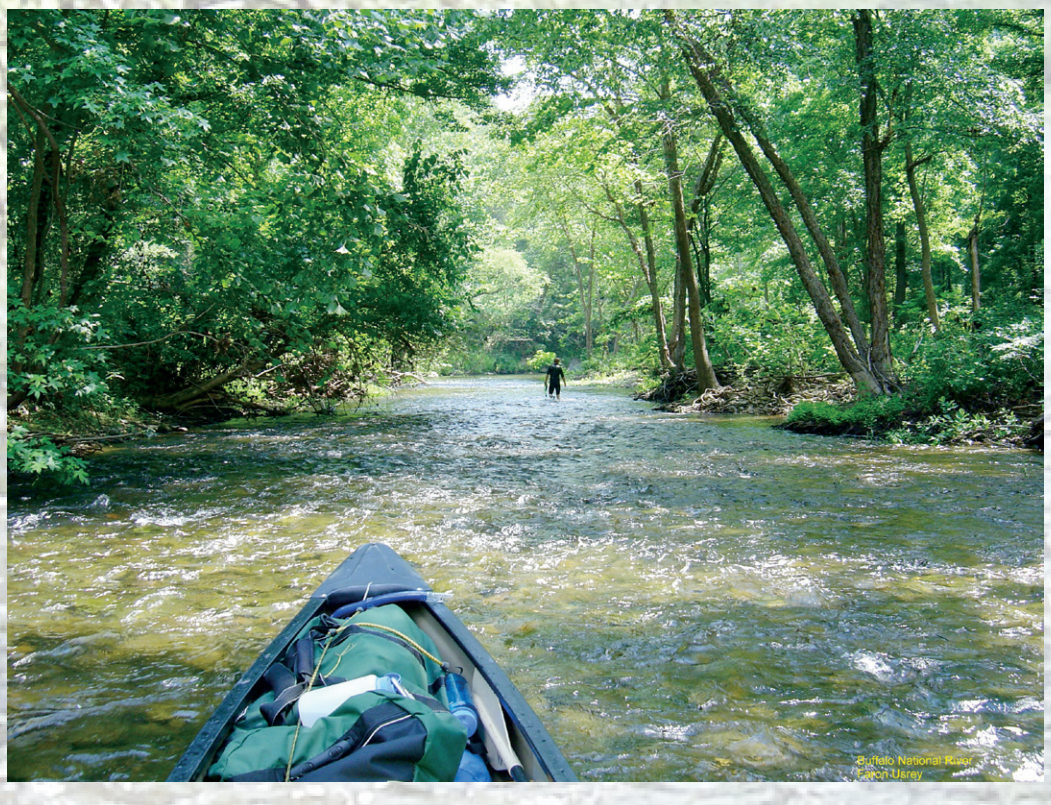
National Park Service
U.S. Department of the Interior

Natural Resource Program Center

Water Resources Division

2004 ANNUAL REPORT



Buffalo National River
Faron Usrey

Water Resources Division

2004 ANNUAL REPORT

Natural Resource Program Center
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National Park Service

U.S. Department of the Interior
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This entire publication, including useful embedded hyperlinks, is available in PDF format at:
http://www.nature.nps.gov/water/wrdpub.htm

front cover, photos:
Freshwater fish inventory, Meshik Lake, Aniakchak National Monument & Preserve (Joe Miller)
Live reef, War in the Pacific National Historical Park (Dwayne Minton)
Voyageurs National Park (John Wullschleger)

opposite:
Mussel search, Buffalo National River (Faron Usrey)

Glen Canyon National Recreation Area (Sara Bartels)

The Water Resources Division of the National Park Service 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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Kelp, Channel Islands National Park - Kevin Noon

A Word from the Associate Director Natural Resource Stewardship and Science

Mike Soukup, PhD

This annual report provides a summary of the 2004 accomplishments of the National Park Service's Water Resources Division (division). The division, in partnership with parks and others, provides leadership, technical assistance, and funding support for understanding, protecting, and managing water and aquatic resources of the National Park System. The division provides its services directly to parks through a broad range of programs in the areas of hydrology and water quality, water rights, watersheds and wetlands, planning, and fisheries and marine resources. Through the application of science in a planning, stakeholder negotiation, policy, regulatory, technical, or administrative context, the division'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 NPS. The division is part of the National Park Service Natural Resource Program Center and is located in Fort Collins, CO, with additional offices in Denver, CO, and Washington, D.C.

I am extremely pleased with the many accomplishments of the division and its partners reflected in this annual report. The Water Resources Division continues to be a model for cost effective, centralized support to the vast majority of parks that still do not have the range of technical expertise they need. In recent years, the significant support from Congress for the Natural Resource Challenge has enhanced NPS field capabilities in aquatic resource management and enabled the division to leverage its overall effectiveness through application of the tools of program leadership, servicewide program and technical guidance, senior technical support, and management accountability. These new opportunities have substantially enhanced the service's capabilities and effectiveness in critical program areas such as water quality monitoring, water resource protection, watershed assessment, aquatic biological resources, and coastal and marine resource protection. I am pleased with the professionalism and effectiveness with which the division has taken on these new leadership challenges, while continuing to provide one-on-one support to parks in addressing their day-to-day water and aquatic resource issues.

I think as you read this report, you'll note the diversity of water resources issues confronted by the National Parks and the professionalism with which they are being addressed. You will encounter articles on the new Oceans Initiative, riparian restoration, ground water protection, hydrographic and water quality databases, native fish restoration, watershed condition assessments, and desert flash floods, just to mention a few. These articles reflect the diversity of water and aquatic resources in our National Parks and the variety of challenges confronting them.

Comments from the Acting Division Chief

Bill Jackson, PhD

As we begin the 4th year of the Natural Resources Challenge (NRC), it is useful to pause and take stock of how this important initiative helped transform the service's capabilities to know, protect, and restore the abundant water, wetland, fishery, and coastal/marine resources entrusted to it. On the surface, the NRC has resulted in a tripling of the WRD base budget and the number of aquatic resource professionals in the field has more than doubled. But, budget and staffing numbers don't tell the real story; rather, it's the very positive differences these program gains are making in our parks. This report, WRD's 14th consecutive annual report, is intended to highlight some of the many substantive accomplishments stemming from our people and our programs.

While reading this report, I hope you'll notice how important the NRC is proving to be to the management of NPS water and aquatic resources. For example:

- Over 175 parks obtained water resources related technical assistance in 2004. A substantial component of that technical assistance support stems from the 15 new field aquatic resource professionals funded through the NRC. Appendix A summarizes these many substantive accomplishments.
- Twenty-three Vital Signs Monitoring Networks were fully funded through the NRC for water quality monitoring in 2004; twelve of those Networks have completed their Phase 3 planning for water quality monitoring. Appendix C summarizes the significant progress towards implementing what will become the service's first national water quality monitoring activity.
- Sixty-seven water resource projects were funded either through regions and parks or through interagency agreements for parks. A summary of WRD project programs, including the competitive program and U.S. Geological Survey (USGS) funded projects can be found in Appendix A. All water quality partnership programs and water rights project programs have benefited from the NRC.
- Eighteen new coastal watershed condition assessment projects were initiated in 2004 in units in the Pacific Northwest, California, Hawaiian Islands, and Southeast Alaska, bringing to 26 the total number of assessments being conducted to date. All of these assessments are supported by NRC increases and are part of a new servicewide program to assess watershed conditions throughout the National Park Service.

The report contains 20 short articles by staff, many in cooperation with cooperators or our park colleagues. Two of the articles are contributed by new NRC field aquatic resource professionals. These articles serve to highlight the ways in which our people and our projects work to help address park issues.

This past year was not without its challenges. There are growing expectations, as there should be, of WRD in the areas of

servicewide program leadership, budget and performance accountability, and reporting. We have invested considerable effort in being responsive to these expectations and to develop more streamlined accountability capabilities. The division has also been challenged by the gradual erosion of its base budget–largely because of increasing salary obligations–even as our workforce remains fairly stable. Despite some considerable belt tightening, this will result in the loss by 2006 of our legacy "competitive" project program. Current plans are to launch a new NRC supported watershed condition assessment project program in 2006; however, reestablishment of the competitive project program will remain a priority as we move forward. Finally, new NRC field aquatic resource professional positions are critical to enhancing place-based aquatic resource expertise in parks, and we will need to insure that they have a solid funding foundation as we move forward.

I want to thank everyone we've worked with over the past year throughout the National Park Service and its partners. It's the quality and dedication of our people, the world-class nature of the resources we manage, and the challenges presented by the issues we address that make what we do so rewarding. And, on a personal note, I want to thank everyone who has pitched in to help me during this sustained period of "Acting" division leadership–WRD staff and the rest of our management team, the ADNRSS and NRPC management team, regional water resources coordinators, and everyone we've worked with in the parks, just to name a few. Despite some missteps, the division has managed to address challenges and move forward. I think you'll note as you read this report that we are making a positive contribution to our parks. We look forward to 2005.

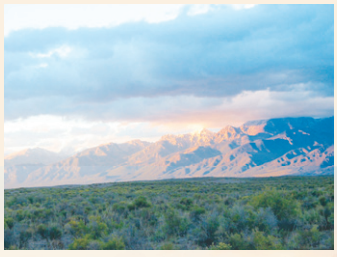
A Sampler of Significant 2004 WRD Accomplishments

- Re-issued *Director's Order 35A: Sale of Resources or Services to Support Activities Outside of Parks*.
- Secured protective determinations for water resources at four park units. These included the American Fork River and cave ground water systems at Timpanogos Cave National Monument, ground water supply systems at City of Rocks National Reserve and Coronado National Memorial, and the ground water system at Chickasaw National Recreation Area that is the source of the park's springs.
- Collaborated with other Department of Interior and non-federal interests to develop scientific information to support a filing with the State of Colorado for the protection of ground water related resources at Great Sand Dunes National Park and Preserve.
- Initiated water quality inventories in 18 parks.
- Conducted hydrogeologic assessments of water supply wells at 20 park units.
- Completed Water Resources Scoping Reports for Shenandoah National Park and Missouri National Recreational River and participated in the development of Water Resources Management Plans for Katmai National Park and Preserve, Capitol Reef National Park, Buffalo National River, Voyagers National Park, and Isle Royale National Park.
- Assisted in the development of Fisheries Management Plans for Biscayne National Park and Isle Royale National Park.
- Assisted in the development and review of marine resource protection strategies for Dry Tortugas National Park.
- Conducted a hydrogeologic assessment of proposed salt marsh restoration at the Herring River estuary in Cape Cod National Seashore.

- Provided review and assessment of possible resource damage from "The Pines" fly-ash landfill facility near Indiana Dunes National Seashore.
- Facilitated a fluvial geomorphologic restoration workshop in Yosemite National Park to assist in identifying restoration alternatives for the Merced River in Yosemite Valley.
- Conducted a follow-up assessment of riparian areas in Channel Islands National Park to assess condition change after the 1998 removal of livestock from Santa Rosa Island.
- Improved the content available through our public internet and NPS intranet websites by increasing the number of park water resource management planning and scoping documents, WRD technical reports, and servicewide water quality and hydrographic databases now available online.

Cedar Breaks National Monument (NPS)

Colonial National Historic Park (John Wullschleger)



Great Sand Dunes National Park & Preserve (NPS)

PLANNING AND EVALUATION BRANCH HIGHLIGHTS

Mark Flora, Chief
Planning and Evaluation Branch

Planning and Evaluation Branch (PEB) activities in FY 2004 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; re-designing our water resources planning products to better respond to needs created by the implementation of new Resource Stewardship Planning and Park Planning Program Standards; expanding our efforts in developing coastal water resources / coastal watershed resource condition assessments; 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 worked directly with the DOI Assistant Secretary for Policy, Management and Budget, the White House Council on Environmental Quality (CEQ), and various interagency working groups to include NPS perspectives in the development of a U.S. Oceans Action Plan. Continuing support was also provided to the NPS Office of Strategic Planning in the development of servicewide technical guidance for NPS Strategic Plan goals relating to "wetland land health" and "marine and coastal processes." In addition, PEB staff has been active in guiding NPS efforts to assure compliance with *Executive Orders 11990: Wetlands Protection and 13158: Marine Protected Areas*, providing a perspective to the U.S. Coral Reef Task Force and the Marine Protected Area Interagency Committee, providing NPS policy review and input during the development of standards for wetlands, deepwater and related habitat mapping (U.S. Fish and Wildlife Service, hereafter referred to as USFWS), and development of a strategic plan for the Fisheries, Aquatic, and Endangered Resources (FAER) Program (USGS).

During the course of FY 2004, PEB staff provided programmatic oversight, technical review, and guidance for 72 active WRD or NRPC funded projects relating to water resources planning, wetlands protection and restoration, fisheries management, and marine resource protection. Included in this effort are providing fiscal oversight, accountability, and quality control for approximately $ 6.4 million of Natural Resource Challenge funding (multi-year total) allocated to support these projects. In addition, PEB also provided the lead for the regulatory review and approval of 13 wetlands statement of findings, servicewide review and comment on 23 EIS/EA environmental compliance documents, and policy review of the water related aspects of 21 NPS planning documents including General Management Plans, Special Resource Studies, and other planning studies.

