiment to determine the feasibility of diverting a small, entrenched stream to re-establish the hydrology of a degraded wetland.

Provided detailed advice on survey plans, protocols, and standard operating

procedures needed for proper monitoring of sediments and fish at a Superfund site. Helped review draft EPA fish tissue data and report covering diverse parts of the lake. Helped review content of large quantities of past water quality, contaminants, and hydrology information.

Lassen Volcanic National Park

Facilitated the incorporation of edits made to the park's GIS hydrographic coverage into the National Hydrography Dataset.

Mount Rainier National Park

Served as WRD point of contact for the Fluvial Geomorphologist position supported by the Natural Resources Challenge.

Nez Perce National Historical Park

Reviewed recommendations for water rights from the Idaho Department of Water Resources.

North Cascades National Park

Evaluated the feasibility and value of three wetland restoration projects proposed as wetland impact compensation from the *Golden Mine NRDA Proposed Restoration Project Descriptions and Cost Estimates Report*.

Reviewed draft report on WRD funded project "Development of Stream Benthic Macroinvertebrate Biomonitoring Protocols for North Cascades National Park Service Complex and Adjacent USFS Lands." Advised park on the national wadeable streams report and methods for determining minimum detectable differences.

Facilitated the incorporation of edits made to the park's GIS hydrographic coverage into the National Hydrography Dataset.

Olympic National Park

Provided technical advice and comment on the draft *Olympic National Park General Management Plan/EIS*.

Provided continuing assistance related to the proposed removal of two dams on the Elwha River, including the development of a plan for a pre-drawdown of Lake Mills to assist with the management of sediment in the lakebed.

Assisted park in revising scope of Elwha River sediment project funded by NPS-USGS partnership program.

Provided a technical review of the first draft *Coastal Water Resources / Watershed Condition Assessment for Olympic National Park*.

Provided comments on quality control progress being made by Oregon State Low Level Nutrient Lab and a summary of new technical developments in national water quality meetings related to the park priority of detecting small changes away from pristine conditions.

Advised park on potential environmental issues of a proposed use of a carbamate dock treatment compound.

Point Reyes National Seashore

Provided a technical review of the draft *Coastal Water Resources / Watershed Condition Assessment for Golden Gate National Recreation Area / Point Reyes National Seashore*.

Assisted in the completion of the draft *Point Reyes National Seashore Water Resources Stewardship Report*.

Collected site information in support of applications to convert consumptive use rights to instream flows.

Provided water rights guidance to resolve the protest of the North Marin Municipal District's change application for the acquired Giacomini water right on Lagunitas Creek.

Provided technical review of the

Development Advisory Board package for the "Giacomini Wetlands Restoration Project."

Conducted an on-site NPSTORET training class.

Pu'uhonua o Hōnaunau National Historical Park

Provided policy and technical review of the final report entitled *Assessment of Coastal Water Resources and Watershed Conditions at Pu'uhonua o Hōnaunau National Historical Park (Hawaii)*.

Pu'ukoholā Heiau National Historic Site

Provided a technical review of the draft *Coastal Water Resources / Watershed Condition Assessment for Pu'ukoholā Heiau National Historical Park (Hawaii)*.

Redwood National Park

Provided a technical review of the first draft *Coastal Water Resources / Watershed Condition Assessment for Redwood National & State Parks*.

Obtained, entered, reformatted, and quality assured / quality controlled additional water quality data for upload to new STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

San Juan Island National Historical Park

Provided a technical review of the draft *Coastal Water Resources / Watershed Condition Assessment for San Juan Island National Historical Park (Washington)*.

Sequoia National Park

Provided technical assistance for implementation of the Halstead Meadow pilot wetland restoration project, including technical review and comment on a report entitled *Wetland Delineation in Upper Halstead Meadow and on the draft report Analysis of Meadow Hydrology, Vegetation, and Soils and Suggestions for Restoration of Upper Halstead Meadow*, prepared by

cooperators from Colorado State University.

Advised park and Denver Service Center staff on wetland compliance requirements for placing riprap at an eroding culvert on the Generals Highway and for future construction of a bridge at this location.

Provided technical information on issues relating to the deposition of phosphorus from air sources, advised the park on which nutrient parameters to monitor, and confirmed that some source documents the park was using were of high quality.

USS Arizona Memorial

Reviewed *Floodplain Statement of Findings for the New Visitor Center Project*.

Whiskeytown-Shasta-Trinity National Recreation Area

Provided park staff with information related to a spill investigation and data from Willow Creek while continuing to serve as WRD project officer on a water monitoring project for Willow Creek.

Yosemite National Park

Visited the Poopenaut Valley area of the park and made recommendations for future studies of the Tuolumne River to assist in the development of a Wild and Scenic River Comprehensive Management Plan.

Provided advice to park staff on issues related to bank erosion on the Merced River near park infrastructure.

Prepared a declaration for a U.S. District Court case in California filed against the Secretary of the Interior regarding the Yosemite Valley Plan and provided Rebuttal Declarations for submission to court case related to the Merced River Plan.

Provided an assessment of potential impacts of ground-water pumping in the Crane Flat area and investigated hydrogeologic

conditions at the Yosemite West area.

Participated in the Floodplain Restoration in East Yosemite Valley – Vegetation Workshop.

Assisted park staff in downloading river stage data from recorders loaned from WRD's inventory of equipment.

Facilitated the transfer of WRD pump samplers from Sequoia Kings Canyon National Park to Yosemite National Park for continued use in the field.

Advised park staff on how to get hard copies of National Wetlands Inventory maps digitized through the USFWS.

SOUTHEAST REGION

Big South Fork National River and Recreation Area

Reviewed a State of Tennessee Aquatic Resources Alteration Permit and mining permit applications and forwarded these to the park for review.

Reviewed and provided comments for a proposed coal mine operation outside, but upstream, of the park.

Provided technical and policy review and evaluation of the *Big South Fork National River and Recreation Area and Obed Wild and Scenic River Oil and Gas Management Plan and Environmental Impact Statement*.

Provided water quality data from new STORET and the USGS National Water Information System for the South Fork Cumberland watershed, including the New River watershed, to support the development and implementation of a water monitoring plan.

Biscayne National Park

Participated on the interdisciplinary team addressing coral reef and seagrass restoration actions and the development

of programmatic environmental impact statements for restoration.

Provided technical assistance to the park on the development of a cooperative fisheries management plan.

Assisted in review and completion of a WRD Technical Report entitled *Groundwater Characterization and Assessment of Contaminants in the Marine Areas of Biscayne National Park* on the results of a USGS contracted study.

Reviewed responses to requests for interest from CESU members and private entities for planned assessment of marine resources, working with the Coastal Watershed Condition Assessment Coordinator.

Reviewed technical documents and issues related to the landfill and ammonia while serving as WRD project officer on project entitled “Development and Implementation of Water Flow Needs for Biscayne National Park Using Adjacent Coastal Wetland Indicators.”

Provided nutrient, bacterial, and physical water quality data to Center for Marine Science at the University of North Carolina-Wilmington for a study of aquatic environmental damage in south Florida before and after Hurricane Andrew.

Provided comments and recommendations to the Associate Director concerning a fund raising fishing tournament at BISC proposed by local park supporters.

Discussed water reuse issues with the superintendent and resource management staff.

Obtained, entered, reformatted, and quality assured / quality controlled a variety of water quality data for upload to new STORET.

Blue Ridge Parkway

Proposed and assessed site investigation approaches and methodologies that would minimize surface impacts during ground-water site characterization studies on park lands yet achieve the desired site characterization. Relocated wells to better assess the possibility that contamination from a landfill had spread beneath park via ground-water pathway.

Provided technical review of the project “Construct Mt. Pisgah Terraced Wastewater Treatment System” for the Development Advisory Board.

Buck Island Reef National Monument

Inspected the Army Corps of Engineers’ Big Ditch project and provided WRD interdisciplinary comments to resource management staff based on flood, wetland, water quantity, water quality, and contaminants issues.

Participated in planning process with park staff and USGS field scientists in developing strategy to assess the 2005 coral reef bleaching event. Drafted interagency agreement to transfer watershed condition assessment high priority project funds for USGS analysis of video monitoring data.

Reviewed progress report, outline, and stressor table for the coastal resources / coastal watershed condition assessment project from the cooperator.

Provided liaison and coordination with USGS to conduct research evaluating the performance of “no-take” marine reserves.

Canaveral National Seashore

Reviewed progress report containing retrospective analysis of water quality data and proposed monitoring network for Mosquito Lagoon.

Cape Hatteras National Seashore

Provided policy and technical review of the final report entitled *Assessment of Coastal Water Resources and Watershed Conditions at Cape Hatteras National Seashore (North Carolina)*.

Provided advice regarding ongoing (and related) issues of campground flooding, draining wetlands, water quality, and ORV access to beaches.

Provided review and comment on two funding proposals for water pollution studies.

Cape Lookout National Seashore

Assisted Denver Service Center staff on wetland compliance requirements for the park's *Historic Village Reuse Implementation Plan and Environmental Assessment*.

Carl Sandburg Home National Historic Site

Provided peer review of a report on an investigation of fish health within Front Lake.

Chattahoochee River National Recreation Area

Completed policy and technical review and comments regarding a Federal Energy Regulatory Commission application and environmental compliance for the relicensing of the Morgan Falls Dam.

Chickamauga & Chattanooga National Military Park

Provided preliminary floodplain assessment of a proposed development area in Moccasin Bend.

Continued as project coordinator for investigation to characterize karst groundwater and delineate recharge zones.

Congaree National Park

Received the final report for the project "Species Diversity and Condition of the Fish Community in Congaree Swamp

National Park."

Cumberland Gap National Historical Park

Provided guidance on how to setup NPSTORET metadata and import existing datasets.

Dry Tortugas National Park

Provided liaison and coordination with USGS to conduct research evaluating the performance of "no-take" marine reserves.

Developed interagency agreement with the NOAA Center for Coastal Monitoring and Assessment for joint assessment of the park under the NOAA Biogeographic Assessment of the Tortugas Ecological Reserve.

Everglades National Park

Reviewed and signed the *Statement of Findings for Wetlands and Floodplains: Proposed Tamiami Trail Modified Water Deliveries*.

Advised park management on wetland compliance requirements for proposed post-Hurricane Wilma dredging at Flamingo.

Advised park staff on wetland compliance requirements for a proposed Miccosukee Tribe housing project.

Fort Pulaski National Monument

Provided policy and technical review of the final report entitled *Assessment of Coastal Water Resources and Watershed Conditions at Fort Pulaski National Monument (Georgia)*.

George Washington Carver National Monument

Began working with park staff on technical assistance in the development of a management plan for the Arkansas darter (*Etheostoma cragini*).

Great Smoky Mountains National Park

Advised consultants to the park on appropriate wetland functional assessment

methods for use in an environmental impact statement for the proposed Foothills Parkway.

Provided review and comment on a proposal to open park streams to brook trout fishing based on completed impact studies and assessments.

Gulf Islands National Seashore

Provided benthic macroinvertebrate and physical water quality data to the Army Corps of Engineers' Research and Development Center for a study to identify foraging habitat of the endangered Gulf Sturgeon in the northern Gulf of Mexico.

Provided detailed recommendations on chemical analyses needed before accepting dredge spoil sand onto park beaches.

Jean Lafitte National Historical Park and Preserve

Provided review and comment on *Implementation Plan for Documenting Davis Pond Diversion Ditch Impacts on the Barataria Preserve Fish Populations*.

Supervised detailee in reviewing technical assistance request and developing initial approach to managing boating impacts on seagrass resources.

Mammoth Cave National Park

Provided programmatic oversight, policy, and technical review for the *Water Resources Management Plan : Mammoth Cave National Park, Kentucky*.

Reviewed *Floodplain Statement of Findings for the Green River Ferry Project*.

Provided advice on lab quality assurance/ quality control, detection limit, and dioxin issues.

Moore's Creek National Battlefield

Provided technical review for the *Moore's*

Creek National Battlefield Geologic Resource Evaluation Report.

Natchez Trace Parkway

Advised Denver Service Center planners on wetland compliance requirements and wetland delineation cost estimates for a proposed bike/hike trail on the parkway near Clinton, Mississippi.

Advised Denver Service Center planners on wetland compliance requirements for the Pigeon Roost Creek Bridge replacement project.

Provided technical and policy review and evaluation of the *Natchez Trace Parkway: Lindsey Creek, Threet Creek, County Road 85, and Highway 13 Bridge Replacements Environmental Assessment*.

Reviewed *Floodplain Statement of Findings for the Lindsey Creek, Threet Creek, County Road 85, and Highway 13 Bridge Replacements Project*.

Obed Wild and Scenic River

Continued oversight of a USGS study of streamflow associated with geomorphologic processes and vegetation of alluvial surfaces and conducted a field review of study sites with the investigator.

Continued oversight of a multi-year, paired-basin study by the USGS to investigate the effects of small and medium sized impoundments on streamflow and determined that the final report for this study will include results from a second NPS funded, USGS hydrologic study.

Provided technical and policy review and evaluation of the *Big South Fork National River and Recreation Area and Obed Wild and Scenic River Oil and Gas Management Plan and Environmental Impact Statement*.

Reviewed a State of Tennessee Aquatic

Resources Alteration Permit and mining permit applications and forwarded these to the park for review.

Assisted the Office of Natural Resource Information Systems in determining watershed areas for impoundments in the park watershed.

Provided oversight for the digitizing of aerial photography covering about half of the park.

Russell Cave National Monument

Continued as project coordinator for investigation to characterize karst groundwater and delineate recharge zones.

Salt River Bay National Historical Park and Ecological Preserve

Participated in planning process with park staff and USGS field scientists in developing strategy to assess the 2005 coral reef bleaching event.

Received and reviewed progress report, outline, and stressor table for the coastal resources / coastal watershed condition assessment project from the cooperator.

Drafted interagency agreement to transfer watershed condition assessment high priority project funds for USGS analysis of video monitoring data.

Shiloh National Military Park

Helped to coordinate review of a fish passage issue associated with a road project at Dill Creek.

Obtained, entered, reformatted, and quality assured / quality controlled additional water quality data for upload to new STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Stones River National Battlefield

Reviewed *Floodplain Statement of Findings for the Improvements to Self-guiding Tour*

Routes Project.

Timucuan Ecological and Historic Preserve

Designed experiment for re-establishing open water habitat of historical pond.

Provided technical assistance in determining the cause of the recent willow encroachment in Spanish Pond.

Vicksburg National Military Park

Provided consultation and discussion with regional staff on the development of an environmental assessment for piscicide use on an invasive fish eradication project.

Developed a sample scope of work for wetland mapping and functional assessment projects.

Obtained, entered, reformatted, and quality assured / quality controlled additional water quality data for upload to new STORET in preparation for producing a baseline water quality data inventory and analysis report.

Virgin Islands National Park

Participated in planning process with park staff and USGS field scientists in developing strategy to assess the 2005 coral reef bleaching event.

Received and reviewed progress report, outline, and stressor table for the coastal resources / coastal watershed condition assessment project from the cooperator.

Drafted interagency agreement to transfer watershed condition assessment high priority project funds for USGS analysis of video monitoring data.

Met with park staff and provided advice on outliers, statistical power, and general long-term monitoring issues.

Provided guidance on how to setup

NPSTORET metadata and a quality assurance review of currently entered water quality data.

Virgin Islands Coral Reef National Monument

Provided liaison and coordination with USGS to conduct research evaluating the performance of “no-take” marine reserves.

Participated in planning process with park staff and USGS field scientists in developing strategy to assess the 2005 coral reef bleaching event.

Received and reviewed progress report, outline, and stressor table for the coastal resources / coastal watershed condition assessment project from the cooperator.

Drafted interagency agreement to transfer watershed condition assessment high priority project funds for USGS analysis of video monitoring data.



Fort Jefferson, Dry Tortugas National Park (Keteles, 2006).



Fort Jefferson, Dry Tortugas National Park (Keteles, 2006).

TECHNICAL ASSISTANCE PROVIDED BY NATURAL RESOURCE CHALLENGE AQUATIC RESOURCE FIELD PROFESSIONALS

TECHNICAL ASSISTANCE INTERNATIONAL

Cambodia

Provided requested site review, hydrologic comments, and presentations for a temple unit conservation effort at Angkor Wat Archeological Park.

TECHNICAL ASSISTANCE INTERNATIONAL

Compiled documents and information in response to a FOIA request from the Center for Biological Diversity on the federally listed American Wood Stork and NPS management actions.

Attended the National Threatened and Endangered Species Coordinator's Meeting and Training in April 2006 at Everglades National Park. Gave a Powerpoint presentation "Developing Biological Assessments under the Endangered Species Act" and the lessons learned from Cape Hatteras National Seashore and Cape Lookout National Seashore biological assessments on the Protected Species Interim Management Plan.

Helped plan the Eastern Rivers Summit.



*Interdisciplinary international team at Phnom Bakheng, Cambodia
(Michael Schuller, President, Atkinson Noland and Associates, 2006).*

TECHNICAL ASSISTANCE REGIONS, NETWORKS, PARKS

ALASKA REGION

Assisted Alaska Department of Fish and Game (ADF&G) with sockeye salmon research in the Kuskokwim River drainage including review of project proposals, study plans, logistical support, and supervision of data collection.

Assisted ADF&G with fish collection from the Nushagak drainage in southwest Alaska.

Arctic Network

Participated in vital signs scoping workshops, technical committee meetings, and ranking exercises.

Denali National Park and Preserve

Implemented the shallow lake monitoring plan in 30 lakes.

Glacier Bay National Park

Provided review comments and technical edits for two reports by park staff.

Kenai Fjords National Park

Provided technical assistance for a project studying aquatic habitat in the upper Nuka River.

Submitted two manuscripts for publication in peer reviewed journals. “Dynamic In-Lake Spawning Migrations by Female Sockeye Salmon” was accepted by *Ecology of Freshwater Fish*. “The Spawning Distribution of Sockeye Salmon in a Glacially Influenced Watershed; The Importance of Glacial Habitats” was accepted by *Transactions of the American Fisheries Society*.

Lake Clark National Park and Preserve

Participated on the NPS Pebble Mine Resource Management Team. Attended meetings, reviewed study plans, and

commented on fisheries resource issues concerning this potential mine.

Provided project oversight, wrote progress reports, and supervised data collection for a study investigating the escapement and population structure of Lake Clark sockeye salmon.

Provided project oversight and technical assistance for a research project studying the distribution and population structure of humpback whitefish (*Coregonus pidschian*) within the Lake Clark drainage.



Humpback whitefish captured in Lake Clark, Lake Clark National Park and Preserve (Irvine, 2006).

Proposed and secured funding, designed and wrote project work plan (in collaboration with ADF&G), and supervised data collection during a coho salmon escapement and harvest study at Silver Salmon Creek.

Received funding for two project proposals submitted in FY2006 (in collaboration with ADF&G), including projects studying sockeye salmon and coho salmon.

Administered contracts, agreements, and CESU agreements for fisheries and water resource projects.

Assisted with the development and testing of monitoring protocols for resident fish.

Noatak National Preserve

Designed and implemented a study to inventory freshwater fish assemblages.

Sitka National Historical Park

Reviewed and provided written comment on Coastal Watershed Condition Assessment scorecards and reports.

Southwest Alaska Network

Attended workshops, reviewed project proposals and phase reports, and provided technical assistance with fish and water resources.

Yukon-Charley Rivers National Preserve

Maintained long-term water quality monitoring stations.

INTERMOUNTAIN REGION

Represented NPS on the Biology Committee of the Upper Colorado River Basin Endangered Fish Recovery Program. Participated in the Nonnative Fish Control Workshop, a public meeting on nonnative fish control in the Yampa River, the Annual Researchers Meeting, Aspinall Unit Environmental Impact Statement meetings, and Flaming Gorge Work Group meetings.