MNRR Silver Carp (Wayne Werkmeister)

Accomplishments during the year were numerous, and several are highlighted in the following short articles. During FY 2004, PEB provided oversight for the development of Water Resources Management Plans at Buffalo National River, Capitol Reef National Park, Isle Royale National Park, Katmai National Park & Preserve, Mammoth Cave National Park, and Voyageurs National Park and Water Resources Scoping Reports at Shenandoah National Park, Missouri National Recreational River, Sequoia and Kings Canyon National Parks, and Cuyahoga Valley National Park. Of particular note during FY 2004 was the initiation of efforts to re-engineer PEB's Water Resources PlanningProgram.

Golden Gate National Recreation Area (Christina Crooker)

While this program has been highly successful in completing over 65 water related planning documents during the 12 years of its existence, recent changes in NPS park planning standards and the development of natural resource stewardship planning guidance will require revisions to our water related planning emphasis in order to support new planning requirements, including the development of park specific *Foundation for Park Planning and Management documents, General Management Plans, and Resource Stewardship Plans*. A Water Resources Planning Fact Sheet and accompanying detailed "white paper" were developed to provide information as to how the WRD can better assist parks in successfully achieving these new requirements.

During the year, PEB's Wetlands Protection and Restoration Program participated in wetlands restoration activities for the Snake River Gravel Mine (Grand Teton National Park / John D. Rockefeller, Jr., Memorial Parkway), the Glacier Creek Livery and Hidden Valley wetland restoration projects (Rocky Mountain National Park), and the development of a plan to address the removal of exotic shrubs and promote channel and floodplain recovery at Canyon de Chelly National Monument. In addition, WRD and Channel Islands National Park staffs collaborated in a follow-up assessment of riparian areas on Santa Rosa Island in order to assess changes in wetland function and condition following the 1998 removal of livestock grazing activities from the island.

In FY 2004, PEB's Fisheries Management and Marine Conservation Program provided fisheries assistance for the Upper Colorado River Endangered Fish Recovery Implementation Plan, participated as a cooperator in the Flaming Gorge EIS affecting Dinosaur National Monument, assisted in the development and review of marine protection strategies for Dry Tortugas National Park, assisted in the planning for native trout restoration in Great Basin National Park, Great Sand Dunes National Park and Preserve, and Rocky Mountain National Park, and participated in the development of Fisheries Management Plans for Biscayne National Park and Isle Royale

National Park. In addition, assessments of coastal resources and coastal watershed conditions for 18 additional NPS units located in the Pacific Northwest, California, Hawaii, the Pacific Islands, and Southeast Alaska were initiated in follow-up to eight "pilot" assessments initiated in FY 2003 as part of the Natural Resource Challenge's Watershed Condition Assessment Program.

PEB staff is also proud of the numerous opportunities we have had during this year to directly serve parks by providing technical support at the request of park staffs. More than 90 opportunities to work directly with park and regional staffs in activities ranging from issues assessment and proposal development to implementation of new field techniques are summarized in a later section of this report. The Planning and Evaluation Branch is honored to be part of the National Park Service and looks forward to being of continued service to the units of the national park system during FY 2005!

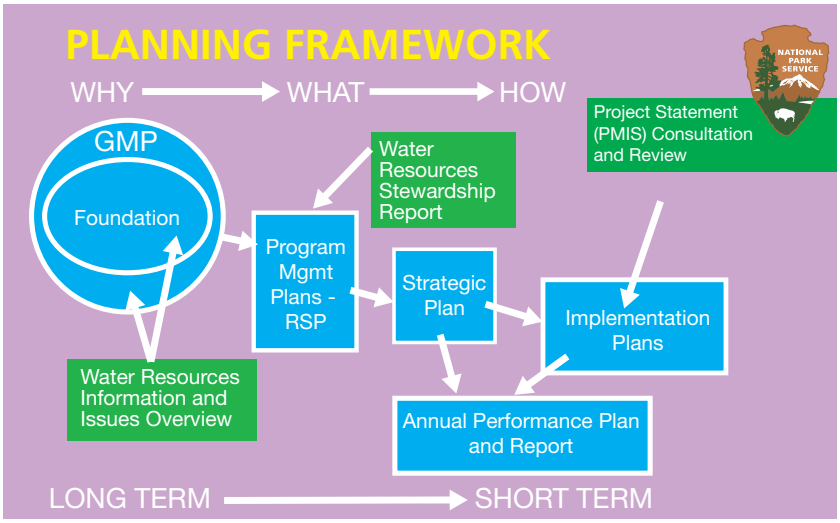
CHIC Stream Gauging (Sue Braumiller)

Water Resources Planning: Supporting our National Parks with the New Park Planning Program Standards

David L. Vana-Miller, Planning Program Leader; Don P. Weeks, Hydrologist
Planning and Evaluation Branch

The Water Resources Planning Program has been operating in its present form since 1991 with the continued development of *Water Resource Issues Overviews, Water Resources Scoping Reports, and Water Resources Management Plans* (WRMPs) for units across the national park system. While this program has been successful -- over 65 planning products covering over 30 million acres of the national park system -- recent changes in NPS general planning (update of *Park Planning Program Standards*) and resource planning (draft *Director's Order 2.1: Resource Stewardship Planning*, to be finalized in 2005) require a programmatic revision of the Water Resources Planning Program to assure that its products support the new NPS planning standards and objectives. These changes propose new planning documents, such as the development of *Foundation for Park Planning and Management and the Resource Stewardship Plan*.

The replacement of *Director's Order 2: Park Planning* with the new P*ark Planning Program Standards* in 2004 introduced a new planning template for parks (see figure). A logical flow is established through several levels of planning that become increasingly detailed and complementary by agreeing first on why a park was established and what resource conditions should exist and then increasingly focus on how those conditions should be achieved. Within this framework, planning and decision making are accomplished through six discrete kinds of planning, resulting in six kinds of planning related



The "new" NPS framework for planning and decision making (blue boxes). Green boxes represent WRD planning products or assistance. RSP = Resources Stewardship Plan.

documents (see figure), two of which are new:

Foundation for Planning and Management: The purposes of the foundation document are to define the legal and policy requirements that mandate the park's basic management responsibilities and to identify and analyze the resources and values that are fundamental to achieving the park's purpose or otherwise important to park planning and management. This document may be developed as a separate document in advance of the General Management Plan (GMP) or as Phase 1 of the GMP.

Program Management Plan: The latest park planning standards make a greater distinction between program planning and other kinds of implementation planning. Program Plans are now placed between GMPs and strategic plans. Through program planning, parks are able to translate the qualitative statements of desired conditions established through the GMP process into measurable or objective indicators that can be monitored to assess the degree to which the desired conditions are being achieved. Based on information obtained through this analysis, comprehensive strategies are developed to achieve the desired conditions. DO 2.1 (in draft) specifically addresses the development of a *Resource Stewardship Plan*, the Program Management Plan for natural and cultural resources.

It is the requirements of these two documents that form the basis for the new NPS water resources planning framework. We now offer a *Water Resources Information and Issues Overview* that is designed to address the water resource needs of either the *Foundation for Planning and Management* document or Phase 1 of the GMP (see figure). *The Water Resources Stewardship Report* is designed specifically to address the water resource needs in a park's *Resource Stewardship Plan* (see figure).

The *Water Resources Information and Issues Overview* and the *Water Resources Stewardship Report* may be considered renamed extensions of the original *Water Resource Issues Overview* and *Water Resources Scoping Repor*t, respectively. However, there is no logical extension of the original *Water Resources Management Plan*. The reason for this is that the plan was programmatic and strategic in its concept, elements now covered in the *Resource Stewardship Plan*. In place of the WRMP, we now offer consultation and review of water based, Project Management Information System project statements that address the priorities of the Strategic Plans.

For more information on the new NPS water resources planning framework, visit our website at www.nature.nps.gov/water/planning.htm.

Bush Administration Adopts NPS Ocean Initiatives

Cliff McCreedy
Marine Management Specialist
Planning and Evaluation Branch

On September 20, 2004, the U.S. Commission on Ocean Policy's (U.S. COP) final report, An Ocean Blueprint for the 21st Century, splashed onto the front pages of newspapers around the country. The headlines read "Troubled Waters" (*St. Petersburg Times)* and "Panel Presses New Ocean Safeguards" (*Los Angeles Times*). The message of the commission was ominous and clear: "Pollution, depletion of fish and other living marine resources, habitat destruction and degradation, and the introduction of invasive nonnative species are just some of the ways that people harm the oceans, with serious consequences for the entire planet."

Mandated by the Oceans Act of 2000, the commission was appointed by the President and Congress to review our nation's ocean stewardship. The U.S. COP report was the first such review in more than 30 years. Among other things, the report calls for grounding ocean policy in a better scientific understanding of ecosystems, reforming fisheries management, doubling the nation's investment in ocean research, strengthening the National Oceanic and Atmospheric Administration (NOAA), and establishing regional ocean councils to coordinate between various levels of government and agencies.

The national park system conserves a major portion of our nation's ocean and Great Lakes heritage, managing more than three million acres of marine waters and 5,000 miles of coast, including coral reefs, kelp forests, barrier islands, wetlands, historic shipwrecks, and other valuable resources. Several of the report's recommendations have major implications for NPS management of threats to ocean park resources. With this in mind, I served on behalf of DOI and NPS on several working groups under the White House Council on Environmental Quality (CEQ) to develop the Administration's responses to the report, as required by the Oceans Act of 2000.

Olympic National Park (John Wullschleger)

President Bush responded to the report on December 20, 2004, by signing an executive order establishing an interagency oceans committee and releasing the *U.S. Ocean Action Plan*, the Administration's response to the *U.S. Commission on Ocean Policy Report*. The *U.S. Ocean Action Plan* adopts the NPS Ocean Park Stewardship Strategy, a 28 point strategy for increasing NPS scientific and organizational capacity to conserve ocean resources. Cliff McCreedy (Marien Management Specialist) and Jim Tilmant (Fisheries Program Leader) are working with a task force of park superintendents to develop a workplan to implement the strategy.

The US Ocean Action Plan also adopts the NPS proposal for coordinating Department of Interior and NOAA marine protected area programs. Parks, wildlife refuges, marine sanctuaries, and estuarine research reserves are united by their proximity and resource management concerns. The proposal builds on an existing Memorandum of Understanding between NPS and the Sanctuary Program. The four agencies

will develop national level and site level partnerships on research, habitat mapping, monitoring, education, enforcement, and evaluation of significant issues, including pollution, overfishing, and invasive species. USFWS, NPS, and NOAA are currently finalizing a national cooperative enforcement agreement to authorize cross-deputization of enforcement personnel and other joint enforcement programs.

In the report, the commission places a heavy emphasis on the value of interagency coordination. The National Park Service currently coordinates many of its management activities with the USGS, NOAA, and university partners and seeks to increase these programs. However, the report went further to propose consolidating certain "area-based" agency programs and mapping functions under NOAA. Mike Soukup, Associate Director, NRSS, and I provided comments to DOI through NPS Deputy Director Don Murphy, saying that such consolidation runs counter to the intent of Congress and presidents, who recognized the essential interdependence of the land and sea portions of coastal ecosystems and purposely combined both in the national parks, seashores, and monuments. Soukup also raised concerns about consolidating USGS ocean science and mapping functions in the National Oceanic and Atmospheric Administration, emphasizing that the National Park Service and other Department of Interior bureaus rely on USGS products. The interagency working groups under DOI and CEQ provided a forum for discussion, and as a result, these concerns were reflected in the Administration's response.

The Congress has held hearings on the report and will consider the report's legislative and budget recommendations in 2005. Coming on the heels of the Pew Ocean Commission report, which also called for immediate action to protect ocean resources, *An Ocean Blueprint for the 21st Century* provides a call to the National Park Service and the nation to enhance the scientific and organizational capacity to conserve our oceans.

New Program Assesses Coastal Watershed Conditions in the National Parks

Kristen Keteles
Coastal Watershed Condition Assessment Coordinator, Texas A&M University
Cliff McCreedy,
Marine Management Specialist
Planning & Evaluation Branch

Coastal watersheds or land areas that drain into the coastal zone are nature's dynamic hydrologic systems that create and sustain coastal ecosystems. Impaired watersheds can impact the coastal parks by transporting pollutants or invasive species, altering sediment flows, changing salinity, and degrading habitats. Consequently, the NPS needs to better understand watershed use, conditions, trends, and detrimental impacts on coastal watersheds where parks are located in order to effectively respond to these issues.

The NPS has initiated the coastal watershed condition assessment component of its Watershed Condition Assessment Program to determine the condition of coastal watersheds and their potential impacts on coastal water resources. Investigators review and synthesize information to determine the status of coastal park resources, including water quality, habitat condition, invasive and feral species, extractive uses, physical impacts from resource use and coastal development, and other issues. Information obtained from these assessments will characterize the relative health or status of estuarine and marine resources as well as identify actual or potential "stressors" upon these systems. These assessments will also make recommendations for further

studies or assessments where needed to fill information gaps or more fully evaluate conditions.

This program was initiated in FY 2003 with a focus upon seven coastal NPS units located in the Gulf of Mexico and along the southeastern coast of the United States. Currently, assessments have been completed for Cape Lookout National Seashore, Padre Island National Seashore, and Cumberland Island National Seashore. These assessments provide a synthesis of current resource conditions and valuable insights into factors affecting the health of park resources for use by natural resource managers. For example, dissolved oxygen concentrations were found to be low in Cumberland Island National Seashore surface waters during summer months (Alber *et al*. in preparation). This observation has resulted in increased attention by the State of Georgia concerning the potential for hypoxia in the area. At Cape Lookout National Seashore, contamination of ground water and tidal creeks by leaking septic systems and fuel storage tanks was identified as a possible threat (Mallin *et al*. 2004). Additionally, stressors such as pathogens, nutrients, invasive species, and metals were identified as potential problems of varying degrees of concern and are summarized in a threat matrix table for use by NPS managers to evaluate potential threats to park resources (Table 1). The assessment of Padre Island National Seashore revealed that physical changes to the coastal environment dramatically altered salinity patterns and affected seagrass composition

Table 1. CALO Stessor Matrix from Mallin et al. 2004

Shackleford Banks					
Stressor	**Ocean beach**	**Sound shore**	**Tidal creeks**	**Wells**	**FW ponds**
Algal blooms	LP	LP-PP	PP	LP	ND
Toxic algae	LP	LP-PP	PP	LP	ND
Nutrient loading (horses)	LP	LP-PP[1]	PP (horses)	ND	PP
Excessive nitrate	LP	LP	LP	ND	ND
Excessive fecal bacteria (horses)	LP	LP-PP[2]	PP (horses)	ND	PP
Metals contamination	HP (Hg)[3]	HP (Hg)[3]	PP (Hg)[3]	ND	ND
Toxic compounds	ND	ND	ND	ND	ND
Invasive species	PP (lionfish)	LP	LP	LP	ND
Habitat disruption (horses)	LP	PP (horses)	PP (horses)	LP	PP

1 - Based on several high nutrient measurements at docks on Core Banks NPS survey and potential horse manure loading
2 -Based on high holiday boater/swimmer use of the end sound/beach on western Shackleford Banks
3 – Fish tissue consumption advisory by NC DWQ

(Withers *et al*. 2004). Further study of these changes to assess impacts on habitat integrity and ecosystem function was recommended by the authors.

The Water Resources Division is providing the Coastal Watershed Condition Assessment Reports to parks and the Inventory and Monitoring Networks to help guide resource management planning and support the development of Vital Signs Monitoring Plans. The NPS also plans to work collaboratively with programs such as the EPA National Coastal Assessment (EMAP) and with USGS, NOAA, state and local agencies, watershed councils, landowners, and other community stakeholders to address issues cooperatively on a local watershed or regional oceanographic scale.

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Padre Island National Seashore (NPS Photo)

Evaluating Riparian Recovery After Removal of Livestock from Santa Rosa Island Channel Islands National Park

Joel Wagner, Wetland Program Leader
Planning & Evaluation Branch
Michael Martin, Hydrologist
Water Operations Branch
Kate Roney Faulkner
Chief of Resource Management
Channel Islands National Park
Sarah Chaney, Restoration Ecologist
Channel Islands National Park

In 1995, the State of California directed Channel Islands National Park (CHIS) to correct water quality problems on Santa Rosa Island caused by year-round grazing of approximately 5,000 cattle. In order to respond, CHIS needed a rapid evaluation of riparian conditions on the island and wanted to know if changes to existing livestock management would help achieve water quality goals. A multi-agency technical team decided to use the Bureau of Land Management's "Process for Assessing Proper Functioning Condition" (PFC) to evaluate ten stream reaches in seven of the island's watersheds. Three of the ten reaches were "reference reaches" that were largely or completely inaccessible to cattle while the other seven were subject to year-round cattle grazing.

The PFC method uses an interdisciplinary team to evaluate riparian functional condition according to 17 hydrology, vegetation, and stream geomorphology factors. Possible riparian assessment ratings include "Proper Functioning Condition," "Functional At-Risk," or "Nonfunctional." The proper functioning condition of a riparian area refers to the stability of the physical system, which in turn is dictated by the interaction of geology, soil, water,

and vegetation. A riparian area in PFC is in dynamic equilibrium with its streamflow forces and channel processes. The system adjusts to handle larger runoff events with limited change in channel characteristics and associated riparian-wetland plant communities. Because of this stability, riparian areas in PFC can maintain fish and wildlife habitat, water quality enhancement, and other important ecosystem functions even after larger storms. In contrast, nonfunctional systems in the same storms might exhibit excessive erosion and sediment loading, loss of fish habitat, loss of associated wetland habitat, and so on.

Field work for the grazing era assessment was completed in March 1995, and results were published in a WRD technical report (NPS/NRWRD/NRTR-98/202). Of the seven stream reaches that were subject to year-round cattle grazing, six were rated "Nonfunctional" and one was rated "Functional At-Risk." Of the three reference reaches, two were in "Proper Functioning Condition" and one was rated "Functional At-Risk." The Nonfunctional systems were missing almost all characteristics of properly functioning riparian areas. An oversupply of sediment from upland and channel sources had exceeded the streams' transport capabilities, resulting in mostly braided channel forms, high lateral instability, and other characteristics that were out of balance with the landscape setting. Riparian-wetland vegetation was almost completely absent, exposing banks to excessive erosion in each flood event.

The NPS eliminated cattle from the island in 1998 and substantially reduced deer numbers. After cattle were removed, CHIS saw dramatic improvements in riparian vegetation cover and water quality. In 2004, the park requested assistance from WRD to perform post-grazing riparian reassessments on the island. The idea was to re-apply the same techniques (PFC assessments and repeat photography) on the stream reaches that were evaluated in 1995 to document vegetative and geomorphic changes. Specifically, had riparian areas that were "Nonfunctional" in 1995 recovered to PFC status by removing cattle, or were additional management steps necessary for recovery?

The 2004 team published its findings in the WRD technical report *Riparian System Recovery After Removal of Livestock From Santa Rosa Island, Channel Islands National Park, California*, NPS/NRWRD/NRTR-2004/324). The team found that all six reaches that were rated "Nonfunctional" in 1995 had recovered to "Proper Functioning Condition" in 2004. The sediment-choked, braided channels evident in 1995 have progressed to narrower, deeper, meandering channels with well-developed floodplains that are in balance with the landscape settings. Herbaceous riparian-wetland vegetation cover went from near 0% in 1995 to more than 90% on almost all of these reaches. However, the expected woody riparian components (willows and cottonwoods) have not re-established. Willows and cottonwoods may not be absolutely necessary in these reaches for bank and floodplain stabilization, but they would enhance such stability, help dissipate flood energy, and provide valuable wildlife habitat that likely occurred historically in the canyons.

The remarkable improvement in Santa Rosa Island's riparian conditions since 1995 demonstrates these systems' ability to "self-restore" once the major stressor, year-round cattle grazing, was removed. The transitions from nonfunctional to PFC riparian systems became possible when vegetation recovery in the watersheds led to decreased runoff and sediment delivery to the island's stream systems and when appropriate riparian-wetland vegetation became established.

The PFC method proved to be a very useful tool for evaluating the basic physical stability

components of riparian system recovery. However, we emphasize two points that are critical to a successful evaluation using this method: 1) the team must be carefully assembled to assure proper (and repeatable) application of the method and 2) the team must understand that even though a riparian system may be in PFC with respect to geomorphic stability, it may not have achieved a site's potential natural vegetation community or other desired condition. To address the latter point, the 2004 team identified management actions (including willow and cottonwood plantings) that would put the recovering riparian systems on a trajectory toward desired future conditions.

The 1995 team rated this Old Ranch Canyon channel as Nonfunctional due to high width/depth ratios, unvegetated channel banks, and susceptibility to continued erosion even in low to moderate flow events. Repeat photography in 2004 shows dramatic recovery of channel morphology and vegetation (Proper Functioning Condition) since cattle were removed from this pasture.

Assessing the Impacts of Oyster Culture on Drakes Estero, Point Reyes National Seashore

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Drakes Estero is a 4,000 acre estuary that lies within the boundaries of Point Reyes National Seashore. Although it is considered to be one of the most pristine estuaries in California, it supports one of the state's largest commercial oyster farms. Commercial oyster culture has the potential to affect water quality, tidal circulation, sediment transport and deposition, aquatic vegetation, and estuarine fauna. In addition, the importation of oysters from other regions may result in the inadvertent introduction of other non-native species that present a threat to native organisms and ecosystem functions. Within Drakes Estero, oysters are primarily cultured on racks made of posts driven into the substrate and connected to one another by stringers. Wires threaded through oyster shells are suspended from the stringers to provide a surface on which oysters can attach and grow.

Oyster racks are currently found in 3 of the 5 arms of the estuary and are typically located within the same range of depths that are occupied by the estuary's extensive eel grass (*Zostera marina*) beds. Eel grass, like sea grass habitats in other coastal systems, is

believed to support productive and diverse biotic communities and to be particularly valuable as nursery habitat for marine fishes. Although oyster culture has been going on in Drakes Estero since the 1930s the effects have never been evaluated. In 2002 and 2003, WRD provided funding to Point Reyes National Seashore to conduct an initial assessment of the existing oyster operation on the estuary and its biota. These funds provided partial support for graduate studies conducted though the University of California at Davis.

Aerial view of Drake's Estero (NPS Photo)

The results of an initial phase of the study have been published in a Master of Science thesis (Harbin-Ireland 2004). The study compared sediment and benthic infaunal invertebrates collected with a large bore corer under and at various distances from oyster racks located in Schooner Bay (one of the arms of estuary). In general, the study was unable to detect differences between benthic fauna or sediment under the oyster racks and at distances of 1 to 50 meters from the racks. Diversity, richness and the relative abundance of most individual taxa were similar for all locations. However, relative abundance of ostracods and bivalves did appear to increase with distance from the racks, whereas amphipods appeared to be more abundant under the racks than at adjacent locations. Percent organic matter in sediments was also similar between locations. But percent silt was significantly greater at distances of 10 meters from the oyster racks than in locations immediately under the racks suggesting that the racks may be causing accelerated erosion of fine sediment.

Oyster racks in Drakes Estero (NPS Photo)

The second study was designed to compare the fishes, invertebrates, and eel grass in an arm of the estuary with oyster racks to those of an arm of the estuary where there is no history of oyster culture. Fish were sampled using gill nets, an 8 foot otter trawl, minnow traps and beach seines. Infaunal invertebrates and sediment were sampled according to the methods described above; epifaunal invertebrates and fouling organisms were sampled as well. Although study results are not yet available it is anticipated they will be published in a second Master of Science thesis in 2005. A final report to be submitted by the principle investigators will synthesize the results of these studies and other activities and make recommendations for future monitoring of oyster culture effects within the Drakes Estero system. Additional products of this project that are to be provided to the park include a compilation of previously collected data, data from sampling conducted during the study, GIS data for sampling sites, eel grass beds, oyster racks, channels and sand bars, and voucher specimens of invertebrates, plants, and fish. Ultimately, the results and products of this study should help the

National Park Service determine how to best monitor the effects of oyster culture on Drakes Estero and ensure that estuarine resources are protected into the future.

Harbin-Ireland, A.C. 2004. *Effects of Mariculture on the Benthic Invertebrate Community in Drakes Estero, Point Reyes Peninsula, California*. Master of Science Thesis. University of California, Davis. 52 pages.

Boats used for collecting invertebrate and sediment samples. (Angelique Harbin-Ireland)

(Angelique Harbin-Ireland)

Setting the Stage for Informed Management at Missouri National Recreational River: Understanding River Morphology, Hydrology, and Water Resource Issues

Don Weeks and David Vana-Miller
Hydrologists
Planning and Evaluation Branch
Rick Inglis, Hydrologist
Water Operations Branch
Hal Pranger, Fluvial Geomorphologist
Geological Resources Division

Legislation in the 1940s was the impetus for the construction of a six-dam system of flood control on the main stem Missouri River. The Missouri National Recreational River (MNRR) comprises two remnant free-flowing reaches of the Missouri River downstream of two of these dams. This multiple dam system affects the social, cultural, and economic conditions along the Missouri River. The social, cultural, and economic benefits notwithstanding, there has been a high ecological cost associated with the development and operation of this system, including

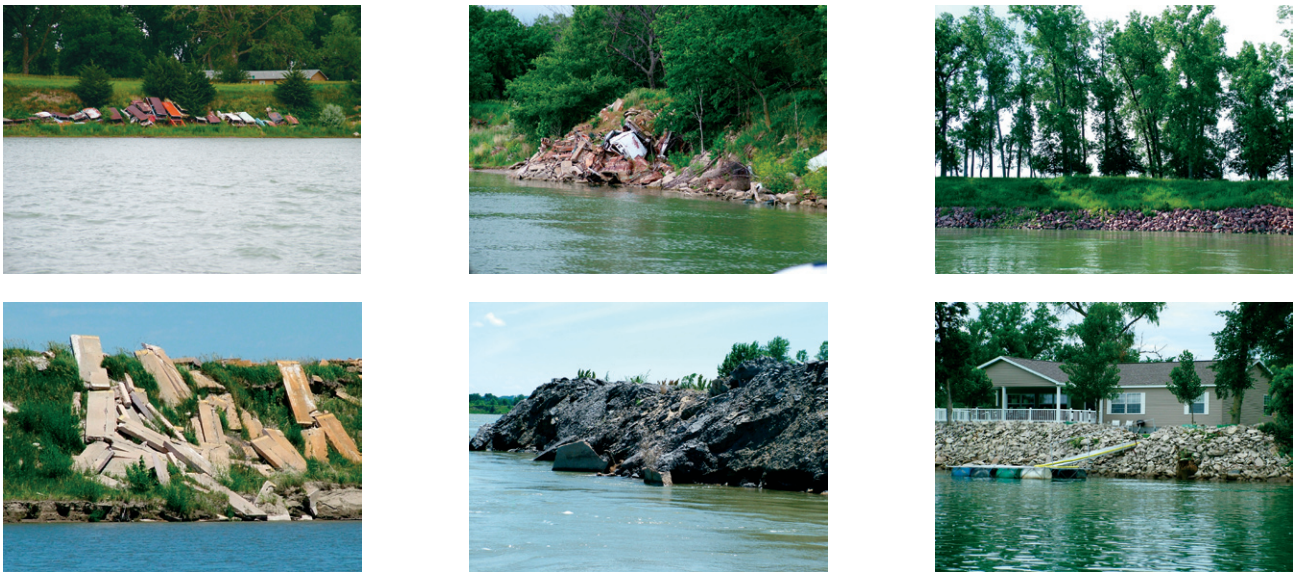
- The amplitude and frequency of Missouri River natural peak flows have been sharply reduced. Primarily, the extreme high (spring and summer floods) and extreme low flows were lost from the hydrograph downstream of each main stem dam. This isolation of the Missouri River from its floodplain has in many stretches largely eliminated the flood pulse and its ecological functions and services.
- So-called "navigation flows" are large volumes of water that are stored in the reservoirs and released in late summer and fall of the year to support barge traffic in the lower river. The biota of the

river's environments is ill adapted to this reversal in the hydrograph–biological clocks are offset, life histories are affected, and the seasonally available habitat is changed.