Assisted USFWS with Upper Colorado River Basin Endangered Fish Recovery Program related field work: White/Green River Colorado pikeminnow population estimate, Upper Yampa River northern pike removal, Green River entrainment study, Lower Yampa River smallmouth bass and catfish removal, and Colorado River smallmouth bass removal.



Non-native northern pike from Echo Park, Dinosaur National Monument (Trammell, 2006).



Estimating entrainment of larval razorback sucker into a floodplain on the Green River (Trammell, 2006).

Participated in smallmouth bass summit convened by the Colorado Division of Wildlife to discuss issues of control and management.

Reviewed State of Arizona conservation plan for six fish species.

Attended Utah Division of Wildlife three species conservation agreement and strategy meeting.

Peer reviewed two articles for *North American Journal of Fisheries Management*.

Reviewed oil and gas leases.

Participated in regional review panels for water resources related project proposals.

In collaboration with park natural resource staff and the USGS Texas Water Science Center, collected stream flow data along a 200-mile reach of the Rio Grande Wild & Scenic River to characterize baseflow conditions.

In collaboration with park natural resource staff and the Water Rights Branch, formulated a request for a ground-water model simulation by the Texas Water Development Board to evaluate the potential impacts of ground-water developments in unregulated counties near the Rio Grande Wild and Scenic River on scenic river baseflows.

Arches National Park

Reviewed and corrected fish voucher lists, accounts, and references for the inventory and monitoring program.

Aztec Ruins National Monument

Acted as NPS lead for hydrology study funded by Colorado Plateau CESU through Fort Lewis College. This project is aimed at the identification of water sources impacting ruins and the development of effective methods to mitigate the water impacts.

Black Canyon of the Gunnison National Park

Provided fisheries and endangered fish recovery program expertise for water rights discussions.

Bryce Canyon National Park

Reviewed and corrected fish voucher lists, accounts, and references for the inventory and monitoring program.

Canyon de Chelly National Monument

Assisted with fish survey of Tsaile Creek.

Canyonlands National Park

Reviewed and corrected fish voucher lists, accounts, and references for the inventory and monitoring program.

Capitol Reef National Park

Worked on Fremont River issues, including removing a barrier restoring the roundtail chub and instream erosion control projects.

Reviewed and corrected fish voucher lists, accounts, and references for the inventory and monitoring program.

Assisted guest researchers from Mansfield University (Pennsylvania) and Dickinson State University (North Dakota) in fish survey.

Reviewed small stream bank stabilization projects and erosion control environmental assessment.

Researched and reported on presence of new non-native species, the white sucker (*Catostomus commersonii*), which can hybridize with native suckers.

Chaco Culture National Historical Park

Continued ongoing hydrological support to resource staff. The data collected support ongoing park efforts at assessing effects of climatic conditions on physical habitat and ecological conditions.

Chickasaw National Recreation Area

Collected baseline hydrologic data in support of Water Rights Branch efforts to protect park water resources (springs and streams) from the impacts of a large-scale ground-water development in the basin. Served as liaison to a state-sponsored aquifer study conducted to characterize ground-water resources in the basin and to anticipate the impacts of proposed large-scale ground-

water developments.

Helped initiate discussions with local community representatives concerning the development of an alternative public water supply (retirement of a well field).

Supported Water Rights Branch efforts to develop a ground-water and surface-water monitoring plan for a new aggregate mine in the basin of the park.

Chiricahua National Monument

Planned, coordinated and participated in treatment aimed at control of iron-reducing bacteria at new water supply well, Pinery Canyon. Collected water samples and trained park staff on interpretation of sample incubation results.

Curecanti National Recreation Area

Provided fisheries and endangered fish recovery program expertise for the Aspinall Unit Environmental Impact Statement and water rights discussions.

Dinosaur National Monument

Kept park appraised of changes in releases and requests for releases from Flaming Gorge Dam and other recovery program activities.

Review and commented on USFWS reports on Brown trout in Lodore Canyon and on smallmouth bass in Yampa Canyon.

Reviewed and corrected fish voucher lists, accounts, and references for the inventory and monitoring program.

Assisted Colorado State University with a fish survey.



Electrofishing in the Canyon of Lodore, Dinosaur National Monument (Trammell, 2006).

Fort Bowie National Historic Site

Continued direction and data analysis of the hydrological monitoring program. The program supports the park by providing documentation needed for water rights claims, understanding the relationship between ground-water pumping and spring flow, and establishing a long-term baseline of water availability for inventory and monitoring purposes.

Updated statement of work and engineering estimate for water supply well rehabilitation to be done in 2006. Contacted prospective bidders, coordinated issuance of Request for Quotation with contracting officer, and reviewed bids.



July 31, 2006, debris flow at Fort Bowie National Historic Site after intense rainfall (Filippone, 2006).

Gila Cliff Dwellings National Monument

Conducted site scoping, planning, and equipment purchase for stream gaging station. This station will provide baseline data on stream flows in support of long-term aquatic monitoring and understanding the effects of fire and climate change in the West Fork of the Gila River watershed.



Monitoring / field mapping channel health along the West Fork of the Gila River at Gila Cliff Dwellings National Monument (Balmat, 2006).

Glacier National Park

Contributed to the preparation of a successful funding proposal to assess water quality and aquatic communities in the North Fork of the Flathead River (NPS 'mentor' for a USGS Colorado Water Science Center proposal).

Glen Canyon National Recreation Area

Represented NPS on the San Juan River Recovery Program, commented on proposals, and corrected the fisheries bulletin.

Grand Canyon National Park

Reviewed Bright Angel Creek Environmental Assessment.

Organ Pipe Cactus National Monument

Continued technical support for ongoing monitoring at Quitobaquito Springs and pond to support an endemic endangered desert pupfish and a biologically rich oasis in the Sonoran Desert, which had been experiencing a declining trend in water

availability for a decade.

Conducted analysis and authored a chapter for the 2006 report on ground-water data gathered by the Ecological Monitoring Program at park monitor wells.

Conducted site scoping with WRD and park staff and developed plan for hydrology project at Quitobaquito Springs and pond. Authored proposal to Arizona Water Protection Fund. Proposal was not selected for funding.



Organ Pipe Cactus National Monument staffer uses a mirror to aim sunlight down a closed well and looks for a reflection to determine if the well is wet or dry (Filiponne, 2006).

Parashant National Monument

Worked with region and Lake Mead National Recreation Area staff during development of interim plan for the protection of historic resources at Tassi Spring.



Seep sampling at Tumacácori National Historical Park (Filiponne, 2003).

Saguaro National Park

Planned and wrote statement of work and engineering estimate for water supply well rehabilitation at Tucson Mountain District. Assisted park in scoping project prior to issuance of the request for quote, served as Contracting Officer's Representative on the project, conducted follow up well testing, and wrote report on the well condition.

Sonoran Desert Network

Trained staff in downloading and servicing a surface-water monitoring installation and developed a template for archiving and analysis of data.

Continued to provide technical support in development of site specific water quality and water quantity protocols for network aquatic resource monitoring.

Southern Plains Network

Attended Vital Signs Inventory and Monitoring Program workshop.

Tonto National Monument

In support of inventory and monitoring efforts, completed implementation of surface-water monitoring at Cave Canyon Spring.

Tumacácori National Historical Park

Initiated ground-water monitoring as part of a larger effort to understand and preempt widespread die-off of riparian trees in the Upper Santa Cruz River Basin.

Developed a fact sheet pertaining to public health issues associated with the presence of raw and treated sewage effluent in the Santa Cruz River.

ZION National Park

Reviewed and corrected fish voucher lists, accounts, and references for the inventory and monitoring program.

Participated in the Virgin River Recovery Program by attending Recovery Team and Spinedace Recovery Team meetings.

MIDWEST REGION

Contributed, as a member of the Midwest Regional Science Committee, to a regional Science Strategy document and a park needs assessment.

Participated in regional review panels for water resources related project proposals.

Buffalo National River

With park natural resource staff, completed a geomorphic survey to support the development of an environmental assessment for the removal of a bridge.

Grand Portage National Monument

Worked cooperatively with aquatic specialist from Grand Portage Band of Lake Superior Ojibwa to 1) analyze water quality data from Grand Portage Creek and surrounding tribal waters and 2) begin developing appropriate nutrient criteria.

Assisted with sediment core collection for historical nutrient reconstructions in cooperation with staff from the Grand Portage Band, the USGS, and the St. Croix Watershed Research Station.

Great Lakes Network

Along with the Midwest Regional Fisheries Biologist, initiated and coordinated an aquatic invasive species (AIS) workshop, sponsored by Minnesota, Wisconsin, and Michigan Sea Grant offices, to provide AIS prevention tools to parks.

Provided technical assistance with data analysis protocols and field assistance with water quality and surface sediment sampling for the network diatom biomonitoring project.

Hot Springs National Park

In collaboration with park natural resource staff and the USGS Arkansas District, developed a USGS study plan to characterize the degree of hydraulic connection between the geothermal system, the hypothesized recharge area for park hot springs, and an area of proposed highway expansion/blasting.

Contributed to the preparation of a successful funding proposal for purchase of water and soil radon-monitoring equipment.

Isle Royale National Park

In cooperation with volunteers and the Midwest Regional Fisheries Biologist, conducted a pilot survey of shoreline rock pools to document potential effects of proposed Coast Guard lighthouse activities and support development of a full proposal.

Mississippi National River and Recreation Area

Completed a draft water resources information and issues overview report to support water resource management activities and interagency coordination.

Cooperated with USGS investigators to develop a successful proposal to address nutrient cycling and biological effects in unstudied backwaters.

Niobrara National Scenic River

In collaboration with park staff and the Water Rights Branch, participated in discussions with the State of Nebraska concerning the establishment of in-stream flow requirements/protection.

In collaboration with park natural resource staff and the USGS Nebraska District, contributed to the preparation of a successful funding proposal for a characterization of sediment quantity/quality in support of the development of an environmental assessment for removal of the Cornell Dam.

Ozark National Scenic Riverways

In collaboration with park natural resource staff and the USGS Missouri District, initiated development of a source water assessment program for rivers and world-class springs.

Continued participation on a multi-agency committee assembled to review the results of USGS studies conducted with the aim of evaluating the impacts of proposed lead mining west of the park.

Pictured Rocks National Lakeshore

Developed a successful proposal to inventory and assess vernal forest pool resources.

Provided technical review and comments on the draft coastal watershed condition assessment.

Saint Croix National Scenic Riverway

Provided written review of proposal for the project “Determining Effects of Mercury on Amphibians in the St. Croix National Scenic Riverway.”

Cooperated with USGS investigators to develop a successful proposal to address nutrient cycling and biological effects in unstudied backwaters.

Contributed to subcommittee activities of the interagency St. Croix Basin Water Resources Planning Team. Helped develop a watershed-wide water quality monitoring plan and strategies for achieving phosphorus reduction goals.

Provided primary oversight for the Lake St. Croix historical hypoxia project and conducted oxygen profile monitoring in cooperation with network and park staff.

Assisted with qualitative and quantitative zebra mussel monitoring in Lake St. Croix and the St. Croix Falls flowage.

Sleeping Bear Dunes National Lakeshore

With investigators from University of Wisconsin, Milwaukee, conducted pilot monitoring of zebra mussel and nuisance algal problems in nearshore Lake Michigan waters.



Sediment cores were collected from Lake St. Croix as part of an assessment of historical hypoxia in the lake’s bottom waters. Left to right: Dr. Donna Francis, Dr. Mark Edlund, and Caitlin Stewart (Moraska Lafrancois, 2006).



At left, invasive dreissenid mussels and mats of the alga Cladophora line parts of the Lake Michigan shoreline at Sleeping Bear Dunes National Lakeshore (Moraska Lafrancois, 2006). At right, quantitative samples of Cladophora were collected from Lake Michigan nearshore waters (Moraska Lafrancois, 2006).

Voyageurs National Park

Developed and conducted a volunteer supported project to determine differences in mercury burdens in native crayfish (important food web components) and the invading rusty crayfish.



Crayfish were collected in and near Voyageurs National Park for comparison of mercury burdens in native versus invading crayfish species (Moraska Lafrancois, 2006).

NATIONAL CAPITAL REGION

Served as regional goal contact for Government Performance Results Act Wetlands and Riparian/Stream land health goals.

Represented the region during the development and rollout of the Watershed Condition Assessment Program.

Acted as key official on a NPS / USGS / University of Maryland - Baltimore County project developing tools for natural resource managers to graphically explore the condition of water resources surrounding park lands.

Center for Urban Ecology

Provided technical assistance and leadership for two science communication projects: developing the Center's presence on the WWW and the production of a fifty-three page glossy publication describing the Center's activities in support of natural resources management.

Authored an article for the *Values & Challenges in Urban Ecology* publication, describing the extent and threat of impervious surfaces in watersheds surrounding region park lands.

Catoctin Mountain Park

Provided technical advice regarding the threat of contamination and environmental degradation of substances containing glycol.

Chesapeake & Ohio Canal National Historical Park

Provided technical assistance and biological opinions in support of several issues, including a fish kill, the threat of amphibian diseases discovered within the park, and the development of a fish ladder facilitating anadromous eel migration.

Provided GIS support on water resources during the scoping of NPS / George Mason University cooperative agreement that will provide insights on how the local public views threats to the water resource assets of the park.

Collaborated on course curriculum created by the NPS partner *Bridging the Watershed* related to teaching the geomorphology of an island in the Potomac River.

George Washington Memorial Parkway

Provided site assessments and hydrologic opinions in support of efforts to control beaver damage and in support of the environmental assessment of Jones Point Park.

Installed nine surface elevation tables in Dyke Marsh in a cooperative effort with the USGS Patuxent Wildlife Research Center to gather information on the quantity of sedimentation and degree of subsidence of the surface of this marsh.

Great Falls Park

Provided a site assessment and hydrologic opinions regarding restoration of trails impacted by a 100-year flood event.

Harpers Ferry National Historical Park

Provided site assessments and hydrologic opinions for several park projects, evaluating their potential impact on karst resources.

National Capital Region Network

Installed 15 water level loggers in support of Vital Signs Monitoring of water resources and trained network staff in the operation

and maintenance of the equipment.

Provided site assessment and field support in the documentation of magnolia bogs in National Capital Parks - East.

Rock Creek Park

Collaborated on course curriculum development of module created by the NPS partner "Bridging the Watershed," involving field activities related to teaching the ecology of anadromous fish.

Provided technical support for a cooperative effort between the park, USGS, and Montgomery County, Maryland, for the establishment of a new stream gaging station with the capability to continuously monitor water quality.

Provided technical support and opinion on several science communication projects, including scoping the condition of the park's natural resources and developing methods to present the Vital Signs Monitoring efforts on the www.

NORTHEAST REGION

Regional goal contact for Government Performance Results Act Wetlands and Riparian / Stream land health goals.

Reviewed and provided written comment on the draft *NPS 2006 National Management Plan*.

Attended annual New England Cluster science review meeting and presented a synthesis of projects along the northern region.

Provided oversight of region reporting to Goals IA4 a, b, and c.

Joined the international Air Quality Committee to support accreted Air Resource

Division job duties.

Provided a list of talking points and updated studies to the Regional Director's Representative for the Delaware River Basin Commission Federal Summit.

Participated in regional workshop for the conservation and management of submerged marine resources.

Regional goal contact for Government Performance Results Act Wetlands and Riparian/Stream land health goals.

Acadia National Park

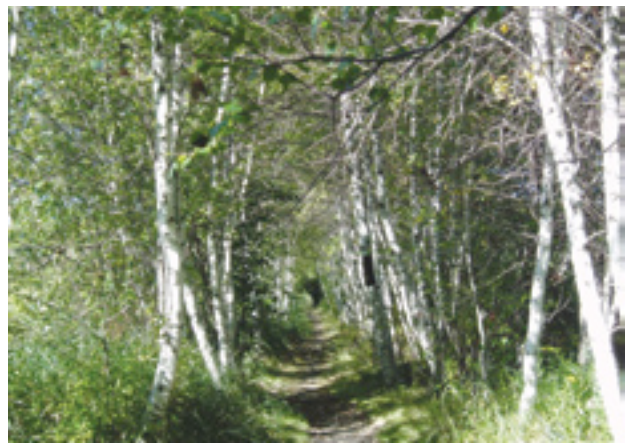
Initiated data review and assessment of monitoring locations and techniques for atmospheric deposition surface-water monitoring program.

Provided written comment on lead contamination EIS and assistance with planning for riparian zone protection.

Reviewed and provided substantive comment on draft rendition of *The Impact of Vehicle Traffic on Water Quality in Acadia National Park*.

Helped establish freshwater research needs in support of programming at the Schoodic Education and Research Center.

Evaluated potential and alternatives for trail construction and hydrologic impacts in support of the new trail management plan.



Trail bisecting wetland at Sieur du Mont, Acadia National Park (Ellsworth, 2006).

Discussed stream sedimentation at Sieur du Mont, streambank erosion control alternatives, and ground-water nutrient inputs.



Acadia National Park staff completed a streambank stabilization at Sieur du Mont (Ellsworth, 2006).

Evaluated beaver dam flooding issues and culvert construction for fish passage.

Completed extensive statistical review of the park's Freshwater Monitoring Program in support of an assessment of the effectiveness of the program in meeting monitoring objectives.

Appalachian National Scenic Trail

Attended a USGS workshop to define research needs and opportunities in the geographic area of Appalachia, which

resulted in plans to use the trail as a mega-transect for regional assessment.

Co-authored two grant submissions for studies of atmospheric deposition along the trail corridor to construct an ecological impacts model and perform soil sampling to assess chemical change.

Assateague Island National Seashore

Provided written comments on the project “Bathymetric Survey and Sediment Mapping of Virginia’s Portion of Chincoteague Bay.”

Booker T. Washington National Monument

Provided comments to superintendent regarding site construction plan, stormwater management, and riparian buffer protection related to upstream development outside of the park.

Colonial National Historical Park

Provided review and written comment on a construction water management plan and concerns related to construction releases to surface-water resources.

Delaware Water Gap National Recreation Area

Coordinated NPS response for the Delaware River Basin ecological flow committee to support native and threatened aquatic communities and recreational fisheries.

Got the park established in the first round of the Watershed Condition Assessment program to support a Water Resource Stewardship Plan.

Provided guidance on written comment for the Pennsylvania Department of Environmental Quality on a National Pollutant Discharge Elimination System permit application in Delaware Township, Pike County.

Established agreement to acquire and

share provisional data from New York City reservoirs in response to a request from the park’s chief of natural resources.

Investigated potential need for NEPA review associated with upcoming flow change recommendations on the Delaware River.

Eastern Rivers and Mountains Network

Identified and helped establish cooperator for design of the network’s water quality monitoring program. Provided liaison support and watershed reviews for this project.

Attended inventory and monitoring workshop to improve program understanding, engaged WRD contacts on program vision and inclusion of watershed condition assessments, and promoted the need for common monitoring protocols.

Attended decision meetings of the Science Advisory Committee and provided comment on vital sign selection.

Eisenhower National Historic Site

Provided the park natural resource manager with written guidance and contacts for appropriate cattle crossings and techniques for streams.

Farmington National Wild and Scenic River

Provided written comments on scope of work for a proposed hydrogeologic assessment.

Fire Island National Seashore

Represented NPS on technical committees for the Army Corps of Engineers Fire Island to Montauk Point Reformulation Planning to develop storm damage reduction and protection for the southern shore of eastern Long Island.

Coordinated and assisted with coastal research.

Represented NPS on The Nature Conservancy's Blue Point Bottomlands Council to develop restoration and protection of the Great South Bay ecosystem.

Represented NPS on The Nature Conservancy's Efroymson Fellowship Program to develop a conservation plan for Great South Bay.

Provided technical assistance regarding classification of wetlands for the development of vector control and monitoring program for communities within park boundaries.

Reviewed the project "Mapping submerged marine habitats at Fire Island."

Co-authored FY2009 funded project "Impacts of Beach Scraping and Artificial Dune Creation on the Natural Resources of Fire Island National Seashore."