- Flood control measures coupled with loss of native vegetative cover have interrupted the essential movement of dissolved and suspended matter, which forms the basis for ecosystem productivity. Main stem reservoirs serve as sinks, preventing downstream movement of organic matter and sediment. Historically, the high sediment load and flood annually created new in-channel bars, side channels, and bed forms that served as tremendous fish and avian habitat. With over 90 percent of the river's annual sediment load now trapped in reservoirs, the result is a large loss of physical habitat in the river corridor. Even with a less active river system, rapid channel bed and bank erosion has continued. Unfortunately, bank erosion is dealt with through strategic placement of rock riprap, broken concrete slabs, and, in some cases, car bodies.

As a result of these changes, the production and diversity of the ecosystem have both markedly declined. Symptomatic of these changes is the presence of three federally listed threatened and endangered species–least tern, piping plover, and pallid sturgeon.

Missouri National Recreational River requested assistance from the Water Resources Division and the Geological Resources Division to conduct a River Morphology/Hydrology training workshop for park staff and other interested stakeholders and to prepare a Water Resources Issues Overview Report. The park requested the training workshop and the issues overview to better position its staff in the assessment of technical issues and the management of the Missouri River. The park has relied on outside expertise in evaluating water related projects and believed that some basics in hydrology and fluvial geomorphology would improve understanding and communication about these projects. The workshop began with an introduction to fluvial geomorphology and its principles; this information was later applied to current issues faced by MNRR, such as 1) hydrologic impacts of dams, 2) channel geometry changes, 3) net erosion and sediment impacts of dams, 4) impacts on vegetation and large woody debris, and



Examples of streambank stabilization efforts along the Missouri National Recreational River (NPS GRD, 2004)

5) channel evolution, river adjustment and dynamic equilibrium.

The Issues Overview highlighted the issues stemming from flood control and provided some management strategies for dealing with those issues, including 1) develop in cooperation with stakeholders a set of clear desired conditions related to water resources, 2) embrace the concept of adaptive management, 3) give funding for experimental restoration and evaluation priority over funding for ecological research, 4) work with stakeholders to modify reservoir operations to approximate the pre-dam flow regime, 5) evaluate in detail each bank stabilization project, and 6) place a greater emphasis on non-structural solutions, such as acquisition and restoration of wetlands, in management of the Missouri River floodplain.

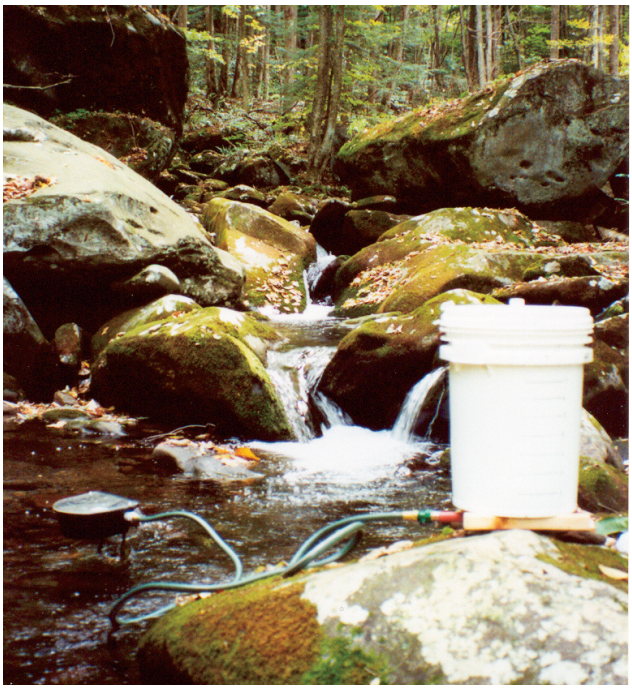
Water Resource Division Encourages Parks to Undertake Native Fish Restoration Projects by Sharing Servicewide Expertise

James T. Tilmant
Fisheries Program Leader
Planning and Evaluation Branch

Concern for the biological integrity of aquatic ecosystems within national parks has been growing in recent years (Bahls 1992, Tilmant 1999, Ferrin 2004, Courtenay and Fuller 2004). This concern centers around the widely ranging affects of early sportfish stocking practices and more recent invasions of exotic species introduced through aquarium discards, ship ballast water, state stocking in connected waters, illegal activities, and recreational boats and equipment frequently transported among water bodies. Impacts of the National Park Service's own fish stocking practices was first expressed as early as the 1930s (Wright et al. 1933, Crammerer 1936, Hubbs and Wallis 1940, Sellers 1997) but most NPS activities to control invasive species have historically targeted terrestrial plants and animals (Drees 2004). Until recently, little effort has been placed on fish or aquatic organisms. However, recent publications have expressed ever greater acknowledgement that past stocking and fish management practices, in addition to new causes of species introductions, have extensively altered species composition, predator-prey relationships, and, in historically fishless lakes, whole aquatic ecosystems within our national parks (Larson and Moore 1985, Gresswell and Varley 1988, Liss and Larson 1991, Yuskavitch 1991, Bahls 1992, Franke 1997, Larson and Hoffman 2004). Complete displacement of one or more native fish species is quite common within aquatic habitats of many parks.

Electrofishing to remove non-native trout in Great Smoky Mountains National Park. (Steve Moore)

In response to the above concerns, more parks are undertaking introduced and invasive aquatic species removal programs for waters where native species restoration is possible. During the last several years, native fish restoration projects have been undertaken at Crater Lake National Park, Great Basin National Park, Great Smoky Mountains National Park, Sequoia and Kings Canyon National Parks, Yellowstone National Park, and Glacier National Park and are continuing at Rocky Mountain National Park.



Chemical treatment station, native fish restoration project, Great Smoky Mountains National Park (Matt Kulp)

With increasing emphasis on native fish restoration, there has been a need to develop restoration expertise and explore ways of effectively removing non-native species while preserving the integrity of non-target organisms within the system. Restoration actions typically involve removal of non-native species through either electrofishing or chemical treatment followed by reintroduction of native species in streams or lakes that are isolated from a return invasion by natural barriers. Evaluation of habitat restoration potential, determination of fish movement barrier effectiveness, effective removal and treatment approaches, and chemical application techniques are all highly technical elements of a restoration project that require experience and training to be carried out successfully. Such expertise is rarely available locally, which can be a deterrent to parks undertaking restoration programs.

To better address this servicewide need, WRD has helped develop a team of individuals with native fish restoration skills that can be made available to assist other parks in undertaking restoration projects. This expertise has been developed through cooperation on projects involving personnel from parks with prior restoration experience. Crater Lake, Great Basin, Great Smoky Mountains, Yellowstone, and Rocky Mountain National Parks have all benefited from sharing expertise, and that knowledge is now being provided to other parks. During Summer 2004, restoration team members from Great Smoky Mountains National Park, WRD, and the USFWS joined park staff at Great Sand Dunes National Park and Preserve in an evaluation of the newly acquired Sand Creek drainage for possible treatment and restoration of the native Rio Grande cutthroat trout within the coming years. The evaluation team spent a week hiking through the Sand Creek drainage, evaluating upper basin lakes, stream segments, and potential fish barriers to determine the feasibility of restoration and formulating ideas on approaches that could be used. The evaluation team has provided a report of their recommendations to the park and will be available to help park staff implement the project once funding and environmental review clearances are obtained.

Fish barrier built on Sun Creek, Crater Lake National Park. (Mark Buktenica)

Recognition of NPS non-native fish problems has increased, but many parks still need to develop programs to address this issue. Because introduced aquatic species are underwater and out of our daily sight, impacts are less likely to be realized or to receive funding, but the need is great in most parks.

WRD hopes that the servicewide expertise will encourage more parks to take on aquatic species restoration projects in the future. Anyone desiring to learn more about the availability of assistance or wanting to discuss potential projects should contact the author.

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Native fish restoration team surveying Sand Creek drainage, Great Sand Dunes National Park. (James Tilmant)

WATER OPERATIONS BRANCH HIGHLIGHTS

Gary Rosenlieb, Acting Chief Water Operations Branch

The Water Operations Branch had another diverse and productive year in FY 2004, continuing a tradition of professional service to parks. Design and consolidation of program requirements for the Watershed Assessment Program and attainment of some of long-term management goals in water quality management dominated the 2004 agenda. The branch also continued to provide high-quality, issue-specific technical assistance to individual parks.

The Hydrology Program added a new staff member, Jeff Albright, who transferred from the Water Rights Branch and who will primarily focus on the final design and implementation of the Watershed Assessment Program. This program is currently being targeted for full implementation in FY 2007 with the initiation of condition assessments at the park level to develop science-based information for use in a wide variety of resource planning, decision making, and restoration activities at the park, regional and servicewide levels. Progress was also made on completing the Compendium of Watershed/ Ecological Condition Assessment Methods. The primary objective of this tool is to help parks and their partners, cooperators, and contractors identify condition assessment approaches and methods appropriate to a park's information needs.

WOB unveiled two new data management and information systems that will facilitate servicewide data assessment for the Water Quality Vital Signs Monitoring Program as well as provide the foundation for servicewide accountability through the Government Performance and Results Act (GPRA). The Designated Use and Impairments Database was completed and made available on the NPS Intranet. This data and information management system formed the backbone for developing new baselines for reporting to the water quality goals contained in the Department of the Interior and NPS Strategic Plan. A summary of the information contained in this system and how it is used was the subject of a feature article in the 2004 Natural Resources Year in Review. In addition, NPSTORET Microsoft Access templates/forms for entering and documenting the results and other metadata of water quality monitoring conducted by the Vital Signs Monitoring Networks have been distributed for alpha testing.

Chickamauga & Chattanooga National Military Park, Mocassin Bend of the Tennessee River (Christopher Light)

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 an appendix to this report. Some of the more high-profile efforts included:

Several parks obtained assistance for the evaluation of flood issues and the development of floodplain statement of findings–Denali National Park, Assateaque Island National Seashore, Kenai Fjords National Park, Yosemite National Park, Padre Island National Seashore, Glacier Bay National Park, Channel Islands

National Park, Lake Meredith National Recreation Area, Big Thicket National Preserve, and Death Valley National Park.

Assistance was provided to park and regional staff in regards to watershed restoration efforts at Canyon de Chelly National Monument, Missouri National Recreational River, Yosemite National Park, Cape Hatteras National Seashore in the wake of Hurricane Isabel, and Cape Cod National Seashore.

Numerous ground water management and supply issues were addressed, including those at Ebey's Landing National Historical Reserve, Lava Beds National Monument, Yosemite National Park, Cumberland Island National Seashore, Glacier National Park, Rocky Mountain National Park, and Channel Islands National Park.

Little Calumet River (Winter's Coat), Indiana Dunes National Lakeshore (Park archive)

WOB staff provided assistance with contaminant cleanup efforts at Yellowstone National Park by obtaining funds to investigate and monitor ground water elevations at the proposed site of a State of Montana repository for the McLaren tailings. Assistance with water quality assessments related to mines, dumps, and oil and gas activities were also provided to Indiana Dunes National Seashore, Mojave National Preserve, Padre Island National Seashore, and Big Thicket National Preserve.

In support of a Natural Resource Damage Assessment at Rocky Mountain National Park, WOB facilitated the development of a LIDAR-based mapping project in the area of the Grand Ditch and provided major support for the production of documents for a Freedom of Information Act Request.

WRD and the Servicewide Inventory and Monitoring Program continued cooperating with the USGS to fund the creation of the high-resolution National Hydrography Dataset for subbasins encompassing NPS lands. More than half of all national park units can now map and model their hydrographic features using this advanced dataset.

The branch continued to provide technical guidance and leadership for the development of the Natural Resource Challenge water quality monitoring plans. The Water Quality group provided detailed comments on the first 12 network Phase 3 monitoring plans, provided reviews of individual protocols, oversaw the fiscal administration of the program, and co-hosted a session at the Aquatic Professionals Meeting devoted to technical transfer for the Vital Signs Water Quality planning process.

The following articles provide additional insights into WOB accomplishments this year and demonstrate our commitment to provide high-quality assistance to parks.

Watershed Condition Assessment Program—A Brief Overview

Jeff Albright, WCA Program Coordinator
Water Operations Branch

In FY 2003, WRD received an increase in base funding through the Natural Resource Challenge to conduct Natural Resource Condition Assessments (Condition

Assessments) in national park units. The division's new Watershed Condition Assessment Program will fund high-priority Condition Assessment projects in parks and develop technical guidance that parks can utilize to design and conduct Condition Assessments appropriate to their situation.

A variety of Condition Assessment approaches and methodologies are possible. Condition Assessment design therefore depends on the circumstances surrounding the natural resource planning, decision making, or restoration activity that called for the assessment.

- *What types of science-based information are needed from the assessment?*
- *Over what geographic scale?*
- *Involving what types of resource conditions and resource interactions?*

Most Condition Assessments entail integration of data across geographic scales, synthesis of multi-disciplinary resource data, and translation of data into a form more readily understandable and usable by managers. All Condition Assessments result in a scoring or ranking of natural resource conditions relative to a standard, benchmark, or reference condition.

Watershed Condition Assessment Program accomplishments to date include development of a web-based Compendium of Assessment Methods (scheduled for release Fall 2005) and completion or initiation of inventory-level assessments of coastal/marine conditions in a number of parks (see Keteles and McCreedy article). A pilot group of Condition Assessments will be conducted in FY 2006 to evaluate different assessment approaches and methodologies in a variety of park settings. In FY 2007, the full project program will commence to identify and fund, on an annual basis, the highest priority Condition Assessment needs in parks.

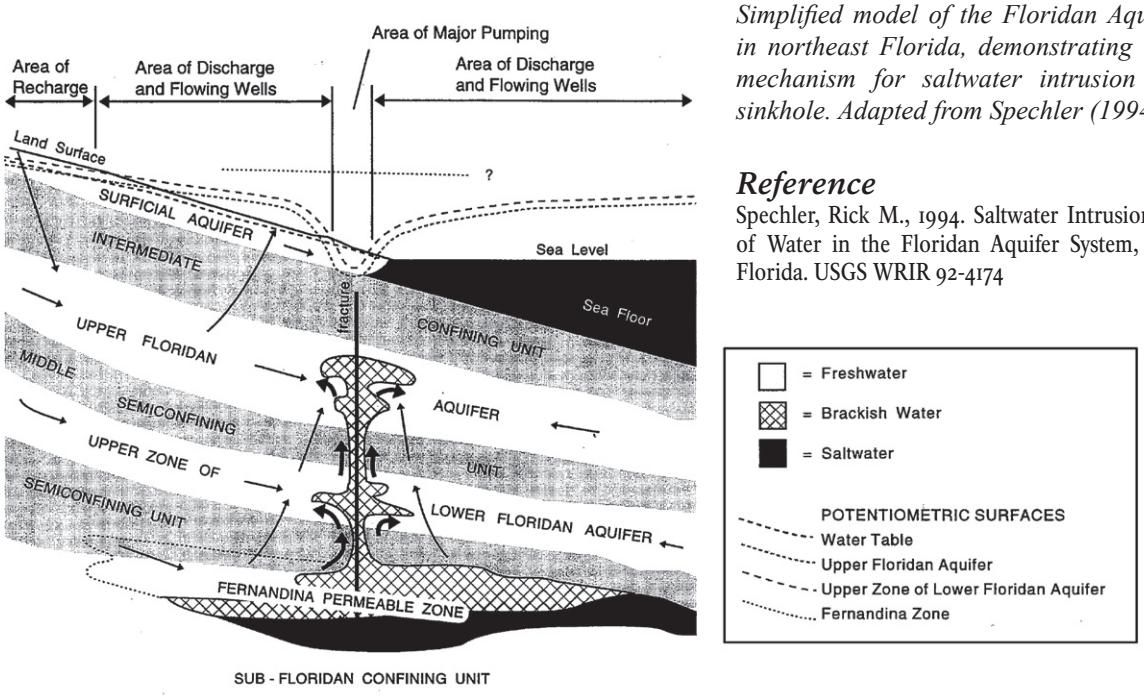
A Little Salt with Your Lime (-stone)? Ground Water Management in Timucuan Ecological and Historic Preserve

Michael Martin, Hydrologist
Water Operations Branch

One of the primary concerns regarding use of coastal ground water is the potential for saltwater intrusion. A portion of the facilities at Timucuan Ecological and Historic Preserve are located on Fort George Island in northeast Florida. The water supply for these facilities is an Upper Floridan Aquifer artesian well, which has a natural discharge sufficient to support existing uses. The preserve's overall plan is to expand visitor services on Fort George Island, increasing the water demand and raising the concern of saltwater intrusion. A privately owned well about one mile southeast of the NPS well previously experienced this type of degradation due to large withdrawals for golf course irrigation. This was not an isolated incident; other wells nearby have also experienced a salinity increase.

Some wells in the county have exhibited continual increases in chloride concentrations, indicating that saltwater is gradually intruding into the Floridan Aquifer System in certain areas (Spechler 1994). Conversely, abrupt increases of chloride in other wells indicate that saltwater may also invade previously unaffected areas rapidly. Even though there have been local problems with salt water intrusion, the NPS well is still of usable quality. Nevertheless, water quality degradation is likely and the preserve, on the advice of WRD, is preparing for future conditions by implementing a ground water monitoring program.

Of the possible mechanisms for saltwater movement and subsequent increases in ground water salinity in the area of Fort George Island, upward leakage of deeper,



Simplified model of the Floridan Aquifer System in northeast Florida, demonstrating the inferred mechanism for saltwater intrusion via paleo-sinkhole. Adapted from Spechler (1994).

Reference

Spechler, Rick M., 1994. Saltwater Intrusion and Quality of Water in the Floridan Aquifer System, Northeastern Florida. USGS WRIR 92-4174

more saline ground water through structural deformities appears the most plausible (Spechler 1994). Geophysical, chemical, and artesian pressure data all suggest the presence of a paleo-sinkhole on the surface of the Ocala Limestone (the uppermost unit of the Floridan Aquifer) in the northeastern portion of Fort George Island. Decreasing heads in shallower freshwater zones through pumping or uncontrolled flow from artesian wells can increase the potential upward migration of saltwater through zones of higher permeability. Intruded saltwater can then move laterally through freshwater aquifers (see figure). In fact, chloride concentrations in the wells of Fort George Island have increased in recent years as artesian head pressures in the Upper Floridan Aquifer have declined.

The potential for saltwater contamination of freshwater aquifers in northwest Florida will probably increase as artesian pressures continue to decline. Some regional management strategies may reduce this threat. These include: minimizing well depths, drilling new wells where freshwater thickness is greatest or in aquifers hydrologicaly isolated, reducing draw down in well fields, and plugging deeper parts of problem wells. Most of these strategies are out of the control of the preserve. However, there are two basic guidelines that will help NPS protect the water quality in the regional aquifer system: 1) desist pumping from the NPS well and use another water source and 2) eliminate uncontrolled artesian flow from the Upper Floridan Aquifer by capping unused wells. Additionally, any new wells should be carefully located to avoid the zone of increased salinity. Lastly, any plans to pump nearby, non-NPS wells should be strongly discouraged.

Parks Face Increasing Resource Threats from Landfills

Pete Penoyer, Hydrogeologist
Water Operations Branch

Old landfills of various types (county, municipal, and industrial) are a very common occurrence throughout the United States and are increasingly becoming resource threats to federal land management agencies. In some instances, county, municipal, and even industrial landfills are found in close

proximity to National Park Service lands. Before the mid-1970s and the beginning of more strict environmental legislation regulating solid and hazardous waste disposal, few municipal landfills adequately or consistently separated or distinguished industrial from municipal solid and liquid waste streams. Early landfills lacked advanced design criteria to limit releases of contaminant-containing leachate to the environment. Also, some substances that were once considered benign are now considered toxic at the levels produced by industrial landfill leachate and have become regulated (e.g., boron from coal combustion by-products such as fly ash). When discharged to surface and ground water primarily in landfill leachate, these newly regulated substances pose new human health and environmental threats not anticipated a few years ago. Little was done in the past to limit release of loosely regulated or unregulated substances through the use of landfill designs of high integrity (caps/liners of low permeability, leachate collection systems, etc.), and the insidious discharges to ground water went unseen and were largely ignored.

Yard 520 Fly Ash Landfill. Water table mounding beneath landfills can be subtle, but the effect on shallow ground water flow can have serious consequences. (Scott Hicks, INDU)

Even in the older landfills where some engineering design for environmental protection was used, failure of one or more components often occurred over the years with a subsequent release of contaminants. As a result, environmental problems exist today with many, if not most, landfills constructed or designed before 1980. In states with weak solid and hazardous waste regulation or enforcement, environmental problems from poor landfill design and construction have occurred with landfills constructed even later. Unfortunately, poor landfill designs have usually led to ground water and/or surface water resource impact. Past landfill monitoring was typically very limited in space and to a single depth (e.g., at the water table), so it did not always detect a release or potential threat of contaminant migration toward an adjacent property owner by more dense organic solvents that tend to sink.

The rate of ground water flow is generally slow and depends upon the gradient of the phreatic (water table) surface and the aquifer's hydraulic conductivity. Steep gradients and high hydraulic conductivity generate long ground water plumes (sometimes up to a mile or more in a decade). Surface waters are also potentially impacted directly by landfill runoff or by discharge of contaminated ground water to a nearby stream or wetland. WRD recently assisted several parks whose resources were impacted or threatened by old municipal and/or industrial landfills. As a first step in recognizing any potential threats, we recommend that park staff be cognizant of the landfills in their immediate area (within 2 miles) and the general direction of ground water flow. Local area landfills/waste site occurrences and local ground water flow information are publicly available through a query of such EPA published lists as CERCLIS (available at http://www.epa.gov/superfund/sites/query/basic.htm) and by contacting local USGS WRD offices in your state (http://www.usgs.gov/), respectively. Discharge of landfill leachate is becoming an increasing threat as old landfills age and the down gradient distance that ground water has traveled increases with time. Please

contact Pete Penoyer at (970) 225-3535 for technical assistance if there is a concern that a landfill in the vicinity of your park may pose a potential resource threat.

Install and Monitor Ground Water Monitoring Wells at the Proposed McLaren Tailings/Great Republic Smelter Repository Site Park County, Montana

Pete Penoyer, Hydrogeologist
Water Operations Branch

This project is being conducted in cooperation with the State of Montana Department of Environmental Quality. The project will evaluate levels and seasonal fluctuations in ground water at a proposed repository for abandoned, heavy metals-contaminated tailings and waste rock currently located at the McLaren Tailings/ Mill and Great Republic Smelter sites. The materials would be relocated from in-stream and proximal stream areas to a repository located on an elevated bench/ terrace above Soda Butte Creek. Ground water monitoring is needed to ensure that the currently proposed repository design (unlined) is appropriate and suitable for site ground water conditions. Installation of 3 monitoring wells by the state through a transfer of funds was postponed from Fall 2004 to Spring 2005 due to delay at the national level in the transfer and obligation of FY 2004 project funds (mid-summer) coupled with the time required in developing a Cooperative Agreement between the park and the State of Montana. As a result of these delays, a drill rig could not be secured until November, which was beyond the weather window for conducting field work of this nature in this northern clime and at this altitude. This 6-month postponement should not seriously impact the timely acquisition of data to ensure that repository site selection and design are appropriate. The state has received transfer of funding to conduct this work with well installations, and the start of ground water monitoring is now set to begin in Spring 2005.

Furnace Creek Flood Death Valley National Park

Gary M. Smillie, Hydrologist
Water Operations Branch

During the afternoon and evening hours of August 15, 2004, Death Valley National Park experienced some of the heaviest flooding in recent times. A severe band of thunderstorms moved over a large area of the park, including the Funeral Mountains that drain into Furnace Creek Wash. By the early evening hours, flood waters were rising in the wash, causing damage to roads and other infrastructure. Near the road junction of State Highway 190 and Twenty Mule Team Canyon Road, a car was washed into the torrent, killing its two occupants. Further downstream, flow was partially split by a manmade diversion channel located at Zabriske Point. This diversion point had been created in the 1930s to provide protection to the facilities located further downstream along Furnace Creek Wash. Through time, the opening to the diversion had been enlarged by erosional processes, and at the time of the August flood, was capable of passing a large discharge. However, the flow of August 15th exceeded the diversion capacity and flow continued down Furnace Creek Wash. Near the Furnace Creek Inn, several employee vehicles were swept into the flood, but fortunately, no people were caught in the water.

Aftermath of August 2004 flood (NPS Photo)

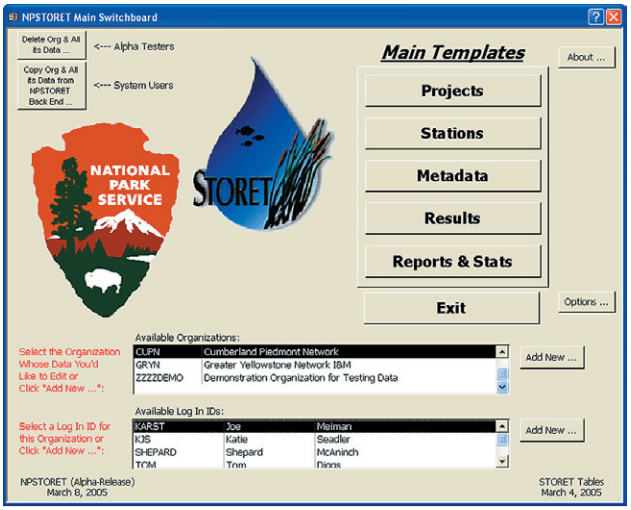
The main park access road down the Furnace Creek Valley was obliterated in several areas and was closed to traffic for several weeks following the flood. Many road segments in the park were damaged or covered by debris and closed to traffic for some time. Other park infrastructure was impacted as well, such as the potable water supply system also located in Furnace Creek downstream of the diversion.