Prepared project "Restoration of Wilderness Area Salt Marshes : Assessment of Mosquito Ditch."

Flight 93 National Memorial

Provided consultation and literature to support acid mine drainage assessments to the regional resource planning specialist.

Fort Necessity National Battlefield

Provided oral comments, supporting email, and contact with the region's environmental protection specialist regarding proposed changes to the water acquisition system.

Fredericksburg and Spotsylvania County Battlefields National Military Park

Evaluated model runs and design proposed by General Motors engineering contractor to maintain current wetland functional acreage and provide adequate stormwater drainage.

Reviewed and provided written comments on the park's internally produced water

management plan.

Gateway National Recreation Area

Reviewed and provided written comment on the report entitled *Assessment of Nutrient Loading to Jamaica Bay, Gateway National Recreation Area, and New York*, a USGS/NPS Technical Assistance Report.

Consulted with USGS toxics expert and provided protocols publication regarding appropriate methods for sampling the contaminant malathion at the request of park staff.

Coordinated with park staff and partner agencies during the development and construction of a 39 acre marsh island restoration in the Jamaica Bay Unit.



Restoration of Elders Point Marsh, Jamaica Bay Unit, Gateway National Recreation Area was a multi-agency partnership (Galvin Brothers, Inc., 2006).

Conducted pre-construction vegetation and benthic monitoring and year 1 post-construction nekton, vegetation, benthic, and bird monitoring for the Army Corps of Engineers funded restoration of Elders Point Marsh, Jamaica Bay Unit.



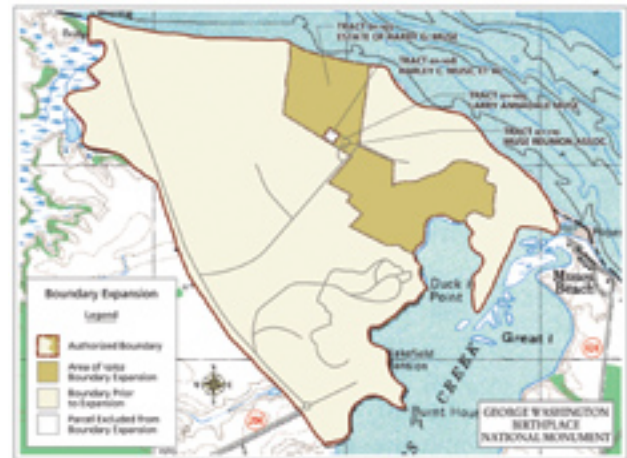
Collecting cores to assess benthic fauna and belowground biomass, Gateway National Recreation Area (Rafferty, 2006).

Prepared *Jamaica Bay Marsh Islands Ecosystem Restoration: Pre-Construction Monitoring Report, June 2006*.

Provided technical assistance regarding beach erosion at Riis Park, Jamaica Bay Unit.

George Washington Birthplace National Monument

Assisted with the collection of natural resource information and synthesis review to support the general management plan process. Moderated and participated in the park's natural resource roundtable.



GEWA boundary with proposed expansion.

Reviewed and provided written comment on *A Synthesis of Natural Resource Data for George Washington Birthplace National Monument: Land Use History, Geology, Paleontology, Relief and Soils, Water Resources*.

Governors Island National Monument

Provided review, written and oral comments on the water resource section of the general management plan.

Hopewell Furnace National Historic Site

Worked with the regional engineer to create a scope of work for a hydrologic analysis and drainage design in response to ongoing flooding issues for superintendent.

Johnstown Flood National Memorial

Initiated thermal study in response to park concerns regarding observed change in water temperatures potentially associated with streamside vegetation management.

Mid-Atlantic Network

Provided evaluation of candidate Vital Signs in support of the network's development of a monitoring program.

Commented on structure, provided selection candidates, completed web-based ranking process, and participated in a workshop to define vital sign selection and prioritization.

Provided evaluation of candidate Vital Signs in support of the network's development of a monitoring program.

Minute Man National Historical Park

Identified funding source, wrote successful grant proposal, and acted as project liaison to recreate stream that had been forced into an underground pipe.

Discussed methods for beaver control and benefits of retaining wetland area in transformed agricultural field.

Provided site assessments and/or hydrologic opinions in support of efforts to control beaver damage to park resources.

Morristown National Historical Park

Provided consultation to natural resource staff on adjacent development wastewater issue.

Researched and provided direction to park on potential water resource affects associated with proposed foam application to emulate snow for a film shoot in the park.

Northeast Coastal and Barrier Network

Participated in the network's Technical Steering Committee.

Northeast Temperate Network

Provided written and oral comments on the Freshwater Vital Sign Monitoring Plan produced by USGS-Maine.

Petersburg National Battlefield

Provided superintendent with hydrologic interpretation and advice on drainage to an adjacent landowner's property.

Richmond National Battlefield Park

Reviewed construction proposal, contacted staff from local agencies and developer, and provided written and oral comment on strategies for protecting water resources.

Provided site assessments and/or hydrologic opinions in support of efforts to control beaver damage to park resources.

Saratoga National Historical Park

Maintain correspondence with park staff and multiple agencies to interpret internal and external technical group discussions on polychlorinated biphenyl dredging.

Provided oral and written comments and pursued regulatory action regarding potential effects from ditch construction in wetlands contiguous to the Schuyler House Unit.



Wetlands and expanded ditch contiguous to the Schuyler House Unit, Saratoga National Historical Park (Ellsworth, 2006).

Saugus Iron Works National Historic Site

Co-authored grant proposal to monitor and interpret sodium chloride inputs for USGS/NPS funding source.

Shenandoah National Park

Provided advice and support for the development of project proposals for the servicewide Comprehensive Call.

Reviewed and provided written comment on contracted natural resource assessment report.

Upper Delaware Scenic and Recreational River

Coordinated NPS response for the Delaware River Basin ecological flow committee to support native and threatened aquatic communities and recreational fisheries.

Provided project development and oversight of USGS/NPS cooperative study for Special Protection Water standards.

Participated in review of a dwarf wedge mussel study and the causes for delinquency in reporting. Attended DWM modeling update with USFWS, Army Corps of Engineers, park staff, and principal investigator to review status of contracted work for an additional mussel study.

Investigated potential need for NEPA review associated with upcoming flow change recommendations on the Delaware River.

Provided oral comment following review of flood damage and proposed reconstruction with the park superintendent.

Valley Forge National Historical Park

Engaged USGS in cost minimization opportunities, acquired funding for two year monitoring extension, and coordinated purchase and installation of sediment equipment.

Consolidated expert reviews and provided project support for contracted sediment storage and remobilization study.

Provided support on compilation of potential projects for Valley Creek improvements.

PACIFIC WEST REGION

Initiated a two-year, WRD funded project to inventory and characterize wetlands in small parks.

Assisted multiple parks with writing and refining funding request proposals.

Continued to co-teach a BLM class entitled “Measuring and Monitoring Plant Populations.”

Participated in an interagency group (USGS, NPS, BLM) to create a framework for long-term, landscape-scale ecological monitoring in the Great Basin and Mohave ecoregions.

Golden Gate National Recreation Area

Assisted planning for several wetland restoration projects, including the Big Lagoon Wetland Restoration, the Rodeo Lagoon Wetland Restoration, and the Crissy Marsh Expansion.

Great Basin National Park

Assisted the WRD’s Water Rights Branch during negotiations with Southern Nevada Water Authority regarding ground-water rights applications to withdraw 91,224 acre-feet of groundwater annually in Spring Valley. The federal agencies managing land that would be affected by this project settled for a monitoring, management, and mitigation plan with SNWA just prior to the start of the September hearing which was held by the Nevada State Engineer regarding these applications.

Continued acting as NPS hydrologic lead regarding on-going BLM managed environmental impact statement evaluations of proposed Southern Nevada Water Authority water development project, the Clark, Lincoln, and White Pine Counties ground-water development project.

John Muir National Historic Site

Assisted with general management of aquatic resources.

Joshua Tree National Park

Worked with park physical scientist to purchase GeoEye (IKONOS) infrared imagery of the Pinto Basin to aid in the possible identification of phreatophytes that could be susceptible to proposed ground-water pumping adjacent to the park.

Klamath Network

Assisted WRD with initiating the watershed assessment project for Oregon Caves National Monument, Redwood National and State Parks, and Whiskeytown National Recreation Area.

Lake Mead National Recreation Area

Continued acting as NPS hydrologic lead regarding two on-going BLM managed EIS evaluations of proposed Southern Nevada Water Authority water development projects, including the Clark, Lincoln, and White Pine counties ground-water development project and the Virgin and Muddy Rivers surface-water development project.

Acted as NPS contact with the USGS for work to provide continuous monitoring of surface-water discharge at Rogers Spring, Blue Point Spring, and the Virgin River.

Conducted a synoptic discharge and temperature investigation at Blue Point Spring to evaluate adequacy of USGS gage installation.

Mount Rainier National Park

Continued to identify initiation mechanisms of debris flows for hazard planning purposes.



Tahoma glacier lateral moraine, Mount Rainier National Park (Kennard, 2006). Colored area collapsed during debris flow.

Continued to survey beds of the river channels and compare them to historic maps and an in-river survey done in 1910 to evaluate the rate of historic channel filling.



Stream surveyor at Mount Rainier National Park (Kennard, 2006).

Continued to identify and prioritize road segments prone to flood and debris flow damage and to develop options to protect these areas in a fish-friendly way.



Debris flow on Westside road, Mount Rainier National Park (Kennard, 2006).

Used an innovative solution to river aggradation for short-term flood protection at Mount Rainier National Park. Placed large wood (up to 40 tons/piece) by Chinook helicopter or with ground equipment in the White River floodplain to increase roughness and act as energy dissipaters, thus reducing the erosive power of flood flows.

North Cascades National Park

Presented data on the aquatic ecological effects of atmospheric nitrogen deposition at the Pacific Northwest Nitrogen and Sulfur Critical Loads Workshop, September 6-7, 2006.

Pinnacles National Monument

Assisted with implementing a floodplain restoration project.

With Pacific West Region cultural resources staff, initiated a watershed history study to address management concerns regarding water availability.

Point Reyes National Seashore

Assisted park with planning and data collection for the Giacomini Wetland Restoration Project.

San Francisco Bay Area Network

Assisted with efforts to initiate long-term ecological monitoring programs for amphibians, reptiles, rare plants, and wetlands.

SOUTHEAST REGION

Revised draft strategic plan for fisheries and aquatic resources in the region.

Acted as regional goal contact for FY2005-2008 NPS Strategic Plan Goal 1a1D—Land Health-Riparian and for Goal 1a2b—Species of Management Concern.

Served as the Regional Contact for Project Management Information System and Government Performance Reporting Act reporting goals (Wetlands and T & E Species).

Attended Gulf States Regional Panel for aquatic invasive species semi-annual meetings as NPS representative.

Guest lectured at Vickery Creek Middle School on the role of NPS in conserving aquatic resources.

Guest lectured at The Walker School on the role of NPS in conserving aquatic resources.

Participated in administering the annual Servicewide Combined Call by reviewing NRPP project proposals for regional selection.

Attended joint annual partnership meeting with USFWS, USGS, and NPS.

Provided comments on USFWS proposed rule to list black carp as an injurious species.

Reviewed four amendments to federal rules regarding fishing the South Atlantic, Gulf of Mexico, and Caribbean.

Acted as South Florida-Caribbean CESU coordinator in June/July 2006.

Performed collateral duties related to hunting issues in the region due to lack of wildlife biologist on staff.

Performed collateral duty as regional coordinator for the NSP Research Permitting and Reporting System.

Requested and compiled comments on the Florida Wildlife Commission proposal to reclassify the listing status for several endangered and threatened species.

Developed a summary/fact sheet of the *Endangered Species Act* and NPS responsibilities under the act for the region and linked it to on the region's Division of Science and Natural Resource Management website.

Served as regional contact for all region threatened and endangered species expenditures and data spreadsheets and Government Performance Reporting Act reporting information. Reviewed and verified the data for submittal to Washington and the Colorado Natural Heritage Program for NPS Access database.

Attended Southeast Aquatic Resources Partnership (SARP) semi-annual meetings as NPS representative.

Worked with SARP to develop the *Southeast Aquatic Habitat Plan* under the National Fish Habitat Initiative.

Big Cypress National Preserve

Reviewed and provided comments on the draft plan of operations for subsurface oil and gas explorations and 3-D geophysical seismic surveys.

Biscayne National Park

Reviewed and provided comments on the park's environmental assessment for the *Igloo Moon Grounding Site Restoration Plan*.

Big South Fork National River and Recreation Area

Reviewed and provided comments on the park's environmental assessment for the field management plan (restoration of open fields and meadows to natural conditions).

Assisted with fish inventory surveys.

Assisted the park in applying for \$30,000 in funds from the USFWS through the National Fish Habitat Initiative to restore fish habitat at two locations in the river.

Canaveral National Seashore

Reviewed and provided comments on the parks' environmental assessment for the fire management plan.

Cape Hatteras National Seashore

Compiled data on juvenile and adult fish from fishery-dependent and -independent data to assess fisheries in the sound.

Authored the biological assessment under a Section 7 Consultation of the *Endangered Species Act*.

Reviewed and provided comments on the draft biological opinion submitted by the USFWS in response to the parks' biological assessment for the Interim Protected Species Management Plan.

Provided technical assistance in development of the Wetland Management Strategy and Response Plan.

Provided examples and guidance on development of a wetland assessment methodology for determining the functional assessment and biological condition of the Buxton Woods wetlands.

Cape Lookout National Seashore

Assisted park with the development of Endangered Species Management Protocols and was the primary author of the biological assessment under a Section 7 Consultation of the Endangered Species Act.

Carl Sandburg Home National Historic Site

Assessed status of fish health in Front Lake and wrote a report of findings.

Chattahoochee River National Recreation Area



Jim Long, Southeast Region Fishery Biologist, with a striped bass captured from the Chattahoochee River below Morgan Falls Dam (Georgia Department of Natural Resources, 2006).

Assisted with wetland and stream restoration plans administered through the Corporate Wetlands Restoration Project at Johnson's Ferry Unit. Attended meetings and provided

technical assistance to staff and consultants on restoration plans.

Developed and conducted a Wetlands and Stream Ecology Education Program and training for the YCC Summer Program.

Reviewed and provided comments on the park's environmental assessment for the *Gunby Watershed Access Trail Restoration Plan*.

Assisted with Federal Energy Regulatory Commission (FERC) re-licensing of Morgan Falls Hydropower project by attending meetings and drafting study proposals.

Completed the shoal bass genetics study to assist the park with the FERC re-licensing of Morgan Falls Dam.

Continued shoal bass restoration in partnership with Georgia Department of Natural Resources by stocking approximately 7,000 young-of-year and sampling for young-of-year at three sites.

Administered the conclusion of the Asian swamp eel (an invasive species) project in cooperation with the University of Georgia and enlisting the aid of the Boy Scouts of America to survey for new invasions.

Conducted television interview on invasion of Asian swamp eel.

Surveyed seven tributaries for reproducing trout and presented a final report to the park and presented the result of this work to the Cohutta Chapter of Trout Unlimited.

Congaree National Park

Participated in the Ivory-billed Woodpecker (IBW) Meeting and Training Workshop and provided assistance to park staff in obligating year-end funds for continued IBW searches.

Provided technical assistance on the

proposed U.S. Highway 601 bridge replacement project and guidance on the State 401 certification process.

Assisted with FERC re-licensing at the park by reviewing FERC-issued documents.

Cumberland Gap National Historical Park

Worked with UGA and USGS scientists to investigate the feasibility of conducting a research study examining the impact of beaver dams on blackside dace populations.

Cumberland Island National Seashore

Reviewed and provided written comment on Coastal Watershed Condition Assessment scorecards and reports.

Everglades National Park

Reviewed and provided comments on the environmental impact statement for the *Tamiami Trail Modifications and Modified Water Deliveries to Everglades National Park*.

Reviewed and provided technical guidance on the development of the *Wetlands Statement of Finding for the Proposed Tamiami Trail Modifications*.

Reviewed and provided comments and technical guidance on the environmental impact statement for the *Interim Operational Plan for Protection of the Cape Sable Seaside Sparrow*.

Fort Frederica National Monument

Reviewed and provided comments on the *General Management Plan Environmental Assessment for the Proposed Land Exchange* in regard to wetlands and floodplains impacts.

Reviewed and provided comments on the NEPA document and wetlands statement of findings for the proposed project to stabilize and repair the bulkhead along Frederica River.

Fort Matanzas National Monument

Reviewed and provided comments on the environmental impact statement for the project “Rehabilitation of Existing Seawalls, Installation of a New Seawall and Replacement of the Existing Boat Dock on Rattlesnake Island.”

Reviewed and provided technical guidance on the wetland statement of findings for the project “Proposed Shoreline Stabilization and Boat Dock Replacement on Rattlesnake Island.”

Fort Pulaski National Monument

Provided technical assistance during the oil spill in the Savannah River in July 2006. This assistance involved field assessments of damage to wetland habitat and recommendations for restoration of salt marsh habitat.

Great Smoky Mountains National Park

Reviewed and provided comments on the environmental impact statement for the project “Implementation of a Biological Control Agent for Old World Climbing Fern.”

Reviewed and provided comments on the environmental impact statement for the Cherokee Orchard Road – Roaring Ford Motor Nature Trail project.

Reviewed and provided detailed comments on the floodplain assessment for the proposed Tremont Institute project, located along the Middle Prong Little River.

Assisted the park in obtaining \$15,000 in funding from the USFWS Aquatic Invasive Species Program to rehabilitate a historic dam to prevent the spread of rainbow trout into brook trout habitat.

Gulf Islands National Seashore

Reviewed environmental impact statement on using sonar to survey for suitable sand sites to restore Mississippi River shoreline

habitat following hurricanes in 2005.

Reviewed general agreement with the State of Florida for administering hunting on park lands.

Reviewed and provided comments on the environmental impact statement for the Compass Port LLC Deepwater Port License for pipeline installation.

Reviewed and provided comments on the environmental impact statement for projects resulting from hurricane impacts: “Reconstruct Road Access to J. Earle Bowden Way,” “Restore Visitor Access to Santa Rosa Island,” and “Restore Visitor Access to Fort Pickens Unit.”

Little River Canyon National Preserve

Provided technical assistance and guidance regarding the Alabama DOT proposed Highway 35 bridge replacement project.

Mammoth Cave National Park

Reviewed and provided comments on the environmental impact assessment for the “Rehabilitate the Green River Ferry Site” project, which would result in direct impacts to floodplains.

Natchez National Historical Park

Assessed the fisheries of the ponds at Melrose Estate.

Natchez Trace Parkway

Provided technical guidance and review of proposed project to relocate a water pipe line along a stream in the park in regard to wetlands and floodplains compliance documentation.

Salt River Bay National Historical Park and Ecological Preserve

Reviewed and provided comments on the draft feasibility study “Proposed Marine Research and Education Center.” Provided

technical assistance to the consultant preparing a wetland’s statement of finding for the proposed project, including recommendations for adequate wetland mitigation.

Shiloh National Military Park

Assessed the need for fish passage at Dill Branch as it relates to road construction and Tennessee River bank stabilization.

Timucuan Ecological and Historic Preserve

Conducted a field visit, attended a project meeting and provided comments/assessment on the proposed Cedar Point Boat Ramp Project, which will displace existing wetland habitat.

Accompanied WRD staff on a site visit to determine the scope and feasibility of restoring the historic Spanish Pond to a predominantly open water and emergent marsh habitat.

Reviewed and provided written comment on coastal watershed condition assessment scorecards and reports.

Vicksburg National Military Park

Drafted an EIS to eliminate invasive fish species in Mint Springs Creek.

Obtained \$9,000 in funding from USFWS, Eastern National, and NPS to support the invasive fish eradication project.