While it is not yet known for sure, the August 2004 flood event appears to have been the largest flood since the diversion at Zabriskie Point was created. The large discharge that flowed through the diversion and into Gower Gulch caused significant scour of the Furnace Creek channel upstream of the diversion, causing the channel bottom to lower by several 10's of feet. The scour resulted because the gradient of flow is much steeper down the diversion than the gradient down Furnace Creek. Both paths flow to the same endpoint, Badwater, but the path is much shorter down Gower Gulch. The material scoured out of the channel traveled in suspension and as bed load through the very steep "notch" reach of the diversion and then deposited on the bed of Gower Gulch, essentially burying the natural channel with sediments of a markedly different appearance than the native materials found in Gower Gulch. As it is presently configured, the Zabriskie diversion has become large enough to capture flood waters from all but the largest events down Furnace Creek.

Immediately following the flood, NRPC staff made a site visit to see firsthand the effects of the flood, record high water marks, and to assist in developing information useful to flood recovery planning. A follow-up visit was made to the park in early winter to acquire survey information to be used in hydraulic modeling and flood magnitude estimation. Surveys were also performed in areas previously surveyed so that comparisons can be made of pre- and post-flood channel geometry. A report summarizing the findings will be prepared in FY 2005.

NPSTORET Water Quality Database Takes Shape

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



NPSTORET is a water quality database designed to allow NPS Vital Signs Monitoring Networks, parks, and other entities to enter results from historical or ongoing water quality monitoring activities in a format that readily uploads to the Environmental Protection Agency's STORET (http://www.epa.gov/storet/) National Water

Quality Database. Under development within the NPS Water Resources Division, NPSTORET comprises a series of templates or forms which enable users to enter information about water quality monitoring projects, stations, metadata, and results in a Microsoft Access database. NPSTORET export routines will create files that can be imported into STORET Version 2.0 by the STORET Import Module. A new Reports and Statistics template is also under development.

Entering data into STORET has long been challenging. Legacy STORET, in operation from the 1960s through 1998, was hampered by architectural/structural (not a relational database) and communication problems (dial-in to a mainframe computer). Modernized STORET resolves many of these issues, while introducing others. Due to the need to document data properly (i.e., enter metadata) to ensure credibility, data entry in modernized STORET remains a challenge. NPSTORET is designed to ease the data entry burden by abstracting and simplifying the data entry requirements. Before routine entry of monitoring results, NPSTORET users create one or more projects, enter one or more station locations, and thoroughly define the environmental characteristics that were measured. Entering projects, stations, and metadata will typically only need to be done at project initiation or when something changes (e.g., a new station location, a different analytical procedure, a change in detection limit, etc.). The bulk of data entry will simply be ongoing entry of results that relate (are linked) to the previously entered projects, stations, and metadata.

The NPSTORET Reports and Statistics Template allows users to generate list and detailed printed reports of all entered data. The statistical routines generate annual, seasonal, or period-of-record descriptive statistics for all or any user-specified subset of the database. Different substitution methods are available for handling censored (i.e., detection limit) data in the statistics. NPSTORET allows all or any user-specified subset of the database to be screened against national water quality criteria to determine potential water quality problems. Results of statistical analyses and criteria comparisons can be saved in GIS-compatible event tables for display in a GIS. Graphics routines will allow the user to display time series and box-and-whiskers plots of the data. Export routines allow users to save all or any user-specified subset of the data in Access, Excel, or text format to facilitate exchange or use in other statistical or graphics packages.

Although work on NPSTORET is ongoing, the latest alpha version can be downloaded from http://nrdata.nps.gov/programs/water/npstoret/. Networks have already begun successfully entering monitoring results into the alpha version. Context sensitive help and a First Time User's Manual are included in the alpha version. A beta version of the database will be available in Summer 2005 when the Reports and Statistics Template is complete, the STORET Import Module exports are done, and an NPSTORET import module is added. Additional information on NPSTORET, STORET, and Vital Signs Water Quality Data Management and Archiving can be found at http://www.nature.nps.gov/water/infoanddata/index.htm. User-input is extremely valuable in guiding the development of NPSTORET to make it useful to the widest audience. If you have any questions, comments, or suggestions, please contact Dean Tucker (Dean_Tucker@NPS.GOV).

WATER RIGHTS BRANCH HIGHLIGHTS

Chuck Pettee, Chief Water Rights Branch

In 2004, the Water Rights Branch (WRB) continued to participate in hearings in state administrative proceedings, settle issues via stipulated agreements, collect and analyze hydrologic and water related resource data, and even become indirectly involved in non-NPS Environmental Impact Statement (EIS) proceedings.

The Southern Nevada Water Authority proceeded on multiple fronts to construct pipelines and related infrastructure that will enable them to import water to the Las Vegas area. Because these pipelines will cross public lands administered by the Bureau of Land Management (BLM), they are conducting EISes to secure BLM right-of-way permits. Additionally, the Bureau of Reclamation (BOR) is preparing an EIS on the operation of the Aspinall Unit dams just upstream from the Black Canyon of the Gunnison National Park. In both of these EIS processes, the NPS is a cooperator agency and WRB staff will provide technical support.

The NPS has continued to collect scientific information to support claims for water rights under state and federal law–in Arizona for a claim previously filed on Rincon Creek in Saguaro National Park and in Colorado where a claim was filed pursuant to the Great Sand Dunes Protection Act for the in-place use of ground water. The WRB also partnered with the State of Utah to complete a reserved water rights settlement agreement for Timpanogos Cave National Monument. Articles follow that describe the completed agreement and the claim for Great Sand Dunes in more detail.

The WRB also continued to work with partners to collect and analyze hydrologic data in several areas that will improve the science available to decision-makers in order to protect park water related resources. Events related to two of these efforts–one in Nevada involving Lake Mead National Recreation Area, Death Valley National Park, and Great Basin National Park and one in Oklahoma involving Chickasaw National Recreation Area–are included in articles that follow. Both Las Vegas and Oklahoma City are proposing to withdraw large amounts of water from ground water aquifer systems that are tributary to park units. Their respective state water administrators have decided that additional technical data are required to determine if the aquifers can support water exports to large cities while maintaining the needs of local citizens and the ecosystem.

In reaction to our ever-tightening budget, we decided to hold one of our positions vacant. When Jeff Albright moved over to the Water Operations Branch at the end of FY 2004 to head up the Watershed Condition Assessment Program, we did not fill his position in WRB. As a result, Bill Hansen is now Team Leader for both the Adjudication and Information Management Teams. The savings in salary costs will help as a partial hedge against the inroads of inflation on our division project funds.

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 the WRB whenever water rights issues are, or could be, affected by management decisions or proposals by park neighbors.

Saguaro National Park, Pool in Rincon Creek (NPS)

Outcome of First Water Rights Hearing Under New State Law

Jennifer Back, Hydrologist
Water Rights Branch

A hearing was held October 28, 2003, and continued to January 6, 2004, on the water right applications filed by Carol Ann Sparks for 3,191 acre-ft/year from the Arbuckle Simpson Aquifer. As reported previously, the NPS protested the water right applications due to concerns about impacts to springs and streams at Chickasaw National Recreation Area (CHIC). This hearing was the first held under the authority of Senate Bill 288, which placed the burden of proof on the applicant for a water right to demonstrate that springs and streams will not be affected by ground water withdrawals. On July 13, 2004, the Oklahoma Water Resources Board (Board) issued a Finding of Fact and Conclusion of Law and approved, in part, the water right application.

The Board Order stated that the proposed withdrawal of ground water at a rate of 3,191 acre-ft/year would likely degrade or interfere with Antelope and Buffalo Springs at CHIC. However, the Board noted that in a case where the maximum annual yield of a basin has not been determined, the Board may issue a temporary permit for a term of one year and that the Board should consider the amount that could be beneficially used. The Board determined through testimony of the applicant's husband that only 800 acres of the applicant's land were suitable for irrigation of pecan trees. Based on the water requirements of pecan trees and natural rainfall amounts, 1,800 acre-ft/yr was deemed sufficient to supplement natural rainfall. Facts gathered during the ongoing five-year hydrologic study of the aquifer, "together with any monitoring undertaken by the NPS and USFWS," will provide opportunity to reevaluate the permit and determine whether the permit will interfere with springs or streams. The Board concluded that if the application was approved for 1,800 acre-ft/yr, subject to revalidation after one year, the applicant's use could be managed so that it did not interfere with springs or streams emanating from the basin.

Evaluating Water Level Fluctuations at Devils Hole in Death Valley National Park

Paula Cutillo, PhD, Hydrogeologist
Water Rights Branch

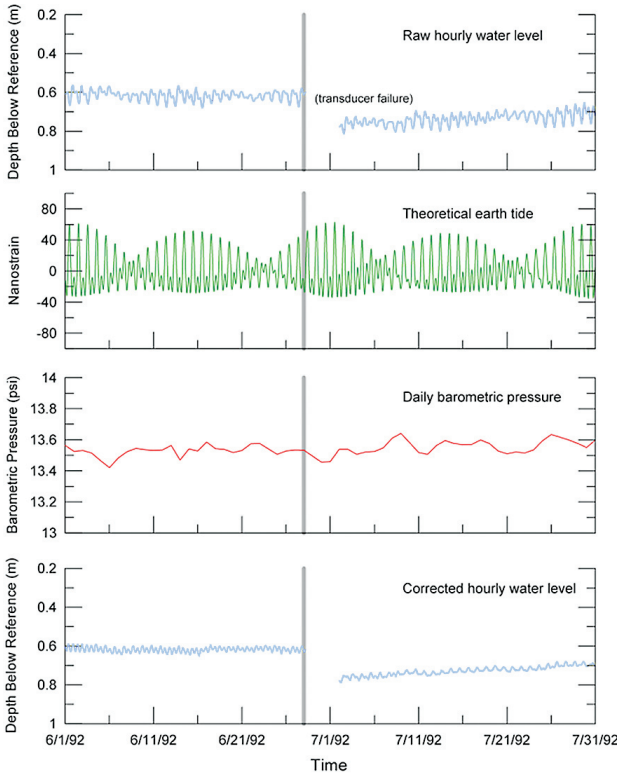
Devils Hole, home to the endangered Devils Hole pupfish (*Cyprinodon diabolis*) in Death Valley National Park, NV, is one of dozens of springs and the largest collapse depression in the Ash Meadows area. The small pool opening leads to an extensive subterranean cavern within the regional carbonate-rock aquifer. The stage of the pool, measured relative to the position of a copper washer placed in the rock wall above the pool, has been declining since 1988, threatening to expose the submerged rock ledge upon which the pupfish feed and reproduce. The National Park Service has a federal reserved water right at Devils Hole; declining pool levels, therefore, have important water rights as well as endangered species implications. For these reasons, the Water Rights Branch has made it a priority to understand the natural- and human-caused factors that produce fluctuations in the stage of the pool, as well as to distinguish between cyclic short-term factors that have no lasting effect on the pool and those factors that may contribute to long-term changes in the stage of the pool.

The Water Rights Branch supports research on the effects of regional ground water pumping, changes in ground water recharge, and tectonic activity. The results of one such project attribute changes in the pool stage to pumping in Ash Meadows and nearby Amargosa Desert.

Natural stimuli, such as barometric pressure, earth tides, and earthquakes, also cause the stage of the Devils Hole pool to fluctuate. The water level of the pool behaves in a manner similar to the water level in a well open to a confined aquifer. Increases in barometric pressure exert an external load on the pool surface, causing the water level to decrease. The stage of the pool responds to an even greater degree to earth tides. The earth deforms as it rotates within the gravitational fields of the sun and moon, producing earth tides. Strains produced by earth tides induce water level fluctuations of up to 12 cm at Devils Hole. The pool rises and falls twice a day, and goes through one full cycle of maximum height about once every 2 weeks at new-moon and full-moon phases.

One of the more fascinating aspects of Devils Hole is the manner in which it responds to earthquakes. Earthquakes induce two types of short-term hydrologic responses: water level oscillations due to the passage of seismic waves and water level offsets due to crustal deformation. The duration of water level oscillations is on the order of minutes to hours. The passage of seismic waves at Devils Hole has been documented for hundreds of earthquakes around the world but is not believed to have any permanent effect on the stage of the pool.

Water level offsets are a result of the crustal contraction and extension that occurs with movement along faults. The offsets are characterized by an instantaneous change in water level, followed by a gradual recovery to pre-earthquake levels within days or months of the seismic event. Two water level offsets, correlating with the 1992 Landers/Little Skull Mountain earthquake sequence and with the 1999 Hector Mine earthquake, are observed in the Devils Hole record. Further investigation by the Water Rights Branch found that when barometric and earth tide effects are largely removed from the Devils Hole water level record, the stage of the pool declined > 21 cm at the time of the 1992 Landers/Little Skull Mountain earthquake sequence and declined 3.6 cm at the time of the 1999 Hector Mine earthquake (see figure). The magnitude and direction of these offsets were found to be consistent with areas of crustal extension predicted by a numerical earthquake strain model. Water level recovery following each earthquake was then simulated with a numerical ground water model to improve understanding of the extent of the earthquake-induced water level offsets. The Water Rights Branch plans to submit the results of this research for publication in 2005. Promoting sound scientific understanding of the causes of water level fluctuations at Devils Hole provides resource managers with timely, relevant research and the technical assistance needed to develop adaptive management approaches.



Measured water level, the theoretical earth tide signal, barometric pressure, and the corrected water level at Devils Hole from June 1 to July 31, 1992. The shaded line indicates the date of the 1992 Landers/Little Skull Mountain earthquake sequence.

Ground Water Claim Filed for Great Sand Dunes National Park and Preserve

William R. Hansen
Supervisory Hydrologist
Water Rights Branch

The Department of Justice, on behalf of NPS, filed a claim on December 30, 2004, for an absolute in-place ground water right for Great Sand Dunes National Park and Preserve in Colorado Water Division Number 3. The claim was filed pursuant to the *Great Sand Dunes National Park and Preserve Act of 2000* (P.L. 106-530; November 22, 2000). The Act recognized that the Great Sand Dunes, together with the associated sand sheet and the adjacent wetland and upland, contain a variety of rare ecological, geological, paleontological, scenic, historical, and wildlife components that merit protection and preservation. The Act specifically recognized that surface and ground water systems on and underlying

Live terminus of Sand Creek, Great Sand Dunes National Park and Preserve (William Hansen)

the park and public and private lands adjacent thereto are necessary to the preservation of the natural and cultural resource values, including the unique pulse flow characteristics of Sand and Medano Creeks. The Act also authorized the Secretary of the Interior (Secretary) to purchase the Baca Ranch.

It is well established that the water table in the unconfined aquifer, on which the sand dune and wetland systems depend, is supported by a complex series of underlying aquifers referred to as the confined aquifer, which is under hydrostatic pressure, and by ground water recharge from surface streams. There is also a history of proposals to withdraw ground water for export from the San Luis Valley to the eastern slope of Colorado.

Significant changes in ground water hydrology, particularly declines in the underlying confined and unconfined aquifers, will alter environmental conditions that are critical to the sand dunes, wetland vegetation, and other resource values. The Act directs the Secretary to obtain and exercise water rights required to fulfill the purposes of the park by maintaining ground water levels, surface water levels, and stream flow on, across, and under the park. The Act also requires the United States to follow state procedural law in obtaining the water right and to establish the purposes and other substantive characteristics of the water right pursuant to state and federal law. The Act protects uses existing on November 22, 2000, and prohibits the federal reservation of water.

The practical effect of the subject in-place appropriation of all unappropriated water in the ground water system is to appropriate a water table level in the ground water system that will fluctuate in the future as a function of climatic conditions, water supply, and water demands from: 1) water rights in existence on November 22, 2000, for non-federal purposes in the San Luis Valley or 2) operations of the Bureau of Reclamation's Closed Basin Division, San Luis Valley Project.

Indian Spring, the source of Big Spring Creek, Great Sand Dunes National Park and Preserve (William Hansen)

The NPS closely coordinated the preparation of the claim with the State of Colorado, the Conejos Water Conservancy District, the Rio Grande Water Conservation District, and The Nature Conservancy. The NPS claim received 13 objections to the claim; five of the objections support the NPS effort to appropriate ground water in the San Luis Valley. NPS will work with the Department of Justice to resolve the objections and/or litigate the claim as necessary. Perfection of the claim in Water Court may take 2-3 years.

Source Area and American River Protected at Timpanogos Cave National Monument

William R. Hansen
Supervisory Hydrologist
Water Rights Branch

A water rights agreement (Agreement) between the United States (National Park Service) and the State of Utah was signed on March 22, 2004, recognizing and protecting water rights at Timpanogos Cave National Monument. This is the sixth water right agreement signed between the NPS and Utah. The NPS originally filed a claim in 1987, and the parties had negotiated water right issues for several years. The agreement defines NPS water rights for inclusion in the Utah Lake and Jordan River Adjudication in Utah.

The Agreement recognizes both state appropriative and federal reserved water rights. Four state appropriative rights are confirmed with priority dates of 1852, 1858, 1859, and 1930. These rights may be used at the visitor center to deplete up to 12 acre-feet per annum. The federal reserved water right protects all naturally occurring water underlying, originating within, or flowing through Timpanogos Cave National Monument, including perennial, intermittent, and ephemeral streams, springs, seeps, lakes, ponds, ground water, and other natural sources of water. The water rights agreement requires that Utah establish a ground water protection zone, primarily on USFS lands upgradient of the cave, to protect ground water and hydrologic features of the monument. Utah will not approve any water right applications to develop or use ground water in the protection zone. The Agreement also recognizes a federal reserved water right for minimum monthly instream flows on the American River at the east boundary of the monument with a priority date of October 14, 1922. The United States has agreed to

subordinate its federal reserved water right for non-consumptive purposes to all valid existing perfected water right and approved applications with priority dates of January 1, 2000, or earlier.

Middle Cave Lake at spring levels, Timpanogos Cave National Monument (Cami Pulham)

Utah has agreed to issue an Addendum to the Proposed Determination for the American Fork River Subdivision (Area 55, Book No. 2). NPS and Utah will then cooperate to obtain an interlocutory decree on the Addendum. The decree will perfect all present and future water rights for Timpanogos Cave National Monument and allow the NPS to enforce those rights against other users.

Ground Water Development Plans for Southern Nevada

Dan McGlothlin
Monitoring & Enforcement Team Leader
Water Rights Branch

Increased demand for water supplies in desert basins near Lake Mead National Recreation Area (LAME) has increased greatly in response to population growth in Las Vegas and the surrounding region.[1] In 2004, the well-documented drought in the Colorado River Basin and significant lowering of Lakes Mead and Powell forced Nevada water managers to take aggressive measures to augment their water supplies. Southern Nevada Water Authority (SNWA) is the primary manager of water in Clark County and relies on the Colorado River for up to 88 percent of its supply. Faced with a continuing drought alert in the Las Vegas Valley, conservation measures have been effective in reducing overall water demand; to meet escalating demand, however, new ground water sources are needed. This article reviews the latest efforts toward large-scale development of regional aquifers in Nevada and NPS responses to protect water rights and resources at LAME, Great Basin National Park (GRBA), and Death Valley National Park.

In 2004, SNWA announced plans to accelerate the importation of up to 125,000 acre-feet/year of ground water to Las Vegas Valley from distant basins and aquifer systems in south-central and eastern Nevada. Two major well field and pipeline projects called *Three Lakes Valley Ground Water Development* and *Clark, Lincoln and White Pine Counties Ground Water Development*[2] are underway.[3] These projects require federal approvals for rights-of-way and SNWA submitted R-0-W applications in 2004.

To facilitate water development, Nevada

sought and won congressional approval of the *Lincoln County Conservation, Recreation, and Development Act of 2004*.[4] This legislation establishes a utility corridor in Lincoln County and Clark County and grants rights-of-ways to federal land for water and related facilities needed to convey water. Investigation of water resources is also authorized in ground water basins located in White Pine County and Lincoln County, Nevada, and adjacent basins located in Utah. GRBA and LAME lie within these ground water basins. NPS intends to cooperate with BLM in the development of the necessary NEPA reviews and environmental analyses to assess project impacts. NPS also intends to cooperate with the USGS in the water resources investigation.

Concurrent with efforts to design water project infrastructure is SNWA's acquisition of ground water right permits. In March 2004, NPS participated in the Nevada State Engineer's administrative hearing on SNWA ground water right applications in Three Lakes Valley Ground Water Development project area. BLM, USFWS, and NPS protested these applications because of potential injury to DOI water rights and resources. State Engineer Ruling 5465, issued January 4, 2005, granted SNWA approximately one-half of the amount requested. This decision acknowledged that developing aquifers in the regional ground water system will ultimately result in impacts to spring discharge and water levels, and recognized the inter-basin movement of ground water toward Devils Hole. The decision focused on the uncertainty of predicting impacts and allowed some pumping accompanied by significant monitoring and modeling to quantify impacts. In 2005, NPS will work with USFWS, BLM, and SNWA to seek monitoring, early detection, and mitigation measures that ensure protection of Devils Hole.

The Secretary of the Interior (Secretary) authorized in 2004 a NPS, USFWS, and BLM cooperative project to develop predictive tools for evaluating effects of regional ground water pumping on natural resources in basins near LAME. The three-year project builds upon work begun in 2001 to develop a model for DOI bureaus to evaluate effects of water use on ground water discharge to bureau-administered areas in Clark County. Project components include evapotranspiration quantification, measuring water levels, spring and stream discharges, geochemical characterization, and completion of the model. The project is authorized $1,897,500 and funded by revenues generated from public land sales in Clark County.

Finally, the Secretary has appointed a DOI liaison to the SNWA's efforts to develop water resources for the Las Vegas Valley. The BLM Nevada State Director was designated to coordinate DOI resources to provide timely information while discharging DOI permit issuance and resource protection responsibilities. WRB will coordinate NPS activities with BLM.

(Footnotes)
1 2001 WRD Annual Report, p.23
2 SNWA, Conceptual Development Plan, February 2004
3 A third project, *Virgin and Muddy Rivers Surface water Development*, proposes to develop surface water rights
4 PL 108-424, Nov. 30, 2004

Lake Mead National Recreation Area (Rogers Spring) (Bill VanLiew)

NATURAL RESOURCE CHALLENGE AQUATIC RESOURCE FIELD PROFESSIONALS HIGHLIGHTS

Bill Jackson, PhD Acting Division Chief

With support from the Natural Resource Challenge, 15 aquatic resource professional positions have been established in the field. 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. A table listing all 15 of these new positions is included in Appendix B, and a summary of accomplishments stemming from these positions is included in Appendix A. The articles that follow provide examples of two of projects and issues being addressed out of these new positions.

Devils Hole Pupfish at Death Valley National Park

Marie Denn, Aquatic Ecologist

The world's entire population of Devils Hole pupfish *(Cyprinodon diabolis)* derives from a unique ground water filled limestone cavern in Death Valley National Park (DEVA). This electric blue fish rarely exceeds 1 inch in length and survives in barely-tolerable, warm, oxygen-poor waters in an extremely food-limited habitat. In 1968 the pupfish was one of the first species federally listed as endangered due to its limited range. However, beginning in 1969, large-scale agricultural pumping in the region drew down the water level in Devils Hole, threatening the fish with extinction. The NPS and the newly-formed Desert Fishes Council took the issue to the U.S. Supreme Court; in 1976 the Court ordered the conservation of Devils Hole ground water resources as a protected part of DEVA and required that water levels in the hole be maintained at a level high enough to preserve the pupfish. This decision had far-reaching consequences for aquatic biota downgradient of Devils Hole and for federal water rights nationwide.

Marie Denn at Devils Hole in Death Valley National Park (Shawn Goodchild)

After the Supreme Court decision, the water level in the hole recovered somewhat from the drawdown, and the pupfish population increased from a spring low of 127 in 1972 to a spring high of 310 in 1994. However, for the past ten years the number of pupfish at Devils Hole has declined for unknown reasons. The 2004 spring pupfish census concluded that the population was at its lowest level in 30 years of monitoring—only 123 fish remained in the hole.

Then in September 2004, a flash flood in Devils Hole exacerbated the decline; monitoring equipment washed into the pool and caused the death of approximately 80 fish. The flood also deposited a large amount of sediment in the hole, degrading the pupfish breeding habitat. Although sediment deposition is a natural process in Devils Hole, stationary equipment in the breeding habitat substantially increased the amount of sediment deposited on the breeding ledge and unnaturally altered its characteristics.

Immediately following the flood, DEVA and WRD staffs met with USFWS and Nevada Department of Wildlife partners to discuss the pupfish mortality. The group entertained some hope that the sudden reduction in population would spur reproduction in this food-limited ecosystem. Unfortunately, larval fish monitoring conducted in late 2004 by Southern Oregon University (SOU) biologists found no young fish. This result was unexpected, because generally some breeding occurs in the hole year-round, and fish hatched since the September flood would have been visible. The SOU researchers observed only large adult fish, and noted about 3 males for every female pupfish. The researchers suggest that sediment deposition so severely degraded the breeding habitat that little or no recruitment is possible. The skewed sex ratio further limits the reproductive capability of the population. As the Devils Hole pupfish has only a one-year lifespan, a lack of reproductive success in 2005 will result in extinction of the population.

The pupfish also exist in two off-site artificial refugia. However, the refugia fish have diverged from their cousins in Devils Hole, due to relatively benign conditions in their artificial habitats. The refugia populations exhibit atypical morphological and behavioral characteristics and it is uncertain if they would survive if transplanted into their ancestral habitat, in the event of extirpation of the Devils Hole population. Devils Hole pupfish have not been successfully bred in aquaria, despite several attempts by experienced aquarists. Currently DEVA is working with pupfish researcher James Deacon and aquarists at Mandalay Bay Shark Reef Aquarium in Las Vegas, NV, to support their efforts to develop the technical expertise to breed Devils Hole pupfish in aquaria.

In order to maximize the pupfish's chance for long-term survival, DEVA and WRD staffs are working closely with USFWS and Nevada Department of Wildlife personnel to reduce the effects of human activities in the hole. Planned and proposed actions include: modifying the breeding habitat substrate to mimic pre-flood conditions, removing some of the stationary equipment in the hole, and maintaining larval fish and habitat monitoring. In addition, DEVA and WRD staffs are continuing to work with pupfish researchers to discover the causes behind the long-term decline of the population, with the hope of conserving the pupfish in Devils Hole for generations to come.