APPENDIX B

SUMMARY OF WATER RESOURCES DIVISION FUNDING

FY2006 base funding for the Water Resources Division was \$12,325,000 (Figure 1). These funds are distributed among five principal categories: Water Resource Projects (Water Resource Protection; Competitive Projects; and Other); Water Quality Monitoring; Water Resource Protection – Aquatic Resource Professionals; Watershed Condition Assessment Program (including projects); and Water Resource Technical Assistance (Figure 2).

Figure 1 - Water Resources Program FY2006 Funding

Funding Available in FY2006	\$ 12,436,000
Pay Increase	85,000
	\$ 12,521,000
Net across-the-board reductions	-196,000
Total available in FY2006	\$ 12,325,000

Figure 2 - Water Resources Program - FY2006 Base Funding by Category

Water Resource Projects	
Water Resource Protection	\$ 989,100
Competitive Projects	161,500
Other Projects	14,500
Water Quality Monitoring	2,781,300
Water Resource Protection – Aquatic Resource Professionals	1,205,000
Watershed Condition Assessment Program	2,649,300
Competitive Projects (\$ 834.7)	
Critical Projects (\$ 220.4)	
Coastal Projects (\$ 362.3)	
Other Projects (Including Staff) (\$263.0)	
Natural Resource and Watershed Condition Assessments (827.9)	
Marine Science Advisor (141.0)	
Water Resource Technical Assistance	4,524,300
Total	\$ 12,325,000

A summary of accomplishments derived from the FY2006 base budget and the FY2006 increase is provided below.

WATER RESOURCE PROJECTS

The projects category includes three areas: Water Resource Protection Projects, WRD Competitive Projects, and Other Projects which are non-competitive. Water resource projects are funded in the areas of general water resources, water quality, wetlands protection, and water rights.

WATER RESOURCE PROTECTION PROJECTS

The Natural Resource Challenge resulted in an increase of \$823,000 in the water resource protection projects budget beginning in FY01. As shown in Table 1, FY2006 expenditures for this budget increase continued the NPS's capability to fund data collection and analyses that can be used to describe surface and ground-water flow regimes and investigate the dependence of park resources upon water in support of the Department of Interior Water Quantity Strategic Goal. These efforts are targeted toward development of scientific information that will benefit decision makers, including federal managers, court judges, or state administrators such as state engineers. Priorities are determined by the requirements of federal or state law. Presentation of results may occur in state or federal regulatory process documents, such as rights-of-way and Clean Water Act permits, state water rights process documents, such as applications, protests, or administrative hearing records, or federal or state court process documents, such as adjudication claims, objections, or court hearing records. Results are also intended to support settlement negotiations, which are conducted to avoid contested case hearings or contested land use decisions or to support the implementation of settlements.

Studies are conducted by scientists with expertise in fields that are appropriate for the park resources being examined. Hydrologic characterization is a need common to all water resources protection issues addressed by this budget. The majority of FY2006 project funds were used to support ongoing studies designed to characterize surface or ground-water flow systems. In the western U.S., ongoing projects are developing modeling capabilities for predicting effects of large-scale development in regional ground-water flow systems. In the eastern U.S., hydrologic studies are developing information on the effects of impoundments on surface river systems. These tools are needed by decision makers to understand the potential for impacts to park water resources in the future from a number of existing water development proposals. In addition, hydrologic data is often required to implement settlement agreements.

Project funds are also used to study the relationships between water quantity and flow timing and water-dependent park resources. In FY2006, water-dependent resources that were studied include riparian vegetation, fish migration, and geomorphology. These results are needed by decision makers to understand the potential effect on the water-dependent resource of potential changes in stream or ground-water flow.

Finally, the results of these studies must be presented to decision makers in written or verbal format, often in a forum dictated by law or regulation. For this reason, a portion of the water resources protection project funds were used to support the Department of the Interior Office of the Solicitor in providing legal advice and representation to the NPS.

Many of the issues being studied are also of concern to the programs of other federal managers, such as the endangered fish and National Wildlife Refuge programs of the USFWS, the water supply programs of the BOR and Army Corps of Engineers, and the research program of the USGS. In many cases, these other federal programs also provide funding for studies that are useful for resolving NPS issues. When this occurs, NPS coordinates its water resources protection funding with that of the other agencies to avoid duplicating studies.

To increase the effectiveness of its water resource protection funding, NPS partners with other non-federal entities. Some studies occur as a result of collaboration with state or private entities with common science objectives. For example, hydrologic data collected by NPS

studies for Lake Mead National Recreation Area, Death Valley National Park, and Great Basin National Park are shared with the Nevada State Engineer, southern Nevada water purveyors, and private developers, thereby contributing to the larger-scale investigation of regional aquifers and ground-water availability in southern Nevada. In another example, data and other science information collected at Chickasaw National Recreation Area contributes to an on-going state-federal study of the Arbuckle-Simpson Aquifer in southeastern Oklahoma. In yet another example, hydrogeologic analyses conducted for Great Sand Dunes National Park and Preserve is being used in conjunction with work being conducted by The Nature Conservancy and local water conservation districts to support water rights protection for the park.

Table 1. Water Resource Protection Projects - FY2006

Park	Region	PROJECT TITLE(S)	FY05 Funding \$(000s)
ALL	ALL	Support to the Office of the Solicitor	202.0
CHIC	IMR	Hydrologic Data Collection	12.6
GRCA	IMR	Ground-water Study, Spring Protection	39.6
CRLA	PWR	Supplemental Water Source	30.0
MOCA	IMR	Hydrologic Data Collection in Support of the Adjudication of the Verde River Basin in Arizona	58.7
MT Parks	IMR	Implementation of the Montana-NPS Compact	16.4
SAGU	IMR	Investigation of Hydrology and Water Related Values	17.3
ARCH	IMR	Hydrologic Data Collection	12.6
BUFF	MWR	Investigation of Hydrology and Water Related Values	42.0
GRSA	IMR	Hydrogeologic Data Analysis	112.4
THRO	MWR	Investigation of Hydrology and Water Related Values	10.2
DEVA	PWR	Devils Hole and Spring Flow Monitoring, Ground-water Study, Participation in Ground-water Model Development	134.0
GRBA	PWR	Assessment of Hydrologic Conditions and Vulnerability of Park Streams to Ground-water Development	18.0
LAME	PWR	Spring Flow Monitoring, Participation in Cooperative Aquifer Stress Test, Ground-water Model Development	70.5
BLCA	IMR	Monitoring of Riparian System	36.8
ALL	ALL	Technical Support to All Projects and Technical Assistances	92.6
ALL	ALL	Administrative Support to All Projects and Technical Assistances	83.4
		TOTAL FOR WATER RESOURCE PROTECTION PROJECTS	989.1

WATER RESOURCES DIVISION COMPETITIVE PROJECTS

Water Resources Division competitive projects support many park-based activities, including the design of information management systems, regulatory assessments, riparian/stream and watershed restoration and protection projects with water quality goals, or other water quality improvement projects. Projects may also include design and implementation of Clean Water Act best management practices required to improve water quality to meet State-mandated polluted runoff or non-point source pollution control or other park water quality goals and objectives. In addition, projects may encompass one-time assessments or inventories of water qual-

ity baseline conditions or contaminants. Projects support National Park Service Strategic Goal I.a.4 A and I.a.4B (water quality), I.a.4C (water quantity) and the new Department of Interior strategic goals for Land Health including I.a.1C (wetlands), I.a.1D (riparian and stream areas), and I.a.1F (marine and coastal areas).

In addition, WRD competitive projects may include wetland restoration design and implementation, impact or condition assessments, inventories, functional assessments, applied research, protection efforts, monitoring, and other wetland projects.

Projects also may include ground-water assessment and monitoring, well and spring inventories, stream and riparian habitat restoration, stream function assessments, channel and bank stability investigations, stream type classifications, watershed condition assessments, watershed management, surface-water hydrology studies, floodplain assessments, river management, water resources management planning, and other water resources-related projects.

WRD competitive project funding for FY2006 totaled \$996,200. This funding was derived from WRD base project funds (\$161,500) and support to the backlog of watershed and water quality assessment needs currently identified in NPS Project Management Information System from the new Watershed Condition Assessment Program before it transitions to a long-term program of systematic park-based assessments of NPS watershed conditions (\$834,700).

Once the Watershed Condition Assessment Program is fully operational, WRD's base funding will no longer be adequate to sustain the competitive project program. Therefore, it is scheduled to become inactive in FY07. Over past ten years, in order to meet increased salary costs per FTE and budget rescissions, WRD has had to reduce funding to its project programs by \$1.4 million. This has resulted in WRD's inability to support the WRD competitive project program after FY2006.

Fully-Funded Projects: Fully-funded projects are projects that received the final funding installment in FY2006. Although these projects will not receive additional funding from WRD beyond FY2006, fieldwork, data analysis, report writing, or peer review may continue into the next year. A total of 10 projects received their last year of funding in FY2006 (Table 2). Appendix A contains a summary of these fully-funded projects.

**Table 2. Water Resource Division Competitive Projects
Final Year Funded Projects - FY2006 (continued on following page)**

Park	Region	PROJECT TITLE	FY2006 Funding \$(000s)
BUFF	MWR	Delineate and Characterize the Karst Ground-water Recharge Zone of Tomahawk Creek at BUFF	30.0
GRTE	IMR	Hydrology and Geomorphology of the Snake River	33.0
SACN	MWR	Using Wetland Environmental Histories to Develop Management Strategies for the St. Croix Riverway	40.8
MULTI	PWR	Reference Site Data for Monitoring Biointegrity & Water Quality of Streams	73.2
JELA	SER	Assess and Map the Distribution of Submerged Aquatic Vegetation Communities at JELA	40.2
MORA	PWR	Assess Water Quality/biological Integrity with Invertebrates	35.0

**Table 2. Water Resource Division Competitive Projects
Final Year Funded Projects - FY2006 (continued)**

Park	Region	PROJECT TITLE	FY2006 Funding \$(000s)
DEVA	PWR	Develop Water Resource Management Plan; Phase II	46.9
CAVE	IMR	Delineate Watershed & Subsurface Channels Feeding Rattlesnake Springs Aquifer	35.8
WRST	AKR	Map Wetlands along the McCarthy & Nabesna Roads	97.5
ROMO	IMR	Ecological Restoration of a Willow Carr That Was Destroyed in the 1982 Lawn Lake Flood	40.0
		TOTAL	472.4

**Table 3. Water Resources Division Competitive Projects
Continuing Projects - FY2006**

Park	Region	PROJECT TITLE	FY2006 Funding \$(000s)
KAHO	PWR	Determine Subterranean Ground-water Nutrient Input	72.4
BUFF	MWR	Map and Characterize the Geology of Tomahawk Creek, Buffalo National River	50.0
MULTI	PWR	Pre-Disaster Preventative Planning in MORA/OLYM	55.0
MACA	SER	Delineation of Dioxin Contamination and Biotic Risk Assessment in the Green River	20.9
YELL	IMR	Norris Geyser Basin: Effects of the Shallow Ground-water System on Visitor Safety	50.0
MULTI	PWR	Assess Ground-water Resources in the Mojave Network	30.0
CUVA	MWR	Biological Assessment of Primary Headwater Streams	47.9
STCR	MWR	Manage Non-point Pollutants through Watershed Modeling	30.5
GRTE	IMR	Baseline Water Quality of Four Western Tributary Streams in the Upper Snake River Basin	56.1
MULTI	PWR	Map Wetlands in Eight Parks	48.5
BEBE	IMR	Determine the History of Channel Change of the Rio Grande River	57.5
EBLA	PWR	Conduct Hydrologic Assessment of Ebey's Prairie	5.0
		TOTAL	523.8

WATER QUALITY MONITORING

FY2006 Funding

In FY2006, the Water Resources Division received \$2,781,300 for the Water Quality Monitoring component of the Natural Resource Challenge. This was the 6th year of funding for a program specifically intended to track and support the attainment of water quality standards in units of the National Park System as required by the NPS and DOI Strategic Plans. The program is now “fully-funded,” minus rescissions.

The National Park Service is committed to a Servicewide and DOI strategic goal to significantly reduce the number of stream and river miles 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 unimpaired 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 within parks, to support the restoration of impaired water bodies in parks to an unimpaired condition. Presently, about 120 park units have one or more waterbodies that do not meet State water quality standards for one or more pollutants on approximately 1,800 miles of rivers and streams and 1,100,000 acres 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 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 FY2006 (Table 4). In addition, funds supported the development of an NPS Servicewide water quality data management program within the EPA STORET national water quality database. While not shown in Table 4, WRD reallocated 20 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.

Table 4. Allocation of Water Quality Park Vital Signs Monitoring Funding - FY2006 (continued on next page)

Network	Region	Number of Parks in Network	FY2006 Funding \$(000s)
Central Alaska	Alaska	5	95.7
Heartland	Midwest	15	80.0
NE Coastal and Barrier	Northeast	8	87.9
National Capital	National Capital	11	69.3
Cumberland/Piedmont	Southeast	14	57.6
Appalachian Highlands	Southeast	4	68.3
North. Colorado Plateau	Intermountain	16	105.4
Greater Yellowstone	Intermountain	3	69.3
Sonoran Desert	Intermountain	11	62.5
North Coast & Cascades	Pacific West	7	80.0
San Francisco Bay	Pacific West	6	68.3
Mediterranean Coast	Pacific West	3	74.2
Southwest Alaska	Alaska	5	135.7
Northeast Temperate	Northeast	10	58.6
Southern Colorado Plateau	Intermountain	19	121.0

**Table 4. Allocation of Water Quality Park Vital Signs
Monitoring Funding - FY2006 (continued)**

Network	Region	Number of Parks in Network	FY2006 Funding \$(000s)
Pacific Islands	Pacific West	9	147.4
Great Lakes	Midwest	9	120.1
Gulf Coast	Southeast	8	86.9
Rocky Mountain	Intermountain	6	59.5
Sierra Nevada	Pacific West	3	61.5
Eastern Rivers and Mountains	Northeast	9	61.5
Arctic	Alaska	5	147.4
Klamath	Pacific West	6	74.2
Southeast Coast	Southeast	17	118.1
Upper Columbia Basin	Pacific West	8	48.8
Southern Plains	Intermountain	10	28.3
Mojave Desert	Pacific West	6	78.1
Southeast Alaska	Alaska	3	41.0
South Florida/Caribbean	Southeast	6	143.5
Mid-Atlantic	Northeast	11	43.0
Chihuahuan	Intermountain	6	71.3
Northern Great Plains	Midwest	13	79.1
TOTAL: 2006 Network Monitoring	7 NPS REGIONS	272	2643.5
Service-wide Data Management			137.8
GRAND TOTAL			2,781.3

Vital Signs Monitoring Networks: In FY2006, 32 Park Vital Signs Monitoring Networks fully committed their water quality funding to compilation of background information, analysis of issues and threats, detailed program planning, and supporting synoptic-level field assessments, and five networks have initiated field-level monitoring. Network planning approaches included personnel hiring, in-house allocation of staff, university cooperative agreements, and USGS Interagency Agreements. In addition, some equipment acquisitions were made. All 32 Networks accomplished one or more of the following activities:

- Network water quality planning workshops
- Historic data compilations and analyses
- Information on State-listed impaired waters and park “outstanding” waters
- Documentation of significant water quality stressors/threats
- Synoptic inventory studies in support of detailed statistical design
- Database management and GIS support programs
- Development of water quality monitoring protocols

Individual network accomplishments are summarized in Appendix C (detailed budgets are provided in individual NPS Network Administrative Reports).

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 national water quality database, and enhancing the means to flow data from the Networks into STORET. Three 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 archive has served as the starting point for most network water quality data compilation and analysis efforts. A contract with Research Triangle Institute and Horizon Systems to revamp automated water quality data retrieval procedures and reporting software to inventory and analyze water quality data from the three major national water quality databases (EPA legacy and modern STORET and the USGS National Water Information System) was continued. Much effort went into enhancing the two mechanisms by which networks report water quality monitoring data to WRD for upload into STORET: NPSTORET and the NPS Electronic Data Delivery format specifications (NPSEDD). NPSTORET v.1.00, 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, was released. NPSTORET v.1.00 also includes import routines to allow users to their own data or stations and results from the three major national water quality databases. Data management functions were added to enable users to create compressed backups of their data (including pictures and documents) and to copy or delete the data for one or more organizations. An NPSTORET User Board was chartered to help guide the future development and implementation of NPSTORET. NPSEDD v.1.00 is a set of Microsoft Excel-based spreadsheets that provide an electronic data deliverable content and format specification for those parks and networks that don't employ NPSTORET.

WATER RESOURCE PROTECTION

Aquatic Resource Professionals

In FY2005, the National Park Service received \$1,205,000 to fund aquatic resource specialists in the field. Fifteen positions were fully funded in FY2005. Twelve of the positions are duty-stationed in parks, and one each is located in the Sonoran Network Office, the Center for Urban Ecology in the National Capital Region, and the Utah State Office. The specific aquatic resource disciplines represented by the new professionals, duty stations, and primary areas of focus are identified in Table 5.

Table 5. Water Resource Protection - Aquatic Resource Specialists

REGION	DUTY STATION	GEOGRAPHIC FOCUS AREA
AKR	Yukon-Charley Rivers NPres. - Aquatic Ecologist	Central and NW Alaska Network Parks
AKR	Lake Clark NP - Fishery Biologist	SW and SE Alaska Network Parks
IMR	Utah State Coord Office - Fishery Biologist	Upper Colorado River Basin Parks
IMR	Sonoran Desert Network - Ground-water Hydrologist	Arizona and New Mexico Parks
IMR	Grand Teton NP – Hydrologist	Vacant
IMR / MWR	Chickasaw NRA – Ground-water Hydrologist	Southern Plains, Heartland Network Parks
MWR	Saint Croix NSR - Aquatic Ecologist	Great Lakes Network Parks
MWR	Isle Royale NP - Fishery Biologist	Great Lakes Network Parks
NER / NCR	Center for Urban Ecology - Aquatic Ecologist	National Capitol / Mid-Atlantic Network Parks
NER	Delaware Water Gap NRA - Hydrologist	East. Rivers & Mountains / NE Coastal & Barrier Network Parks
NER	Fire Island NS - Marine Ecologist	NE Temperate / NE Coastal & Barrier Network Parks
PWR	Point Reyes NS - Aquatic Ecologist	San Fran. Bay / Sierra / Klamath/ Mediterranean Coast Network Parks
PWR	Mount Rainier NP - Geomorphologist	North Coast & Cascades / Klamath Network Parks
PWR	Lake Mead NRA – Ground-water Hydrologist	Mojave Desert Network Parks
SER	Chattahoochee River NRA - Fishery Biologist	SE Coast / Gulf Coast / Appalachian Highlands / Cumberland-Piedmont Network Parks
SER	Chattahoochee River NRA - Wetlands Ecologist	SE Coast / Gulf Coast / Appalachian Highlands / Cumberland-Piedmont / S. Florida – Caribbean Network Parks

These new professional staff provide technical assistance to parks, identify and conduct technical investigations to determine the condition of park aquatic resources, determine if actions of the National Park Service or external parties impair or impact resources, assist in developing and implementing aquatic resource mitigation and restoration projects, and interpret and implement National Park Service water resource-related policies and regulations.

Prior to funding provided by the Natural Resource Challenge, only 20 parks had aquatic resource professionals on staff. Founders of the Challenge recognized the need to increase professional expertise and to employ more park-based aquatic resource professionals to address water resource-related issues facing the National Park Service, and to develop more comprehensive and programmatic approaches to aquatic resource protection at the park level. As called for in the Challenge, these staff will work on aquatic resources issues across a number of parks and will be managed in accordance with NR-PRO (i.e., FTE's are transferred to parks with annual funding provided by the Water Resources Division following approval of an annual work plan).

Positions are fully funded and supported at the GS-II-I grade. Any costs above the GS-II-I grade are to be funded by the host park or region. As salary costs have increased, parks and

regions are finding it increasingly difficult to cover those costs. To help address this situation, one position was lapsed in FY2004 to help support the increased costs associated with the 15 funded positions. In the future, as attrition occurs, the Water Resources Division does not expect to continue to maintain all of these positions.

WATER RESOURCE PROTECTION

Water Resource Technical Assistance

This was the fundamental component of the Water Resources Program before the Natural Resource Challenge, and it has not been expanded with Challenge funding. Through this effort, the Water Resources Program provides direct assistance to parks on high priority needs, using a combination of its own staff and expertise acquired through cooperative agreements. Over 160 parks obtained technical assistance from the Water Resources Division in 2006. Examples of technical assistance accomplishments are:

- Assisted in the identification, review, and assessment of wetlands-related restoration needs for NPS units damaged by Hurricanes Katrina and Rita.
- Assisted Grand Teton NP and the Environmental Quality Division on a damage assessment case involving the introduction of non-native plant species at the Snake River Gravel Pit reclamation site.
- Worked with NPS General Management Planning teams to prepare pilot *Water Resources Foundation for Planning and Management Reports* for Golden Gate NRA and Effigy Mounds NM.
- Completed *Water Resources Management Plans* for Isle Royale NP and Mammoth Cave NP.
- Assisted in the completion and publication of a *Binational Fisheries Management Plan* for Amistad NRA.
- Provided overall coordination on a project to install an automated hydrologic monitoring system at Haleakala NP for natural resource management and visitor safety purposes.
- Released NPSSTORET v.1.0, a database allowing parks and networks to document water quality monitoring projects and manage water quality monitoring data in a format amenable for upload to the EPA-STORET national water quality database.
- Provided hydrogeologic analyses and advice on well construction to 19 parks to help meet their demand for potable water supplies for visitors and staff.
- Completed a detailed survey and complex hydraulic analysis of the proposed fluvial and wetland restoration at Prisoners Harbor on Santa Cruz Island in Channel Islands NP.
- Provided overall leadership to and served as Key Official on a project to design and implement a real-time turbidity monitoring program at Sylvan Pass in Yellowstone NP in conjunction with a gravel mining and road construction project.
- Participated in scientific symposia to exchange scientific viewpoints and seek new information opportunities in support of water rights protection activities at several parks including Kaloko-Honokōhau NHP and Death Valley NP.
- Participated on the NPS Wild and Scenic Rivers Task Force to develop recommendations for the National Leadership Council to improve NPS management of Wild and Scenic Rivers.
- Assisted Crater Lake NP in the drilling of a well to offset out-of-priority diversions on Annie Creek.
- Developed scientific evidence to support water right claims filed with the State of Arizona for Rincon Creek in Saguaro NP.

- Assisted Niobrara NSR with initiating a partnership with the State of Nebraska to protect instream flows in the Niobrara River.

WATERSHED CONDITION ASSESSMENT PROGRAM

FY2006 Funding

The Water Resources Division (WRD) received \$2.65 million in FY2006 as part of the Natural Resource Challenge to assess watershed conditions on a system-wide basis. WRD’s Watershed Condition Assessment Program (WCAP) provides technical guidance and accountability oversight for this effort. Assessment projects are conducted at the level of individual parks, or groups of similar parks, and result in a written report and geospatial map products that convey findings about current resource condition status, critical data gaps, and existing or emerging vulnerability/risk factors for park-managed natural resources, habitats, and watersheds. These are interdisciplinary assessments that draw upon existing data from varied NPS and non-NPS information sources. During the FY2006-14 timeframe, the WCAP plans to fund one of these assessments for each of the more than 270 parks in the NPS Vital Signs Monitoring Networks.

Reporting products emphasize communication of findings in a form that park managers can readily understand and use for resource stewardship planning, especially in terms of helping parks define or map their park management zones and their Desired Condition management objectives and allocate park resources (staff, budget) toward high-priority resource management issues. The assessments also generate data products required to support park reporting to the Department of Interior’s Strategic Plan “land health” goals.

FY2006 projects benefited greatly from academic partnerships with universities in Cooperative Ecosystem Studies Units (CESUs), as well as from collaboration with federal agencies that provided essential expertise in varied aspects of ecological assessment and reporting.

Significant program accomplishments in FY2006 are described below. Table 6 shows the budget allocation in FY2006 for the WCAP.

**Table 6. Watershed Condition Assessment Program
FY2006 Budget**

Program Element	FY2006 Funding \$(000s)
Water Resources Competitive Project Program	834.7
Natural Resource and Watershed Condition Assessments	827.9
WRD Watershed Condition Assessment – Critical Projects	220.4
Coastal Park Natural Resource Assessments	362.3
Marine Science Advisor	141.0
Other (incl. staff)	263.0
TOTAL	2,649.3

Implementation of long-range program plan: Two full-time staff members provided dedicated support to implement long-range program components. This included one Federal employee, who served as Program Coordinator, and a Coastal Resource Analyst, who assisted in the coordination of resource assessments in NPS managed coastal/marine environments. These staff members are overseeing transition of the WCAP to a systematic program of park based assessments of NPS watershed resource conditions, to be conducted in close coordination with other NPS programs and activities as they relate to DOI strategic planning, NPS resource management planning, inventory and monitoring, and disturbed lands restoration.

FY2006 program efforts focused on initiation of a set of pilot projects at 17 parks, designed to demonstrate practical approaches and useful products for a new series of natural resource condition assessments in parks. Pilot projects will be used to formalize national guidelines and standards for these assessments as they are continued and extended to all Vital Signs Monitoring Network parks. Assessments in 12 of the 17 parks were initiated as natural resource and watershed condition assessment projects (Table 7). Assessments in five parks were initiated as coastal condition assessment projects (Table 8).

Table 7. Allocation of Coastal Watershed Condition Assessment Funding – FY2006

REGION	AGENCY OR UNIVERSITY PARTNER	STATE	PARKS	FY2006 FUNDING \$(000s)
Northeast	Pennsylvania State University—Altoona	NJ, NY, PA	DEWA, UPDE	165.5
Southeast	Southern Appalachian Mountains CESU/ Western Kentucky University	AL, KY	ABLI, LIRI	99.4
Midwest	Upper and Middle Mississippi Valley CESU/ University of Missouri	IA, MO	EFMO, OZAR (\$5,100 of project total to Regional Office)	155.1
Intermountain	Rocky Mountains CESU/ University of Montana	MT	GLAC	120.0
Intermountain	Rocky Mountains CESU/ Colorado State University	CO	FLFO, ROMO (funding for project phases 1 and 2)	40.0
Pacific West	Humboldt State University	CA, OR	ORCA, REDW, WHIS (\$50,000 of project total to be transferred to REDW, for GIS project work)	200.0
Multiple	USFWS	AL, CA, CO, OR	FLFO, LIRI, ORCA, REDW, WHIS (development of NWI wetland maps)	39.4
Multiple	NPS Inventory, Monitoring, and Evaluation Program	Multiple states	Multiple parks (GIS delineation of GPRA land types for all FY2006 projects)	8.5
TOTAL			12 parks	827.9

Coastal Park Natural Resource Assessments: The WCAP initiated assessments of natural resource conditions in FY2003. Reports from these assessments characterize the relative health or status of marine, estuarine, and Great Lakes resources within the National Park System. Through academic partnerships with CESUs and collaboration with federal agencies, these projects bring together essential expertise in oceanography, ecology, hydrology, and marine and estuarine sciences as needed to accomplish project objectives.

As of FY2006, the WCAP has initiated assessments in 41 parks, with plans to complete assessments for a total of 55 parks that manage significant ocean and Great Lakes resources by FY10. To date, final reports have been published for a total of 15 parks. In FY2006, reports were published for Cabrillo National Monument, Channel Islands National Park, Glacier Bay National Park and Preserve, Klondike Goldrush National Historical Park, Sitka National Historical Park, Wrangell-St. Elias National Park and Preserve, Kaloko-Honokōhau National Historical Park, Pu’uhonua o Hōnaunau National Historical Park, Fort Pulaski National Monument, and Cape Hatteras National Seashore. Completed reports are available at http://www.nature.nps.gov/water/watershed_reports/WSCondRpts.cfm. In FY2006, the WCAP initiated assessments in five coastal parks and supplemented funding for nine other parks that were part of FY2004 and FY2005 initiated projects (Table 8).

Table 8. Coastal Watershed Condition Assessment Funding-FY2006

REGION	AGENCY OR UNIVERSITY PARTNER	STATE	PARKS	FY2006 FUNDING \$(000s)
Northeast	North Atlantic Coast CESU/ University of Maine	ME	ACAD	50.0
Northeast	USGS	ME	ACAD	3.9
Northeast	North Atlantic Coast CESU/ SUNY Stony Brook	NY	GATE, FIIS, SAGA	80.6
Northeast	North Atlantic Coast CESU/ University of Rhode Island	RI	ACAD, GATE, FIIS, SAGA (GIS database development)	70.3
Southeast	NOAA	FL	DRTO	65.0
Pacific West	Californian CESU/ University of CA Davis	CA	PORE, GOGA (supplement)	14.1
Pacific West	Pacific Islands CESU/ University of Hawaii	HI	KAHO, PUHE, PUHO (supplement)	58.1
Alaska	Pacific Northwest CESU/ University of AK Southeast	AK	KEFJ, KATM, ANIA, LACL (supplement)	20.3
TOTAL			14 parks	362.3

Water Resources Competitive Project Program: There remains a backlog of watershed resource and water quality assessment projects identified in the NPS Project Management Information System. In FY2006 WCAP funded approximately 20 of these projects through the WRD Competitive Project Program process. Summaries of projects that received their final-year and continuing funding in FY2006 are included in Appendix A.

WRD Watershed Condition Assessment – Critical Projects: In FY2006, WRD funded projects that addressed emerging, high-priority, park watershed condition issues that, because

of the applicable timeframes, could not be appropriately directed through the competitive project funding program. Examples of FY2006 projects include a supporting study for a wetland improvement project at Minute Man National Historical Park, evaluation of the influence of riparian vegetation on channel bank stability at Canyon de Chelly National Monument, and an assessment of historic and functional conditions to support lake restoration at Ebey’s Landing National Historical Reserve. Partnering with other federal agencies, state agencies, and/or local watershed groups in carrying out these projects was emphasized. Table 9 shows the funding allocated from the WCAP to support these projects.

**Table 9. WRD Watershed Condition Assessment
Critical Projects Funded in FY2006**

REGION	STATE	PARK	PROJECT TITLE	FY2006 Funding \$(000s)
Northeast	MA	MIMA	Restoration of Battle Road Wetlands: Minute Man National Historic Site Watershed Condition Improvement Project	54.5
National Capital	DC, MD, VA	CHOH, ROCR	Detection of Herbicides in National Capital Parks	5.0
Southeast	VI	BUIS, VIIS, VICR	Assessment of 2005 Coral Bleaching in USVI Parks	30.0
Intermountain	AZ	CACH	Measure the Influence of Riparian Vegetation on Channel Bank Stability in Canyon de Chelly National Monument	4.0
Intermountain	CO	BLCA	Entrainment of Debris Flow Deposits in Black Canyon of the Gunnison National Park and Gunnison Gorge National Conservation Area	24.5
Intermountain	CO	ROMO	Restoration of Willow Carr Habitat Destroyed in the 1982 Lawn Lake Flood at Rocky Mountain National Park	9.1
Intermountain	AZ	SAGU	Radiotelemetry of Sonoran Mud Turtles, Rincon and Chiminea Creeks, Saguaro National Park	11.4
Intermountain	WY	GRTE	Diversion and Instream Flow Management on the Gros Ventre River, Grand Teton National Park	33.0
Pacific West	CA	GOGA	Data Collection and Detailed Restoration Design for the Rodeo Beach Wetland Complex, Golden Gate National Recreation Area	9.9
Pacific West	WA	EBLA	Functional Assessment and Historical Analysis for Restoring Crockett Lake, Ebey’s Landing National Historic Reserve	39.0
TOTAL		13 Parks		220.4

A summary of the Critical Projects that were funded in FY2006 is included in Appendix C.

Marine Science Advisor: The program continued to support Natural Resource Stewardship and Science’s senior scientist/marine science advisor for an additional year.

APPENDIX C

SUMMARIES OF WATER QUALITY MONITORING PROGRAM FUNDING IN PARK VITAL SIGNS MONITORING NETWORKS

Appalachian Highlands Network (APHN)

The APHN received \$68,300 in funding from the Water Resources Division for water quality monitoring in FY2006. Data were analyzed for trends for selected water quality constituents, and 37 long-term monitoring sites were selected. Sampling sites include five Outstanding Natural Resource Waters and seven 303d listed streams. The Network hired a hydrologist in March, who will be responsible for coordinating all aspects of the monitoring program, including data collection, QA/QC, data analysis, and reporting. The hydrologist began incorporating reviewer comments into the final draft of the APHN water monitoring protocol during the summer of 2006. The draft protocol contains 11 SOPS, including a detailed SOP on management of water quality data. The NPStoret database will be adapted for use for the Network water quality monitoring program.

In FY2006, the Network purchased the bulk of the equipment needed to implement the Network water quality monitoring protocol. Equipment purchases include: multiparameter handheld meters, flow meters, an automated sampler and data logging sonde, and field test kits for alkalinity, total coliform, and E. coli bacteria. The APHN resumed an informal search to identify a water lab which will provide efficient and cost effective service over a multi-year period. Currently, the Network has a one-year trial agreement with the water lab at the Department of Environmental

Sciences, University of Virginia to analyze, summarize, and report on the analysis of Network water samples. Also, rating curves were developed for staff gauges at seven long-term monitoring sites at Big South Fork National River and Recreation Area and Obed Wild and Scenic River.

Arctic Network (ARCN)

For FY2006, the Arctic Network received \$147,400 in water quality funding from the Water Resources Division. These funds were spent in completion of the Phase 2 Report; water quality data mining and scoping; and entering into a cooperative agreement with the Arctic Research Consortium to assist with planning, facilitation, coordination, and implementation of the Freshwater, Coastal and Land-Water-Air Linkages Workshops. ARCN also compiled an exhaustive list of relevant fisheries and aquatics literature and hired a graduate student at the University of Alaska Fairbanks to consolidate fisheries data and assemble a spatial map of fish collection data that included water quality data. An aquatic ecologist was hired to help survey the literature for pertinent information and synthesize what is known about aquatic ecosystems in ARCN. Network staff also began identifying streams, lakes, and wetlands with significant or outstanding value or with water quality issues.

Cooperative agreements continued with Utah State University to conduct remotely sensed baseline freshwater ecosystem surveys at the more remote parks (such as GAAR) and the University of Vermont to collect baseline water quality data for freshwater resources in the Wild and Scenic designated Noatak River Basin.

Central Alaska Network (CAKN)

FY2006 water quality funding for the CAKN totaled \$95,700 in this first year of Vital Signs program post-Phase 3 implementation by the Network. WRD funds were used to support implementation of a shallow lake monitoring protocol at 30 lakes in DENA during the

summer with the collection of a full suite of variables. Coupled with the lake monitoring, cooperators at the University of Alaska Fairbanks generated a computer script to automatically calculate surface-water area in DENA using RADARSAT imagery collected in early summer 2006. Water quality funding also supported meetings held between the Network stream ecologist and scientists from the University of Alaska, USGS, ADFG, the Alaska EMAP program, the USFWS, a variety of nonprofit groups, including Cook Inlet Keeper and the Copper River Watershed Council, as well as officials from Parks Canada and Environment Canada to discuss ways in which CAKN could coordinate data collection and data sharing across agencies. Scoping meetings were held with resource staff from the three Network parks to identify and document data needs and management concerns related to moving water resources.

A cooperative data collection field trip was made in early August in the part of WRST that adjoins Tetlin NWR. Data on fish, benthic diatoms, aquatic macroinvertebrates, riparian vegetation, and water chemistry, as well as channel geometry and other physical aspects of stream ecosystems, were examined at twelve sites in WRST. These data continue to be collected so as to be comparable with data collected by EPA's EMAP Wadeable Streams Assessment program now being employed in Alaska. Development also began on a comprehensive protocol for monitoring the water quality and ecological integrity of wadeable streams and on protocols for assessing status and trends in braided glacial stream and large glacial rivers, with 7 of these protocols nearing completion of the scientific peer review process.

Chihuahuan Desert Network (CHDN)

The Network received FY2006 water quality monitoring funds totaling \$71,300. The Network completed a draft water quality assessment Phase II report which

provides a sound basis for moving ahead with water quality monitoring planning. This assessment also brings together a sound understanding of state water quality management processes, existing park water quality monitoring projects, and initial identification of water quality issues and concerns. Initial parameters to be monitored have also been identified, as well as preliminary protocols. The USGS New Mexico Water Science Center, USGS Surface Water Office (San Antonio, Texas), and the Texas Council on Environmental Quality (Austin, Texas) will collaborate and participate in the development and implementation of the Network's water quality monitoring plan.

Cumberland-Piedmont Network (CUPN)

In FY2006 the Network received \$59,000 from WRD to support its water quality monitoring program. Scheduled water quality monitoring was performed at six parks. In total, 244 samples were collected and analyzed for the four core field parameters: pH, temperature, dissolved oxygen, and specific conductance. Parks active during FY2006 were: ABLI, FODO, GUCO, NISI, RUCA, and SHIL – the latter two parks marking the completion of two years of monthly non-conditional synoptic sampling. The CUPN participated in testing of all Beta releases of NPStoret, the National Park Service intermediate repository of water quality data. The CUPN staff has developed efficient and effective data entry, verification, and validation protocols.

Eastern Rivers and Mountains Network (ERMN)

The ERMN received \$61,500 from WRD in FY2006. The Network selected 13 priority vital signs for monitoring. Based on the outcome of the vital signs prioritization and selection process, ERMN will begin development of 9 protocols covering 13 vital signs. The ERMN Coordinator is serving on the planning committee for the upcoming

NPS Eastern Rivers Summit to be held in 2007. The summit will provide a forum for NPS managers and staff to exchange ideas and develop a common understanding of issues, review scientific approaches to evaluating river resources, present available tools for elevating attention to park protection, and offer solutions to address park threats.

In FY2006, the Network further developed conceptual ecological models to support the vital signs prioritization and protocol development process. The ERMN identified three water-related general ecosystems (large rivers, tributary watersheds, and riparian/floodplain communities) for initial conceptual ecological modeling. Two of these models were further refined, peer reviewed and published as NPS NER Technical Reports. A purchase order with Centre Aquatics Consultants was established to provide a compilation of summary data regarding macroinvertebrate bioassessment and biomonitoring protocols used by government agencies and private organizations in and around the ERMN.

Great Lakes Network (GLKN)

In FY2006 the Network received \$120,100 from WRD to support its water quality monitoring program. The Network made substantial progress on the protocol for monitoring water quality in large rivers. The protocol was peer-reviewed, comments were addressed, and the Network is now finalizing the narrative and SOPs. The Network began pilot testing the protocol at MISS in 2006, taking measurements at five sites monthly, beginning in May. Field measurements consisted of temperature, dissolved oxygen, specific conductance, pH, transparency, and turbidity. Water samples were collected for laboratory analysis of nutrients and other parameters. Surface sediment samples were collected at three sites for analysis of diatom communities. The Network began establishing sites for monitoring the St. Croix

and Namekagon Rivers, including developing rating curves, in preparation for monitoring water quality at SACN in 2007. The protocol for monitoring water quality of inland lakes was peer reviewed in 2006 and the protocol was pilot tested at two parks in 2006. Diatom field work was completed at MISS, INDU, and VOYA.

Greater Yellowstone Network (GRYN)

The draft protocol for sampling water chemistry at fixed rivers and stream stations was a major focus for the GRYN water quality team in 2006. The river and stream protocol (which describes the location, sampling frequency, and targeted water quality measurements) was completed, and field work started in June 2006. The protocol describes the field and laboratory procedures, including quality assurance and quality control steps. In preparation for field work, a contract for water quality laboratory services was awarded. In addition to the above activities, all data collected in 2005 were entered into NPSTORET; verification and validation reports were completed; and meta-data was prepared for a full suite of water chemistry parameters. NPS WRD helped conduct training on NPSTORET.

Gulf Coast Network (GULN)

In FY2006, the GULN received \$86,900 in funding from WRD. The Network changed direction on its approach to the water quality component of the monitoring plan. Previously, the Network had provided funding to the USGS, Water Resources Division, Louisiana Water Science Center in Baton Rouge, Louisiana, to develop the Network's water quality monitoring plan. After USGS completed a draft Phase 2, Network-wide summary of water quality issues, the decision was made to split the Network parks into estuarine/coastal and freshwater/inland parks for the purposes of water quality monitoring. The plan for the five predominantly freshwater parks will now be developed in-house by the

Network's hydrologist, who is shared with the Cumberland Piedmont Network. The plan for the three coastal parks is still under development with USGS. The Network will coordinate with other agencies' estuarine monitoring programs and with the Southeast Coast Network to ensure that the data collected by the Network is compatible and comparable to those efforts. The Network recruited and hired a hydrologist to a position shared with the Cumberland Piedmont Network.

In 2006, the USGS completed a Phase I report summarizing water quality issues for each of the 8 parks. The Network provided additional funds to USGS to develop a plan for the three coastal parks: GUIJ, JELA, and PAIS. At the request of the Network, that plan will be modeled on, and use protocols from, existing monitoring programs from EPA, NOAA/NERR, Northeast Coast and Barrier Network, and the Southeast Coast Network. The Network's hydrologist will also help guide the progress of the plan for the coastal parks. In anticipation of installing continuous monitoring stations at GUIJ and PAIS, the Network purchased eight datasondes that are the same as those used by NERR and SECN.

Heartland Network (HTLN)

In FY2006 the Network received \$80,000 from WRD to support its water quality monitoring program. Projects completed addressed monitoring water quality of impaired EPA 303(d) listed streams. A report addressing bacterial contamination in the Jacks Fork River at OZAR was prepared, and microbial source tracking identified bacterial sources. The USGS is developing a monitoring protocol for lead and associated contaminant metals in streams at OZAR. The Iowa Geological Survey submitted the Annual Yellow River Water Quality Report, water quality monitoring project updates, and a Scope of Work for Stream Monitoring at HEHO. A cooperative project between

the USGS-WRD and NPS measured spring temperature in relation to precipitation at HOSP in order to determine the influence of surface-water input into the thermal springs.

Klamath Network (KLMN)

The Network received \$74,200 in water quality funding in FY2006. In partnership with USGS Forest and Rangeland Science Center, the Network completed its Phase II Water Quality Monitoring Report and is beginning to develop the Phase III report. The Phase II report summarized major aquatic resources and monitoring issues in each park of the Klamath Network. These resources and issues included Outstanding Natural Resource Waters, Wild and Scenic Rivers, Aquatic Species of Special Concern, and Clean Water Act Section 303(d) Impaired Waters. The report provided an overview of regional water quality monitoring and research programs that are relevant to the development of a long-term Water Quality Monitoring Program. The report also described a process for prioritizing water quality vital signs that was completed by USGS Scientists in partnership with Klamath inventory and monitoring staff. The Phase III report will outline detailed design work underway to implement monitoring, such as developing specific monitoring objectives, designing sampling protocols and a statistical sampling methodology.

The Network collaborated with the NPS Water Resources Division to complete a baseline water quality inventory in three parks with insufficient background water quality information: Lassen Volcanic NP, Lava Beds NM, and Oregon Caves NM. The WRD provided funding to the USGS Western Ecological Research Center to conduct the inventory. Fieldwork was conducted in the spring and fall of 2005. The final report provides water quality information for 6 parameters that were measured in multiple locations throughout the three parks.

Mediterranean Coast Network (MEDN)

In FY2006 the Network received \$74,200 from WRD to support its water quality monitoring program. The collection of baseline fresh and marine water quality data for surface waters in SAMO and coastal waters at CABR was completed. A draft freshwater quality monitoring protocol, which was prepared in collaboration with faculty from California State University, Los Angeles, is under staff review. Representatives from SAMO, MEDN, USGS, Pepperdine University, and the Resource Conservation District of the Santa Monica Mountains refined stream monitoring objectives, sampling methodology, and sampling site selection for the aquatic amphibian monitoring program. The number of sites to be monitored in SAMO was increased with the selection of thirty-six spatially random sampling points selected across three habitat, elevation, and aspect characteristics within the Santa Monica Mountains. Site locations were located with GPS and entered into the SAMO stream monitoring database. Monitoring of streams in the 11,000 acres of SAMO parkland burned by the Topanga Fire in September and October 2005 revealed a dramatic shift of stream morphology with extreme loading of sediments in affected streams.

Mid-Atlantic Network (MIDN)

The MIDN received \$43,000 in FY2006. Water resources funding was spent on a cooperative agreement with the University of Virginia (\$41,700) for water quality plan development and (\$1,300) for water quality supplies and equipment. The Network continued working through a cooperative agreement with the Department of Environmental Sciences, University of Virginia, to develop a water quality monitoring plan. As part of the Phase 2 report, an updated review on anti-degradation and outstanding waters based on the 2006 assessment was compiled. More detailed information was compiled

on the water quality monitoring activities of each park and adjoining lands that will guide the monitoring protocols in the next phase. Water quality was identified as a high priority in the vital signs ranking process. Vital signs to be included under this protocol include water chemistry, stream and river water dynamics, stream and river channel characteristics, and aquatic macroinvertebrates.

Under the cooperative agreement with the University of Virginia, a report was prepared that updated the information on state-identified, impaired (305b and 303d-listed) waters within Network parks; compiled information on state-identified outstanding waters, or special protection waters; compiled information on other water bodies in the Network not officially recognized as such but that are thought to be both pristine and ecologically highly significant; and identified ecologically significant “stressors” that have the potential to impact water quality within Network parks. In addition, the Network and cooperators continued to work with park staff to conduct data mining and database review activities to determine the status of active and historic water quality monitoring within the parks of MIDN, continued to compile existing water quality data, and evaluated existing water quality monitoring programs (by NPS or others).

Mojave Desert Network (MOJN)

The Network received water quality monitoring funds totaling \$78,100 in FY2006. The funds were used to supplement springs inventories at JOTR and PARA and to fund a Level 1 springs inventory at LAME. The Network also funded two GS-5 biotechnicians to quality-check and enter into a NPStoret database all GRBA water quality data from 1998-2005 (from park files). The completed database was submitted to the Water Resources Division for review. A major accomplishment was the transfer of data from hard copy records (raw data sheets)

to an electronic format, but data are not yet available for analysis. Lastly, Network staff worked with GRBA and the Water Resources Division to plan a Level 1 baseline WQ inventory of GRBA to be performed in FY07.

National Capital Region Network (NCRN)

The Network received \$69,300 in FY2006 water quality monitoring funding. A variety of major accomplishments occurred this year. Monitoring protocols were implemented, including the installation of 16 water level loggers in the parks and the establishment of 40 long-term water monitoring sites. A desktop version of NPSTORET has been configured with sampling metadata for water chemistry and flow data entry. All data collected by the inventory and monitoring monitoring program since May 2005 has been entered into the database. The inventory and monitoring data manager and water resources specialist are working with the parks to enter their continuing monitoring data into NPSTORET.

The Water Resources Specialist continues working with the parks to revise their current monitoring and data management to mesh with the Regional Long-term Monitoring Protocols and NPSTORET.

North Coast and Cascades Network (NCCN)

The NCCN received \$80,000 from WRD for water quality monitoring. Water quality monitoring was distributed among five vital signs: mountain lakes and ponds, large lakes, wadeable streams, large rivers, and intertidal. In 2006, preliminary design and methods of the mountain lakes and ponds protocols were field tested in NOCA, MORA, and OLYM. Certain lakes were sampled twice to determine seasonal variation in productivity, others were sampled with an early season and late season replication, and others were sampled only once during period of high productivity. Sampling included aquatic breeding amphibians, non-native fish, zooplankton, bathymetry, water level,

water chemistry (including lake/pond temperature and dissolved oxygen profiles), and chlorophyll-a. A draft of the large lakes monitoring protocol was completed and sent out for peer review by both academic scientists and the NPS-Water Resources Division in May 2006. In 2006, monthly water quality sampling was conducted at Lake Crescent (OLYM) according to the draft protocol. This included physical and chemical profiles of the water column at five permanent stations in the lake, in addition to zooplankton and chlorophyll-a sampling.

Pilot studies were initiated for the wadeable stream protocol at NOCA and MORA to evaluate stream physical habitat methods. A report was produced on stream sampling using a spatially balanced, probabilistic sampling design for determining status and trends of chemical, physical, and biological properties of wadeable streams. In FY2006, protocol development continued at OLYM on three of the four major components of the intertidal monitoring protocol: sandy beach, intertidal temperature, and shoreline change. Standard operating procedures were finalized for all three components and field tested. Pilot protocol studies were initiated at seven sand beaches for sand grain-size and biological communities and at nine sites for continuous intertidal water temperature.

Northeast Coastal and Barrier Network (NCBN)

In FY2006 the Network received \$87,900 for water quality monitoring activities. An interagency agreement with USGS was modified to complete written revisions and field implement the Network's estuarine eutrophication monitoring protocol in Network parks. Network staff, Cape Cod National Seashore Prototype Monitoring Program staff, and USGS cooperators held a meeting in FY2006 to discuss the necessary revisions and changes needed for completion of a final draft. A final version will be completed in FY2007. Pilot implementation

of the protocol occurred in FY2005 and in FY2006 at GATE, ASIS, and CACO. The Network hired technicians at GATE, CACO, and ASIS to assist park staff with data collection and processing. NCBN and CACO data management staff are working jointly with the USGS cooperators to develop an estuarine water quality monitoring database that can be used by all of the Network parks. This database is being developed by CACO data management staff with review and assistance by Network staff and cooperators. Included in this database will be automated conversion and upload procedures to NPSTORET. A standard operating procedure will also be developed and incorporated into the protocol describing the database and procedures. This project is targeted for completion in FY2007.

Northeast Temperate Network (NETN)

Northeast Temperate Network received \$58,600 in water quality funding from WRD in FY2006. These monies were used by the Network and its cooperators to complete the Lakes and Streams Monitoring Protocol and conduct a full-scale test implementation of the protocol. The USGS Maine Science Center wrote the protocol and trained Network, ACAD, and University of Vermont staff in the monitoring procedures involving the collection of water quality and water quantity data. Monitoring was conducted from June through September and included flow measurements and NPS core physical parameters (temperature, pH, dissolved oxygen, and specific conductance). In addition, samples for selected water quality parameter analysis were taken in June and August and pond invasive species surveys were taken in September. Cooperators from the USGS began developing a draft NETN Freshwater Wetland Protocol based on procedures and a monitoring design they developed for ACAD. The draft was nearly complete at the end of FY2006 with the key remaining section being the sampling design. Under a cooperative agreement, the

USGS Maine Science Center installed and operated a continuous-record streamflow gage at ACAD, which will be used as an index gage for the region from which other similar streams can be estimated. Monthly streamflow measurements were also manually collected at nine other streams at ACAD.

Northern Colorado Plateau Network (NCPN)

In FY2006 the Network was funded by WRD in the amount of \$105,400 to support its water quality monitoring program. Funding was used for a Network hydrologist position and to conduct monitoring at nine Network parks. Other water quality funding was used to continue work with the USGS-WRD on data analysis, monitoring design, and protocol development. An interagency agreement was continued to fund technical assistance from USGS-WRD to support implementation of network-wide water quality monitoring. Monitoring continued at existing sites in ARCH, BLCA, CANY, and CURE; new monitoring sites were established in BLCA, BRCA, CANY, CARE, DINO, and ZION. This monitoring was accomplished through creative partnerships with park staff at BLCA, CURE, ARCH, and CANY, USGS personnel, and the Utah Department of Environmental Quality. The Network hydrologist developed tools to help simplify and improve the accuracy of water quality data collection, and three of these new tools were added to the NCPN website for use by other partners (DO, pH, and MPN bacteriological calculators). After peer review, the water quality monitoring protocol narrative was completed and standard operating procedures continue to be developed. Funding also supported the Network hydrologist's attendance at a water quality training course offered by the USGS and completion of a database documentation report that describes database development, data acquisition, data analyses and syntheses, and monitoring-plan development.

The Network is working cooperatively with the SCPN to develop aquatic invertebrate monitoring protocols after initiating field trials at ARCH, CARE, ZION, and NABR to compare qualitative and quantitative sampling methods to assess effectiveness in describing community structure. Together, these partnerships allowed a much greater monitoring effort to take place.

Northern Great Plains Network (NGPN)

In FY2006 the Network received \$79,100 from WRD to support its water quality monitoring program. The Network completed and submitted Phase I of the Network's Vital Signs monitoring plan. Through an agreement with South Dakota State University, the Network identified specific groups of aquatic macro-invertebrates that are the best indicators of ecological health in the Northern Great Plains. South Dakota State University staff consulted with WRD staff, continued to develop an aquatic monitoring plan for the Network, and collected baseline data in 2004 and 2005 to help develop the plan. The data was analyzed and an index of biological integrity (IBI) was developed. The IBI will be used in the design of a water quality monitoring plan. All of the data collected as part of the South Dakota State University water quality planning project were entered into NPStoret. Nearly completed is a stand-alone water monitoring plan. The plan will include background information on water resources in the Network, a recommend monitoring protocol and sampling design, thresholds, standard operating procedures, and all ingredients necessary to conduct a water quality monitoring program.

Pacific Island Network (PACN)

In FY2006 the Network received \$147,400 from WRD to support its water quality monitoring program. Network staff revised and updated the water quality study plan, and protocols for ground-water dynamic,

freshwater animals, and benthic marine community. The benthic marine Vital Sign protocol was completed, sent for external review, and begun to be implemented in KALA. The Network hired an aquatic ecologist who visited park units, identified areas of concern at each site, and continued water quality monitoring planning tasks. A preliminary draft of several portions of the water quality monitoring protocol was completed, and creation of the PACN water quality monitoring vital sign database was initiated.

Rocky Mountain Network (ROMN)

In FY2006 ROMN received \$59,500 in water quality funding from the Water Resources Division. These funds supported the continuation of ROMN staff's work with USGS-WRD-Colorado District-Alpine Hydrology Group on the Geospatial WQ Database. A preliminary report on the project is due in February of 2007, and the results will be used in developing the ROMN Water Quality and Stream Ecological Integrity monitoring program. ROMN staff and the Technical Committee developed a protocol development strategy and approach in 2006 that integrates water chemistry, surface-water dynamics, ground-water dynamics, freshwater communities and invasive aquatic biota into a single Stream Ecological Integrity protocol. This approach relies on the economies of using the same sampling design (probabilistic) to monitor each of these water-related Vital Signs at each sample point and thus save travel costs that would be needed by separate crews. It is also more meaningful ecologically to monitor these related Vital Signs under one protocol – measures of each will provide more power to understand changes and interrelationships among the Vital Signs. A pilot test of these protocols is planned for a GLAC watershed in FY2007. In addition, ROMN staff worked with Intermountain Region, WASO Water Resources Division, RM-CESU and GLAC, ROMO, and FLFO staffs to 1) initiate

two projects to assess current ecological condition of the parks on a watershed basis/ scale, 2) assess aquatic baseline conditions for the North Fork of the Flathead River, a major drainage of the Crown of the Continent Ecosystem threatened by mineral resource development, and 3) support NPS efforts to develop science based reference conditions and build on existing data bases of Network parks and claim a new Federal reserved water right at GRSA through development of ground-water monitoring protocols.

San Francisco Bay Area Network (SFAN)

In FY2006 the Network received \$68,300 from WRD to support its water quality monitoring program. The Freshwater Quality Monitoring Protocol was completed and formally peer-reviewed. Network staff worked with WRD staff and other peer reviewers to make the protocol into a model that might be followed by other networks. The protocol provides the guidance for monitoring the health of park streams by tracking pH, temperature, conductance, and dissolved oxygen, as well as bacterial, nutrient, and sediment levels. Water Resources Division funding supported the salary for the position of Network Water Quality Specialist, laboratory contracts for water quality testing, equipment and supplies, a vehicle, and travel. Network staff began implementation of water quality monitoring according to protocol and SOPs and established laboratory contracts to run tests on water samples.

Sierra Nevada Network (SIEN)

The Sierra Nevada Network received \$61,500 in water quality funds from WRD. These funds were primarily used for salary, travel and other support costs for the Network's term physical scientist, who is coordinating the Network's water resources monitoring planning and protocol development. Through a cooperative agreement, the SIEN and the USGS-WRD acquired and synthesized air and water resources data

associated with nitrogen deposition research at high elevation lakes. The USGS completed data collection, analysis, and a draft final report. Information from this project assisted the SIEN in selecting the most effective indicators and is contributing to sample design and protocol development decisions for monitoring lake water chemistry.

SIEN parks contain over 4,500 lakes and ponds, and thousands of miles of streams and rivers. The SIEN assembled a multi-disciplinary, water resources workgroup comprised of USGS, University of California at Riverside, and USFS scientists to define water monitoring objectives and assist with protocol development. The water workgroup made the decision to develop two water resource monitoring protocols: 1) Lakes and 2) Rivers and Streams. Protocols will integrate surface-water dynamics, water chemistry, and amphibian vital signs.

Sonoran Desert Network (SODN)

SODN received \$62,500 in FY2006 water quality monitoring funding. Accomplishments include adoption of existing protocols developed by the EPA EMAP program and the Arizona Department of Environmental Quality for monitoring water quality vital signs (core parameters, nutrient loading, pollutant metals, biological condition, and aquatic macroinvertebrates). This effort has been led by the Intermountain Regional Hydrologist for Arizona and two graduate interns. Pilot studies were completed at Tumacacori NHP, Montezuma Castle/Montezuma Well NM, Organ Pipe Cactus NM, and Gila Cliff Dwellings NM in FY2006 and included quarterly sampling of the core parameters in conjunction with annual (or less frequent) sampling of aquatic macroinvertebrates, periphyton, flow, channel morphology, and streamside vegetation. A pilot study at Quitobaquito Springs and Pond at Organ Pipe Cactus NM also continued in conjunction with park staff and the Intermountain Regional Hydrologist

(AZ) addressed key sampling design questions with regard to co-location with other vital signs, spatially-balanced sampling designs, and sampling frequency. A Physical Science Technician (term) was hired in mid-FY2006 to support water quality monitoring.

South Florida/Caribbean Network (SFCN)

In FY2006 the Network received \$143,500 from WRD to support its water quality monitoring program. Network staff worked with WRD and other groups to complete watershed assessments for several park units. The SFCN reef water temperature sampling program now uses two HOBO Temperature Pro sensors set for redundancy at each site collected, building on the extensive work already put into the long-term temperature trends. The Network compiled the water quantity and quality resource information that exists in SFCN parks and put the results into an appendix of the phase 2 Vital Signs Monitoring Plan. GIS layers depicting all long-term water monitoring stations, along with metadata within the SFCN, were compiled. Work continued to determine preexisting short comings of the current monitoring network and to improve the QA/QC of the data from park units.

Southeast Alaska Network (SEAN)

In FY2006 the Network received \$41,000 from WRD to support its water quality monitoring program. These funds went toward a cooperative agreement with the University of Alaska Southeast to provide technical assistance in evaluating and summarizing water quality data for the Network parks and providing recommendations for developing the water quality monitoring component of the Vital Signs Monitoring Plan. Tasks included the evaluation of water resource data in all Network parks and development of water quality monitoring recommendations that will be completely integrated with the Network vital signs monitoring plan. The Network benefited from the recently

completed Coastal Watershed Assessments for GLBA, KLGO, and SITK that provided an especially timely and rich source for identifying the status of and threats to coastal water resources in the Network. The Network also continued its support of the USGS Indian River gage in partnership with SITK, the City and Borough of Sitka, USGS, and ADF&G. Plans are ongoing to fill the recently vacated Network coordinator and data manager positions. The primary emphasis going forward will be in completing the Vital Signs Monitoring Plan (Phase III report), including a data management plan and a fully integrated water quality monitoring plan.

Southeast Coast Network (SECN)

In FY2006 the Network received \$118,100 from WRD to support its water quality monitoring program. Consistent with both National Estuarine Research Reserve and WRD guidance, a core parameter fixed station water quality monitoring protocol was adopted from the system and implemented in the Network. The overall objective of this protocol is to semi-continuously monitor core water quality parameters (pH, temperature, dissolved oxygen, salinity/conductivity) in order to understand short-term variability and long term trends in water quality at fixed sites. The protocol for this monitoring is the first one to be completed in the SECN and has been submitted with the recent SECN Phase III report. Appropriate staff has been trained on the water quality monitoring instrumentation and on the SECN protocol requirements. SECN has partnered with the US EPA to evaluate existing data within or near SECN coastal park boundaries, and the water quality portion of the assessment was completed. The Network completed agreements to work with the Florida Department of Environmental Protection and the Estuarine Reserves Division of the NOAA to collaborate on various monitoring and management issues of joint interest. A

contract was awarded to a laboratory for the nutrient and chlorophyll analyses.

Southern Colorado Plateau Network (SCPN)

In FY2006, the SCPN received \$121,000 in funding from WRD. The publication of the Vital Signs Monitoring Plan for the Southern Colorado Plateau Network marked the completion of the initial planning process for the SCPN monitoring program. The draft report was peer reviewed by a group of NPS, USGS, and academic reviewers early in FY2006. The monitoring plan was published within the new NPS Natural Resource Report series in October 2006. The SCPN hydrologist continued to meet with park staff across the Network to identify monitoring needs and visit park waters and revised the water quality portion of the SCPN Phase III report.

Collaborative work with NCPN and USGS scientists to develop riparian and aquatic macroinvertebrate protocols continued in FY2006. Methods SOPs have been drafted. Riparian field trials focused on field application of a riparian classification system and on pilot testing of stream geomorphology and riparian vegetation methods. Macroinvertebrate field trials focused on comparing quantitative and qualitative sampling, and on collecting multiple samples within the reference period.

In FY2006, SCPN funded USGS to collect water-quality samples at PETR, a site experiencing threats due to rapid urbanization in surrounding areas. Network staff provided technical assistance to NPS WRD scientists studying ground-water issues at AZRU. At GLCA surveys defining spatial variability of NPS Core Water-Quality Parameters were completed. Instrumentation documenting temporal variability of the NPS Core Water-Quality

Parameter was installed at BAND. A rapid assessment of 44 springs at CACH was carried out, including collection of water quality field parameters and biologic data.

Southern Plains Network (SOPN)

The Network received \$28,300 in monitoring funds in FY2006. The Network is working on completing its Phase I plan by compiling and examining temporal trends at selected sites within the Network through a cooperative agreement with Texas State University. All relevant historic water-quality data for all SOPN parks are being inventoried and thoroughly reviewed. Texas State University and SOPN will then select a list of sites for which temporal trends can be identified upon completion of this inventory. Temporal trends at the sites will be analyzed, interpreted, and reported. This information will subsequently serve as the baseline for the Network water quality program. The Network also selected 29 vital signs that will make up the long-term monitoring program. Of these, 11 were designated core vital signs and will represent vital signs which will receive most of the Network resources in the near future. Aquatic core vital signs included the core water quality parameters plus E. coli, surface-water quantity, and ground-water quantity. A secondary aquatic vital sign is aquatic invertebrates, and a tertiary aquatic vital sign is flooding processes. During a prioritization workshop, the Network used a collaborative effort of 30 outside experts and representatives from each Network park to create a prioritized list of vital signs. The technical committee then met to select the vital signs for the program, using the prioritized list as a guide. This selected list was subsequently presented to the Board of Directors for their review and approval.

Southwest Alaska Network (SWAN)

The SWAN received \$135,700 in FY2006. The Network's vital signs monitoring plan was finalized and approved by the Board of Directors and NPS Monitoring Program

Leader. Network staff and cooperators continued writing and field testing protocols and initiated pilot monitoring for landscape processes, glacial extent, freshwater flow systems, and marine nearshore vital signs. Final drafts of each of these protocols will be submitted to the Alaska regional inventory and monitoring coordinator for peer review in late 2006 or early 2007.

A draft freshwater flow system monitoring protocol narrative was completed in December and 11 associated SOPs were completed by September, including SOPs titled: water quality field trip procedures, water sample collection and field processing, water quality assurance project plan, stream flow measurement, and physical water quality measurements. Protocol development for surface hydrology was initiated this year with a cooperative agreement with the USGS to establish crest and stage gages at four SWAN rivers, Naknek and Brooks in KATM, and the Chilikadrotna (Twin Lake) and Telaquana River in LACL.

A cooperative agreement was established in FY2003 with the Institute of Marine Sciences at the University of Alaska-Fairbanks to examine how climatic, oceanographic, and landscape processes may impact lake productivity and salmon abundance through time. Work continued in FY2006 and included collection of additional sediment cores from Kijik Lake in LACL, a draft final report for sediment core analysis in ANIA, and analyses of core samples for organic carbon, nitrogen, C-13, N-15, and biogenic silica. An interagency agreement was established with the USGS Alaska Science Center to assist with the design and development of marine nearshore vital sign monitoring protocols and overall design elements such as metrics, selection of sampling sites, and frequency of sampling. In 2006 draft protocols and SOPs were tested at KATM for monitoring intertidal invertebrates and algae. Water quality data

were collected in KEFJ at Exit Creek and Pederson Lagoon. A work order was written under the existing Interagency Agreement with USGS for continued operation of the Crescent River gauging site (LACL) and to test the proposed surface hydrology protocol by establishing staff and crest/stage gages at Naknek and Brooks Lakes in KATM and Twin and Telaquana Lakes in LACL. SWAN purchased and installed water level recorders at Brooks, Naknek, and Twin Lakes.

Upper Columbia Basin Network (UCBN)

Water Resources Division supported the Upper Columbia Basin Network with \$48,800 in water quality funding in FY2006. The Network used these funds to continue developing a water quality monitoring plan that would be fully integrated with the overall UCBN Vital Signs Monitoring Plan. A cooperative agreement was established with the University of Idaho to develop a water quality monitoring protocol for the UCBN. Components of this protocol include macroinvertebrate and water chemistry sampling and use of multi-parameter water quality equipment for the collection of NPS core field parameters deployed at targeted waterbody locations in parks to address specific monitoring questions. The University has developed conceptual models to guide the selection of monitoring objectives and has provided summary information on water bodies in and adjacent to Network parks, including waters listed through the Clean Water Act's mandated water quality reports. Completion of the narrative portion of the water quality monitoring protocol is planned for October 2006, and it is anticipated that the full protocol will be ready for peer review in early 2007. In addition, a task agreement with the University of Idaho was funded to compile the summary information on water bodies in and adjacent to Network parks, including waters listed through the Clean Water Act's mandated water quality reports and existing water quality programs.

APPENDIX D

PUBLICATIONS/CONTRIBUTIONS AWARDS

PUBLICATIONS

Albright, J. Natural resource condition assessments: Helping parks with resource stewardship planning and GPRA Land Health Goal Reporting. Fifth Annual NPS Inventory and Monitoring Meeting of the Networks. San Diego, California, USA. February 6-10, 2006. Abstract published.

Anderson, G. 2006. An investigation of tectonic deformation on water levels in Devils Hole, Death Valley National Park. Unpublished Master of Science thesis. University of Colorado, Department of Geological Sciences. Boulder, Colorado, USA. 125 pp.

Back, J. T. 2006. Report on ground-water levels in the Amargosa Desert Hydrographic Basin through 2005, in support of National Park Service protests of Amargosa Desert Hydrographic Basin 230 Applications 59352, 62529, 66072, 66077, 66078, 66079 and 66081, prepared for the State Engineer, State of Nevada, Department of Conservation and Natural Resources, Carson City, Nevada. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 16 pp.

Beck, D. A., and J. W. Wilson. 2006. Discharge and physical-property measurements from Virgin River Narrows, Arizona, to Lake Mead, Nevada, February 12, 2003: U.S. Geological Survey Scientific Investigations Report 2005-5286. 10 pgs.

Beck, D. A., and J. W. Wilson. 2006. Synoptic discharge, water-property, and pH measurements for Muddy River Springs area and Muddy River, Nevada, February 7, 2001: U.S. Geological Survey Scientific Investigations Report 2006-5237. 12 pgs.

Bedinger, M. S., and J. R. Harrill. 2006. Analytical regression stage analysis for Devils Hole, Death Valley National Park, Nevada. *Journal of the American Water Resources Association* 42 (4): 827-839.

Billingsley, G. H., T. J. Felger, and S. S. Priest. 2006. Geologic map of the Valle 30' x 60' Quadrangle, Coconino County, Northern Colorado. U.S. Department of the Interior, U.S. Geological Survey. Scientific Investigations Map 2895. 22 pp + map.

Briggs, M. 2006. Middle Rincon Creek: A review of the ecosystem's physical and biological resources. Tucson, Arizona, USA, *in press*.

Christensen, P. K., J. C. Hughes, and W. R. Hansen. 2005. Ground-water discharge from the Navajo Sandstone to the streamflow of the Virgin River in the Zion National Park area. Technical Report NPS/NRWRD/NRTR-2005/343. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 51 pp.

Clark, S. D., and L. A. Davis. 2006. Draft and provisional report: Hydrology of the middle reach of Rincon Creek, Pima County, Arizona. Haley & Aldrich. Tucson, Arizona, USA, *in press*.

Coleman, M., and K. Fausch. 2006. Causes of recruitment bottlenecks in translocated Cutthroat trout populations: Investigations of low temperature effects. Final project report to Colorado Division of Wildlife, Central Utah Project Completion Act Office, USDA Forest Service and the National Park Service. Department of Fishery and Wildlife Biology, Colorado State University. Fort Collins, Colorado, USA. 136 pp.

Cooper, D. J., and E. A. Gage. 2006. Fan Lake and Fall River restoration: Site characterization, design, and recommendations. Department of Forest,

- Rangeland, and Watershed Stewardship, Colorado State University. Fort Collins, Colorado, USA. 27 pp.
- Cooper, D. J., J. Dickens, N. T. Hobbs, L. Christensen, and L. Landrum. 2006. Hydrologic, geomorphic and climatic processes controlling willow establishment in a montane ecosystem. *Hydrological Processes* 20: 1845–1864.
- Cooper, D. J., and E. C. Wolf. 2006. Analysis of meadow hydrology, vegetation, and soils and suggestions for restoration of Upper Halstead Meadow, Sequoia National Park, California. Department of Forest, Rangeland, and Watershed Stewardship, Colorado State University. Fort Collins, Colorado, USA. 18 pp.
- Craft, J. A., and J. A. Stanford. 2004. Investigating water quality in Lake McDonald. Final project report to the National Park Service. Flathead Lake Biological Station. Polson, Montana, USA. 17 pp.
- Crane, T., B. Moraska Lafrancois, J. Glase, M. Romaski, M. Schneider, and D. Vana-Miller. 2006. Isle Royale National Park (Michigan) water resources management plan. Isle Royale National Park. Houghton, Michigan, USA. 262 pp.
- Cuttillo, P. A. 2005. Calculation of drawdown at Buffalo and Antelope Springs, Chickasaw National Recreation Area, with regard to Application No. 2002-602 filed by Meridian Aggregates Company. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 4 pp.
- Cuttillo, P. A. 2006. Calculation of drawdown at Wind Cave, Wind Cave National Park, with regard to Permit Application Nos. 2580-2 and 2585-2, filed by the Southern Black Hills Water System. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 7 pp.
- Cuttillo, P. A., and S. Ge. 2006. Analysis of strain-induced ground-water fluctuations at Devils Hole, Nevada. *Geofluids* 6: 319–333. doi: 10.1111/j.1468-8123.2006.00150.x
- Cuttillo, P. A. 2006. Expert witness statement, in support of National Park Service protests of Spring Valley Hydrographic Basin 184 Applications 54003-54021, prepared for the State Engineer, State of Nevada, Department of Conservation and Natural Resources, Carson City, Nevada. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 7 pp.
- Cuttillo, P. A., S. Ge, and E. J. Sreaton. 2006. Hydrodynamic response of subduction zones to seismic activity: a case study for the Costa Rica margin. *Tectonophysics* 426: 167–187.
- Dakin, E. E., B. A. Porter, B. J. Freeman, and J. M. Long. 2006. Genetic integrity of an isolated population of shoal bass (*Micropterus cataractae*) in the upper Chattahoochee River Basin: Final report. National Park Service, Southeast Region. Atlanta, Georgia, USA.
- Dux, A. M. 2005. Distribution and population characteristics of Lake trout in Lake McDonald, Glacier National Park: Implications for suppression. Masters thesis. Department of Fish and Wildlife Management, Montana State University. Bozeman, Montana, USA. 86 pp.
- Eckert, G., E. Hood, C. Talus, and S. Nagorski. 2006. Assessment of coastal water resources and watershed conditions at Sitka National Historical Park (Alaska). Technical Report NPS/NRWRD/NRTR-2005/347. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 81 pp.
- Elliott, P. E., D. A. Beck, and D. E. Prudic. 2006. Characterization of surface-water resources in the Great Basin National Park area and their susceptibility to ground-water withdrawals in adjacent valleys, White Pine

County, Nevada: U.S. Geological Survey Scientific Investigations Report 2006-5099. 156 pp + 1 plate.

Elliott-Fisk, D. L., S. Allen, A. Harbin, J. Wechsler, D. Schirokauer, and B. Becker. 2005. Assessment of oyster farming in Drakes Estero, Point Reyes National Seashore. Final completion report. 105 pp.

Faber, D., C. Soiseth, C. Murdoch, and J. Wardell. 2005. Evaluation of habitat and growth trends for East Alsek River Sockeye salmon (*Oncorhynchus nerka*) in Glacier Bay National Preserve, Alaska; Annual Data Summary Report – 2005. Memo report to NPS. 58 pp.

Fisk, T. T. 2006. Amargosa Desert Hydrographic Basin 230 hydrogeology, in support of National Park Service protests of Amargosa Desert Hydrographic Basin 230 Applications 59352, 62529, 66072, 66077, 66078, 66079 and 66081, prepared for the State Engineer, State of Nevada, Department of Conservation and Natural Resources, Carson City, Nevada. National Park Service, Death Valley National Park. Death Valley, California, USA. 12 pp.

Fraser, L. H., F. C. Landis, and K. Skerl. 2005. Wetland monitoring protocol for the Cuyahoga Valley National Park, Ohio. National Park Service, Cuyahoga Valley National Park. 107 pp.

Gaiser, E. E., and M. S. Ross. 2004. Water flow through coastal wetlands. Southeast Environmental Research Center, Florida International University. Miami, Florida, USA. 75 pp.

Gaiser, E., A. Wachnicka, P. Ruiz, F. Tobias, and M. Ross. 2005. Diatom indicators of ecosystem change in sub-tropical coastal wetlands. Pages 127–144 in *Estuarine Indicators*. CRC Press. Boca Raton, Florida, USA.

Gettings, M. E., and M.W. Bultman. 2005. Candidate-penetrative-fracture mapping of the Grand Canyon area, Arizona, from spatial correlation of deep geophysical features and surficial lineaments. Data Series 121, U.S. Department of the Interior, U.S. Geological Survey. 21 pp. + 163 map plates.

Hood, E., G. Eckert, S. Nagorski, and C. Talus. 2006. Assessment of coastal water resources and watershed conditions at Wrangell – St. Elias National Historical Park (Alaska). Technical Report NPS/NRWRD/NRTR-2005/346. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 77 pp.

Hood, E., G. Eckert, S. Nagorski, and C. Talus. 2006. Assessment of coastal water resources and watershed conditions at Klondike Gold Rush National Historical Park (Alaska). Technical Report NPS/NRWRD/NRTR-2005/349. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 89 pp.

Hoover, D., and C. Gold. 2005. Assessment of coastal water resources and watershed conditions at Kaloko-Honokūhau National Historical Park (Hawaii). Technical Report NPS/NRWRD/NRTR-2005/344. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 140 pp.

Hoover, D. J., and C. Gold. 2006. Assessment of coastal water resources and watershed conditions at Pu‘uhonua o Hōnaunau National Historical Park (Hawaii). Technical Report NPS/NRWRD/NRTR-2005/352. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 170 pp.

Irwin, R. Lessons learned in the National Park Service Aquatic Vital Signs Long Term Monitoring Program. 2006 National Monitoring Conference: National Water Quality Monitoring Council. San Jose, California, USA. May 8-11, 2006. Abstract

published p. 53.

Ketcham, B., A. Pawley, PhD, D. Fong, and K. A. Keteles, PhD. Coastal watershed assessment: Point Reyes National Seashore and Golden Gate National Recreation Area. 2006 National Monitoring Conference: National Water Quality Monitoring Council. San Jose, California, USA. May 8-11, 2006. Abstract published p. 488.

Keteles, K. A., PhD, C. G. McCreedy, M. D. Flora, and J. T. Tilmant. Coastal national parks: Assessing water resources in stressed ecosystems. Society of Environmental Toxicology and Chemistry 26th Annual Meeting. Baltimore, Maryland, USA. November 13-17, 2005. Abstract published.

Keteles, K.A., PhD, C. McCreedy, and J. Tilmant. A collaborative approach to assessing watershed conditions in coastal national parks. 2006 National Monitoring Conference: National Water Quality Monitoring Council. San Jose, California, USA. May 8-11, 2006. Abstract published p. 291.

Kynard, B., M. Breece, M. Keiffer, M. Atcheson, and M. Mangold. 2006. Status of Short nose sturgeon in the Potomac River: Part I – field studies. 2005 Annual Progress Report by USGS to the NPS. February 2006. 13 pp.

Laczniak, R. J. 2006. Summary of evapotranspiration studies in the Death Valley area of Nevada and California, expert witness statement in the matter of Water Right Applications 59352, 62529, 66072, 66077, 66078, 66079 and 66081, prepared for the State Engineer, State of Nevada, Department of Conservation and Natural Resources, Carson City, Nevada: U.S. Geological Survey. Henderson, Nevada, USA. 15 pp.

Long, J. M. 2006. Assessment of fish health in Front Lake: Carl Sandburg Home National

Historic Site. Technical Assistance Report. National Park Service, Southeast Region. Atlanta, Georgia, USA.

Long, J. M. 2006. Evidence of Rainbow trout spawning in small, warmwater tributaries of the Chattahoochee River, Georgia; Chattahoochee River National Recreation Area. Technical Report. National Park Service, Southeast Region. Atlanta, Georgia, USA.

Long, J. M. 2006. Fish passage needs at Dill Branch: Shiloh National Military Park. Technical Assistance Report. National Park Service, Southeast Region. Atlanta, Georgia, USA.

Long, J. M. 2006. The role of Mississippi River flooding on fish presence in Mint Springs Creek. Technical Assistance Report. National Park Service, Southeast Region. Atlanta, Georgia, USA.

Long, J. M., and W.L. Fisher. 2006. Analysis of environmental variation in a Great Plains reservoir using principal components analysis and geographic information systems. *Lake and Reservoir Management* 22: 132-140.

Lord, E. H. 2006. Witness statement, in support of National Park Service protests of Amargosa Desert Hydrographic Basin 230 Applications 59352, 62529, 66072, 66077, 66078, 66079 and 66081, prepared for the State Engineer, State of Nevada, Department of Conservation and Natural Resources, Carson City, Nevada. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 6 pp.

Lord, E. H. 2006. Witness statement, in support of National Park Service protests of Spring Valley Hydrographic Basin 184 Applications 54003-54021, prepared for the State Engineer, State of Nevada, Department of Conservation and Natural Resources, Carson City, Nevada. National Park Service,

Water Resources Division. Fort Collins, Colorado, USA. 5 pp.

Magoulick, D. D. 2006. Factors affecting migration and recruitment in headwater fish assemblages of Buffalo National River. U.S. Geological Survey, Arkansas Cooperative Fish and Wildlife Research Unit, Department of Biological Sciences, University of Arkansas. Fayetteville, Arizona, USA. 63 pp.

Mallin, M. A., M. R. McIver, and V. L. Johnson. 2005. Assessment of coastal water resources and watershed conditions at Cape Hatteras National Seashore (North Carolina). Technical Report NPS/NRWRD/NRTR-2005/351. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 75 pp.

Margo, M. R. 2006. Restoration of Resaca Wetlands and associated wet prairie habitats at Palo Alto Battlefield National Historic Site. Masters thesis. Department of Rangeland Ecology and Management, Texas A&M University. 49 pp.

Martin, L. 2006. Potential groundwater sources for a potable water supply, Sand Creek Massacre Site, Kiowa County, Colorado, USA. 8 pp.

Martin, L. 2006. Some brief comments regarding hydrogeology and well drilling at Catoctin Mountain Park. 5 pp.

Martin, L. 2006. Comments regarding construction of a new well at the Abo Unit, Salinas Pueblo Missions National Monument. 4 pp.

McCreedy, C. G. 2006. Scientific partnerships evaluate coral reef health at Virgin Islands Monuments. Pages 50–51 *in* J. Selleck, editor. NPS Natural Resource Year in Review—2005. National Park Service, Denver, Colorado, and Washington, D.C., USA.

McCreedy, C. G. and K. A. Keteles, PhD. 2006. Watershed assessments enhance cooperative conservation. Pages 47–48 *in* J. Selleck, editor. NPS Natural Resource Year in Review—2005. National Park Service, Denver, Colorado, and Washington, D.C., USA.

McFarlin, C., and M. Alber. 2005. Assessment of coastal water resources and watershed conditions at Fort Pulaski National Monument (Georgia). Technical Report NPS/NRWRD/NRTR-2005/345. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 184 pp.

Meiman, J. 2006. Water resources management plan – Mammoth Cave National Park (Kentucky). National Park Service, Mammoth Cave National Park. Mammoth Cave, Kentucky, USA. 256 pp. + map folio.

Miller, J. R. 2005. Quantifying historical channel and floodplain change along the Little Missouri River in Theodore Roosevelt National Park, North Dakota. Unpublished Master's Degree thesis. Colorado State University. Fort Collins, Colorado, USA. 99 p.

National Park Service. 2006. Streamflow records for Water Year 2002-2005 for Station No. 343853III45020I, Montezuma Well Outlet near Rimrock, AZ. National Park Service, Water Resources Division. Fort Collins, Colorado, USA.

National Park Service. 2006. Streamflow records for Water Year 2003-2004 for Station No. 320745II036570I, Rincon Creek near Madrona Ranger Station. National Park Service, Water Resources Division. Fort Collins, Colorado, USA.

National Park Service. 2006. Streamflow records for Water Year 2003-2004 for Station No. 453400I0726300I, Little Bighorn River at Little Bighorn National Monument. National Park Service, Water Resources Division. Fort Collins, Colorado, USA.

National Park Service. 2006. Streamflow records for Water Years 1999-2003 for Station No. 453400107263001, North Fork of the Big Hole River at Big Hole National Battlefield. National Park Service, Water Resources Division. Fort Collins, Colorado, USA.

National Park Service. 2006. Water-level records for Water Years 1990-2001 for Station No. 362532116172701, Devils Hole at Death Valley National Park. National Park Service, Water Resources Division. Fort Collins, Colorado, USA.

National Park Service. 2006. Streamflow records for Water Years 2004 for Station No. 363031116401501, Nevares Spring near Cow Creek, Death Valley National Park. National Park Service, Water Resources Division. Fort Collins, Colorado, USA.

National Park Service. 2006. Streamflow records for Water Years 2004 for Station No. 362727116401401, Texas Spring in Furnace Creek Wash, Death Valley National Park. National Park Service, Water Resources Division. Fort Collins, Colorado, USA.

National Park Service. 2006. Streamflow records for Water Years 2000-2005 for Station No. 362711116494401, Texas Springs Syncline Well near Furnace Creek, Death Valley National Park. National Park Service, Water Resources Division. Fort Collins, Colorado, USA.

National Park Service. 2006. Groundwater levels record for Water Years 2003-2005 for Station No. 343022096565701, West Observation Well, Chickasaw National Recreation Area. National Park Service, Water Resources Division. Fort Collins, Colorado, USA.

National Park Service. 2006. Groundwater levels record for Water Years 2003-2005 for Station No. 343017096561501, East Observation Well, Chickasaw National

Recreation Area. National Park Service, Water Resources Division. Fort Collins, Colorado, USA.

National Park Service. 2006. Streamflow records for Water Years 2001-2005 for Station No. 371508108212801, Mancos River at Anitas Flat, Mesa Verde National Park. National Park Service, Water Resources Division. Fort Collins, Colorado, USA.

Page, W. R., D. S. Scheirer, and V. E. Langenheim. 2006. Geologic cross sections of parts of the Colorado, White River, and Death Valley regional ground-water flow systems, Nevada, Utah, and Arizona: U.S. Geological Survey Open-File Report 2006-1040. 23 pp. + 1 plate.

Penoyer, P. Pre-mobilization error checks of multi-parameter field instruments: One way of promoting servicewide consistency in a water quality monitoring program. Presentation at the 2006 National Monitoring Conference: National Water Quality Monitoring Council. San Jose, California, USA May 8-11, 2006. Abstract published p. 85.

Penoyer, P., and S. Monroe. Flow and water quality monitoring. Presentation at the Fifth Annual NPS Inventory and Monitoring Meeting of the Networks. San Diego, California, USA. February 6-10, 2006. Abstract published.

Prudic, D. E. 2006. Response to memorandum by Rowley and Dixon regarding U.S. Geological Survey report titled "Characterization of surface-water resources in the Great Basin National Park area and their susceptibility to ground-water withdrawals in adjacent valleys, White Pine County, Nevada": U.S. Geological Survey Open-File Report 2006-1342. 15 pgs.

Ramsey, E., and Y. Y. Yan. 2005. Palo Alto Battlefield National Historic Site landscape classification and historical analysis.

- Proceedings of the 20th biennial workshop on aerial photography, videography, and high resolution digital imagery for resource assessment. October 4-6, 2005. Weslaco, Texas, USA.
- Reich, C., R. B. Halley, T. Hickey, and P. Swarzenski. 2006. Groundwater characterization and assessment of contaminants in marine areas of Biscayne National Park. Technical Report NPS/NRWRD/NRTR-2006/356. National Park Service, Water Resources Division. 157 pp.
- Rosenlieb, G., and B. Long. An overview of the National Park Service's Vital Signs Water Quality Monitoring Program: A national framework for land management. Presentation at the 2006 National Monitoring Conference: National Water Quality Monitoring Council. San Jose, California, USA. May 8-11, 2006. Abstract published p. 285.
- Scheirer, D. S. and A. H. Scheirer. 2006. Gravity investigations of the Chickasaw National Recreation Area, South-Central Oklahoma: U.S. Geological Survey Open-File Report 2006-1083. 39 pp.
- Shaw, D. S. 2006. Subsurface conditions at the Rodeo Beach parking lot, Fort Cronkhite, Golden Gate National Recreation Area, Marin County, California. University of California-Berkeley, Center for Environmental Design Research. 39 pp.
- Shaw, J. R. 2006. Watershed and stream reach characteristics controlling riparian vegetation in semiarid ephemeral stream networks. Department of Forest, Rangeland, and Watershed Stewardship, Colorado State University. Fort Collins, Colorado, USA. 66 pp.
- Soiseth, C., C. Murdoch, and D. Faber. 2005. Meteorological and hydrological monitoring results for the Dry Bay Preserve, Glacier Bay National Park – 2005. Memo Annual Project Progress Report to the NPS. 35 pp.
- Spruell, P. 2004. Genetic analysis of Lake McDonald Bull trout. Report # WTSGL04-105. Wild Trout and Salmon Genetics Laboratory, Division of Biological Sciences, University of Montana. Missoula, Montana, USA. 8 pp.
- Tilmant, J. T. National parks and the conservation of bonefish and tarpon fisheries. 12 pages *in* Biology and Management of the World Tarpon and Bonefish Fisheries. Chapter 29. CRC Press. *In press*.
- Tiszler, J. 2005. Restoration of Lower Malibu Creek riparian wetlands: Eradication of *Arundo donax*. Final Project Report. National Park Service, Santa Monica Mountains National Recreation Area. 19 pp.
- Tucker, D. Vital Signs water quality data management: NPSTORET and STORET EDD. Presentation at the Fifth Annual NPS Inventory and Monitoring Meeting of the Networks. San Diego, California, USA. February 6-10, 2006. Abstract published.
- Tucker, D., M. Matz, and P. Galloway. Vital Signs water quality data management in the National Park Service. Presentation at the 2006 National Monitoring Conference: National Water Quality Monitoring Council, San Jose, California, USA, May 8-11, 2006. Abstract published p. 217.
- Tupper, M., and T. Donaldson. 2005. Impacts of subsistence fishery on coral reef resources in the War in the Pacific National Historical Park, Guam. Project Report to the National Park Service. University of Guam. Agana, Guam. 17 pp.
- Van Liew, W. P. 2006. Developing a tool to predict the future effects of ground-water pumping in Coyote Spring Valley on springs, streams, and riparian areas. National Park

Service, Water Resources Division. Fort Collins, Colorado. PowerPoint presentation at the Annual Conference of the Nevada Water Resources Association, Mesquite, Nevada, USA, February 23, 2006. 64 slides.

Van Liew, W. P. 2006. Hydrogeology of Kane Springs Wash, Coyote Spring Valley, the Muddy River Springs area, and vicinity: National Park Service, Water Resources Division, Fort Collins, Colorado. PowerPoint presentation given as expert-witness testimony to the Nevada State Engineer on behalf of Lake Mead National Recreation Area in an administrative hearing regarding water-rights applications by Lincoln County Water District and Vidler Water Company in Kane Springs Valley Hydrographic Area, April 6, 2006. 54 slides.

Van Liew, W. P. 2006. Hydrogeology of Kane Springs Wash, Coyote Spring Valley, the Muddy River Springs area, and vicinity. Expert witness evidentiary submittal to the Nevada State Engineer on behalf of Lake Mead National Recreation Area in an administrative hearing regarding water-rights applications by Lincoln County Water District and Vidler Water Company in Kane Springs Valley Hydrographic Area, March 16, 2006. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 16 figures + 4 tables.

Van Liew, W. P. 2006. Preliminary assessment of the hydrogeology of Spring Valley and Snake Valley Hydrographic Areas, East-Central Nevada and West-Central Utah, and potential adverse effects to the water resources of Great Basin National Park and surrounding lands due to ground-water pumping as proposed by the Southern Nevada Water Authority's water-rights applications in Spring Valley. Expert-witness evidentiary submittal to the Nevada State Engineer on behalf of Great Basin National Park in an administrative hearing regarding water-rights applications by the Southern

Nevada Water Authority in Spring Valley Hydrographic Area, June 29, 2006. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 22 pgs + 23 figures, 1 table, and 3 appendices.

Waddell, R. K. 2006. Report on simulation results in the Amargosa Desert Hydrographic Basin in support of National Park Service Protests of Amargosa Hydrographic Basin 230 Applications 59352, 62529, 66072, 66077, 66078, 66079 and 66081 prepared for the State Engineer, State of Nevada, Department of Conservation and Natural Resources, Carson City, Nevada. GeoTrans, Inc. Louisville, Colorado, USA. 9 pp. + 16 figures.

Wagner, J., G. Rosenlieb, K. Roney-Faulkner, S. Chaney, and M. Martin. 2006. Recovery of riparian communities following removal of cattle, Santa Rosa Island, Channel Islands National Park. Poster presentation at National Park Service/Utah State University Livestock and Landscapes Workshop, March 1-3, 2006, Lakewood, Colorado, USA.

Weeks, D. P. 2006. Golden Gate National Recreation Area (California) water resources foundation report. Technical Report NPS/NRWRD/NRTR-2005/348. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 64 pp.

Weeks, D. P. 2006. Effigy Mounds National Monument, Iowa: Water resources foundation report. Technical Report NPS/NRWRD/NRTR-2006/350. National Park Service, Water Resources Division. Fort Collins, Colorado, USA. 49 pp.

Wisleder, D. R. 2004. Reservoir sedimentation along the Upper Washita River in Western Oklahoma and Northern Texas. Masters thesis, Graduate College, Oklahoma State University. Stillwater, Oklahoma, USA. 82 pp.

Woods, S. W., and D. J. Cooper. 2005. Hydrologic factors affecting initial willow seedling establishment along a subalpine stream, Colorado, USA. *Arctic, Antarctic, and Alpine Research* 37 (4): 636–643.

Wullschleger, J. G. 2006. Recovering the Devils Hole pupfish: An ongoing lesson in conservation biology. *Devils Hole Workshop, Death Valley, California, USA, April 26-28, 2006.*

AWARDS

Jeff Alright received a STAR award for providing superior leadership for the development and implementation of the Watershed Assessment program.

Jennifer Back received a STAR award for her negotiations with a large mining company regarding water rights on the Arbuckle Aquifer for Chickasaw National Recreation Area and her expert testimony regarding water development near Devils Hole, Death Valley National Park.

Debi Cox received a STAR award for outstanding performance in the areas of budget formulation and administration and agreements management, especially handling new and unforeseen expectations.

Paula Cutillo received a STAR award for her work on water development near Wind Cave National Park and establishing NPS credibility in hydrologic science with the South Dakota Water Board.

Bill Hansen received a STAR award for performance substantially exceeding job requirements.

Jim Harte received a STAR award for his outstanding performance developing evidence to support the in-place ground-water claim at Great Sand Dunes National Park and Preserve and for technical

assistance to contract and drill a well to replace out-of-priority water on Annie Creek at Crater Lake National Park.

Jim Long, Southeast Region Fishery Biologist, received the Gulf Guardian Award from the Gulf of Mexico Alliance for the NPS' role in conducting the multi-agency Alabama / Mississippi Rapid Assessment of the Mississippi Sound.

Cliff McCreedy received a STAR award for his leadership in developing the Oceans Action Plan and the "Seamless Network" oceans agreement to coordinate management and protection of all federal marine protected areas.

Kevin Noon received a STAR award for his work evaluating proposed oil and gas exploration in Padre Island National Seashore, Big Cypress National Preserve, and Lake Meredith National Recreation Area.

Kris Parker received a STAR award for handling a multitude of tasks, including CORE OPS spreadsheet work and coordinating the CORE OPS meeting in July 2006 and the Eastern Rivers Summit to be held February 2007.

Chuck Pettee received a STAR award for his leadership of the Water Rights Branch in developing scientific data on ground water in the 20+ subbasins north of Las Vegas and developing a positive relationship with the Nevada State Engineer.

Jim Tilmant received a STAR award for professionalism shown in his successful coordination with other federal, state, and tribal fisheries management and regulatory agencies and national conservation / sportfishing organizations regarding NPS fisheries management programs, issues, needs, and initiatives.

Dean Tucker received a STAR award for exceptional performance despite a heavy workload related to the development of a servicewide database.

Bill Van Liew received a STAR award for ground-water work leading to expert testimony at the Great Basin National Park water rights hearing.

Don Weeks received a STAR award for being instrumental in revamping the planning process.

John Wullschleger received a STAR award for his work on the Devils Hole Pupfish Recovery Team.



Southern Appalachian brook trout stream, Bunches Creek Gorge, Great Smoky Mountains National Park (Steve E. Moore, 1999).

APPENDIX E

STAFF

OFFICE OF THE DIVISION CHIEF STAFF

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. 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 vehicle coordination.

Laura Pascavis: Colorado State University Archivist, Web Developer, MA in Archival Science, BA in History with specialization in environmental and western history.

PLANNING AND EVALUATION BRANCH STAFF

Mark Flora: Branch Chief, Hydrologist, MS in Environmental Science (Water Resources). Specialty areas include water resources management planning, water quality, and watershed management.

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

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

Jim Tilmant: Fishery Management & Marine Resources Program Team Leader, MS in Wildlife and Fisheries. Specialty areas include aquatic and marine resources management, fish biology, and population dynamics.

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

Kristen Keteles: Texas A&M University Coastal Watershed Condition Assessment Coordinator, PhD in Zoology, BS in Marine Science. Specialty areas include aquatic toxicology, marine ecology, assessment of coastal water resources, and trace metal contamination.

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.

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, ground-water monitoring, and wetland management.

Lael Wagner: Administrative Assistant.

WATER OPERATIONS BRANCH STAFF

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

Jeff Albright: Watershed Condition Assessment Program Coordinator, MS in Watershed Management. Specialty areas include hydrology data collection and data management protocols, watershed assessments, integration of science and policy in resource protection/restoration programs.

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 ground-water management, ground-water modeling, surface-water/ground-water 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 ground-water analysis, ground-water 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, BS in Environmental Geology, MS in Watershed Science. Specialty areas include open channel flow, geomorphology, flood analysis, wetlands hydrology, geochemistry, and water quality.

Barry Long: Hydrologist, BS in Watershed Sciences, MS in Forest Hydrology. Specialty areas include physical-chemical aspects of water quality.

Roy Irwin: Senior Contaminants Specialist, PhD in Biology. Specialist in 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.

Nathan Elder: Colorado State University Research Associate, STORET Database Project, BS in Watershed Science.

Hashem Faidi: Colorado State University Research Associate, Clean Water Act Designated Use and Impairment Database Manager, MS in Water Resources Engineering, PhD in Ground Water Engineering. Specialty areas include GIS applications in water resources and ground-water and contaminant transport modeling.

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.

Steve Mackie: Colorado State University Research Associate, STORET Database Project. MS candidate in Forestry.

Tony Meneghetti: Colorado State University Student-Hourly Water Quality Data Analyst, STORET Database Project, MS candidate in Civil and Environmental Engineering.

Pat Wiese: Colorado State University Administrative Assistant, BS in Biology, MA in Public Administration. Specialty areas include editing and report production.

WATER RIGHTS BRANCH STAFF

Chuck Pettee: Branch Chief, Supervisory Hydrologist, MS in Watershed Science. Specialty areas include water rights establishment and protection and water resources policy.

Bill Hansen: Supervisory Hydrologist, Adjudication Program and Information Management Program Leader, BS in Watershed Science, MS in Hydrology. Specialty areas include water rights policy

and adjudication, 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 ground- and surface-water 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, BS and MS in Geology. Specialty areas include hydrogeology and surface-water data collection.

Jim 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.

Jennifer Miller: Colorado State University Research Associate, BS in Natural Resources Management, MS in Watershed Science.

Bill Van Liew: Hydrologist, BS in Civil Engineering, BS in Geology, MS in Ground-Water Engineering/Environmental Hydrogeology. Specialty areas include ground-water hydrology and ground-water/ surface-water interactions.

Mark Wondzell: Hydrologist, BS in Forestry, MS in Agricultural Engineering.

Mohamed Aldhamari: Colorado State University Research Associate, PhD in Civil Engineering/Ground-Water Engineering.

Kathryn Converse: Colorado State University Research Associate, BS in Earth Sciences.

Jennifer Friedman: Colorado State University Research Associate, BS in Natural Resource Management (Environmental Policy).

Eric Lord: Colorado State University Research Associate, BS in Mineral Land Management, JD, MS in Forestry.

Flora Romero: Colorado State University Administrative Assistant. Associates Degree in Business. Specialty area is water rights quantification and protection projects.



Loggerhead Light, Dry Tortugas National Park (Keteles, 2006).

Water Resources Division

2006 Annual Report

May 2007

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The Water Resources Division 2006 Annual Report is published electronically on the World Wide Web. Please see www.nature.nps.gov/water/wrdpub.cfm. For a printed copy write to:

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