Research to Control the Exotic, Invasive, Asian Swamp Eel at Chattahoochee River National Recreation Area

Jim Long, Ph.D., NRC Aquatic Resource Professional, SER Fishery Biologist
Byron J. Freeman, Ph.D., Institute of Ecology and Museum of Natural History, University of Georgia
Jay Shelton, Ph.D., Warnell School of Forest Resources, University of Georgia

The Asian swamp (rice) eel (Figure 1) was first discovered in the Southeast in Georgia in 1996 from three spring-fed impoundments at the Chattahoochee Nature Center (CNC) in Roswell, GA, that borders Chattahoochee River National Recreation Area (CRNRA) (Figure 2). It is not known how or why the eels were introduced, however, the likelihood that it was the result of an aquarium release is high. To date, three populations are also known to be established in Florida, one of which borders Everglades National Park.

Figure 1. Photograph of Asian swamp eel (B. Freeman, University of Georgia).

In 2003, the National Park Service partnered with the USFWS and Georgia Department of Natural Resources to work cooperatively with CNC to conduct research on the effects of this exotic species on native species and to develop an eradication/control plan. The University of Georgia (UGA) had conducted previous research (Freeman and Burgess 2000) and was again contracted to conduct this research. In addition, the partnership garnered support from Georgia Power, who operates Morgan Falls Dam. The Morgan Falls Dam impoundment abuts the CNC and contains abundant marsh habitat that could serve as suitable habitat for swamp eels to begin breeding in the Chattahoochee River. The current research activities focus on three objectives: 1) determine the impacts of exotic eels on native aquatic species, 2) determine the extent, if any, of the presence of exotic eels in the Chattahoochee River, and 3) evaluate the susceptibility of exotic eels to various capture methodologies that will lead to the development of an eradication or control plan.

Impacts to native fish species in ponds appear to be more from competition than predation. Previous work (Freeman and Burgess 2000) found that Asian swamp eels in the CNC ponds consumed mostly insects (96% of diet). However, that work was based on only 20 individuals so it may not have been representative of the entire population. Current research is relying on analyses of stable isotopes (C and N) as well as gut contents. Preliminary evidence shows that swamp eels in the CNC ponds appear to be on the same trophic level as mosquitofish and below the level of other predators such as largemouth bass and bluegill, indicating that swamp eels in these areas are primarily invertivores and probably not feeding substantially on fishes. This new evidence confirms what was found with gut contents. Within swamp eel samples, there also appears to be at least one ontogenetic shift in prey consumption: eels >30 cm were higher in trophic level than those eels <30 cm.

The extent of the swamp eel invasion into the Chattahoochee River so far has been found to be widespread in at least one marsh, but only after a more efficient capture method was discovered. Electrofishing has been

used in the CNC ponds previously with success and in other systems to capture this species, so it was determined to be a reliable detection method. In fact, Freeman and Burgess (2000) documented one swamp eel in a Chattahoochee River marsh using this method. So, to determine the extent of swamp eels in the river, several teams conducted multiple electrofishing surveys in the marshes, mainstem, and tributaries of the river in July 2004 but didn't detect any swamp eels.

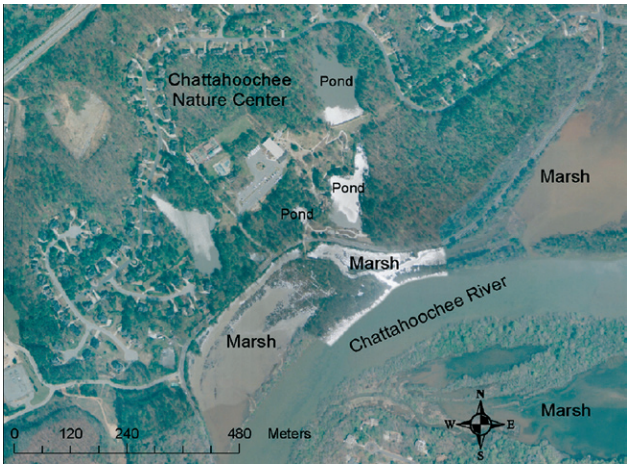


Figure 2. Map of the Chattahoochee River showing location of the Chattahoochee Nature Center and nearby marshes where research to control and eradicate the Asian swamp eel is occurring.

It was only after the researchers had experimented with other methods that they found that leaf litter bag traps, made out of grocery store onion bags stuffed with leaf litter, were very efficient at capturing small swamp eels (<100 mm). After leaf litter bags were deployed into a nearby marsh in the river, 43 individual swamp eels were captured in seven weeks of trapping, demonstrating conclusively that they had indeed invaded areas outside of the CNC ponds. Additionally, it was found that traps that captured eels were clustered near each other. Recent backpack electrofishing sampling around the area of these clusters has documented the presence of larger adult eels. As a result, future work is planned to deploy leaf litter bags in other nearby marshes to see if the invasion outside of the CNC ponds is local or widespread. Future work on this project will continue into the next year with additional funding and cooperation from all of our partners. Because swamp eels have been found in abundance in the river, future control and eradication efforts will likely be devised separately for the CNC ponds and the river. We are proposing a drawdown and habitat modification of one CNC pond next year as an experiment and will be setting out more leaf litter bag traps in the river. With persistence and the help of our partners and researchers, we may be able to eradicate this population of eels.

Reference

Freeman, B.J. and T.N. Burgess. 2000. *Status of the Asian rice eel, Monopterus albus, in the Chattahoochee River system, Fulton County, Georgia*. Final Report to U.S. National Park Service. 41 p.

APPENDIX A

TECHNICAL ASSISTANCE

TECHNICAL ASSISTANCE SERVICEWIDE

Coordinated development of FY 2006 to FY 2007 Servicewide Consolidated Call for WRD Competitive Projects and the NPS-USGS Water Quality Monitoring Partnership Program.

Prepared a water rights handbook and checklist for land and associated water right acquisitions to support NPS land acquisition activities.

Developed a new paradigm for water resources planning within WRD.

Initiated discussions with Texas A & M University regarding cooperative efforts to evaluate and manage coastal watershed assessment activities initiated by WRD in FY 2003.

Provided oversight and technical support to Dr. Candy Bartoldus (George Mason University) and others contracted to develop a *Summary Compendium of Watershed Assessment Methods for the NPS*.

Planned and held the 2004 NPS Aquatic Resources Professionals' Meeting, which was attended by 150 people representing Washington offices, regions, networks, parks, and universities.

Coordinated the joint NPS-USGS effort to acquire high-resolution, 1:24,000-scale National Hydrography Dataset (NHD) for national park units with significant resources, including acquiring and quality assuring NPS data incorporated into NHD.

Completed migration of the NPS servicewide water quality database from legacy STORET system to modernized STORET. This major milestone entailed migration porting the data (more than 17,000 locations, 2 million results, and 2,100 different parameters) between two entirely different data models. With the diversity of NPS data, the migration was by far the most complicated undertaken by any data steward in legacy STORET.

Arches National Park, reflection in pothole (Sara Bartels)

Completed a new 5-year Interagency Agreement between the NPS and the USFWS for production of National Wetland Inventory maps and digital data.

Developed an Interagency Agreement between the WRD and the USFWS Fisheries Assistance Office to provide for technical assistance on fish restoration projects throughout the national park system.

Served as NPS representative to the National Water Quality Monitoring Council.

Provided review and comment on the EPA/USGS Collaborative Strategy for Monitoring and Modeling to the National Water Quality Monitoring Council.

Provided technical review and comment

on the USFWS draft Standards for Wetlands, Deepwater, and Related Habitat Mapping: National Standards and Quality Requirements. These are the standards used for producing National Wetland Inventory maps.

Participated in discussions with the U.S. Public Health Service representatives about the role of the respective WASO divisions in assisting NPS units with recreational water quality / bathing beach monitoring requirements.

Yosemite National Park (Bill Jackson)

Participated on the State of Wyoming Total Maximum Daily Load Implementation Advisory Board and the Federal Family Coordination Committee.

Represented the NPS at a USGS sponsored workshop entitled The Ecological Relationships of Water Quality held in Denver, CO, May 4 – 6, 2004.

Provided a review and comment to the USGS on their five-year draft Strategic Plan for the USGS Fisheries: Aquatic and Endangered Resources Program.

Provided review and comment to the National Undersea Research Center, University of North Carolina, Wilmington, on a grant proposal by Dr. Jerald Ault concerning coral reef research in South Florida.

Provided review and comment on two proposals for NOAA's International Coral Grant Program.

Completed the final servicewide technical guidance for the NPS Strategic Plan Goal for Wetland Land Health (Goal Ia1C). Served as the national coordinator for this Strategic Plan goal.

Supported the implementation of Servicewide Goal 1a4 of NPS's Strategic Plan by 1) developing new Technical Guidance for Reporting to Goal 1a4 A and B and providing input to the DOI task force working to develop a water quality goal for the Department's Strategic Plan; 2) consolidating park end-of-year reports for incorporation into the Annual Performance Plan; and 3) overseeing the completion of the impairments element of the Designated Use and Impairments database.

Served as NPS goal coordinator for the DOI Land Health Strategic Goal related to streams and riparian zones.

Developed guidance for field staff for reporting on GPRA goals related to natural marine and coastal resources.

Assisted regional and park GPRA goal contacts with the use and interpretation of the new DOI Strategic Plan water quantity goal.

Responded to a DOI/USGS request to provide a summary of NPS water resources related activities sponsored by the WRD in the U.S. - Mexico border region in FY 2003 and FY 2004.

Participated in teleconference meetings related to a strawman exercise for developing park desired condition statements.

Provided the Biological Resources Management Division (BRMD) with summary information on the problems and numbers of non-native fish and the amount of native fish restoration work within the NPS for presentation to the National Invasive Species Council.

Participated in teleconference meetings related to development of a servicewide State of the Parks natural resource condition assessment and reporting system.

Served as the Contracting Officer's Technical Representative for the investigation entitled *Use of Semipermeable Membrane Devices to Assess the Presence and Potential Impacts of Polycyclic Aromatic Hydrocarbons Resulting from Recreational Snowmobile Use in National Parks* being conducted by the Columbia Environmental Research Center.

Sunset view, Grand Canyon National Park (Margaret A. Carfioli)

Continued updating and distributing handouts on deicers, dust suppressants, ammonia fate and effects, and chlorophyll.

Provided technical information and review comments to assist development of the DOI's Strategic Plan for FY 2004 through FY 2008.

Provided input and review to a presentation prepared for the Secretary of the Interior concerning NPS ocean park issues.

Coordinated NPS Response to DOI and the White House Council on Environmental Quality regarding the Commission on Ocean Policy.

Provided input to and participated in a briefing for the Director concerning NPS coral reef issues.

Provided comments on the draft and the final Government Accounting Office reports for a national water data survey requested by Congress.

Provided review and comment regarding remaining issues pertaining to the NR-MAP database update.

Provided policy review and comment on the Administration's proposal to use hatchery origin fish to fulfill Endangered Species Act requirements for listed salmon species.

Provided policy review and comment on DOI's draft response to *HR 2693 - Reauthorization of the Marine Mammal Protection Act*.

Provided input and review to the *FY 2003 Natural Resource Challenge Report to Congress*.

Infant Alligator, Everglades National Park (Bill Kettler)

Coordinated NPS Response to *Executive Order 13158: Marine Protected Areas*.

Reviewed and recommended continuation of *Director's Order 35A: Sale of Resources or Services to Support Activities Outside of Parks* beyond its July 2004 expiration date. The order was subsequently extended until July 2010.

Reviewed and commented on the draft *Director's Order 41: Wilderness Management*.

Participated in the revision of *Director's Order 46A: Wild and Scenic Rivers Within the National Park System* to include the concept of river management plans.

Provided review and comment on a draft Environmental Quality Division's memorandum regarding Environmental Compliance for Park Roads and Parkways Program projects.

Provided comments and edits on the Natural Resource Information Division's *NPS Hydrologic Unit Modeling Background for Data Source Assessment and Model Initiation*.

Provided project reviews for the Development Advisory Board.

Provided review and comment to the National Fish and Wildlife Foundation on a funding proposal entitled *Reef Fish Movements and Marine Reserve Designs*.

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.

Provided oversight and direction leading to the completion of uploading 37 water resources management plans, 27 water resources scoping reports, and 3 water resources issues overviews to the NPS Nature Net (http://science.nature.nps.gov/water/planning.htm).

Prepared a webpage (http://science.nature.nps.gov/im/inventory/water/index.htm) for the servicewide Inventory and Monitoring Program to explain water resources related inventories.

Developed a website for Vital Signs Water Quality Data Management and Archiving (http://www.nature.nps.gov/water/infoanddata/index.htm).

Updated a website for the WRD Servicewide Wetlands Protection Program (http://science.nature.nps.gov/water/wetlands.htm).

Acquired a new high-end server dedicated to STORET. Acquired a second server to run EPA web procedures against the STORET National Data Warehouse in order to have retrievals of unlimited size.

Continued development research into protocols and draft technical guidance available through federal agency and internet sources for water quality monitoring, recommended core parameters, detailed monitoring plans (including QA/QC), and water quality data management.

Made progress in creating 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 modernized STORET through the STORET Import Module. Updated *Part E. Draft Guidance on Data Reporting and Archiving in STORET* of the overall *Guidance on Water Quality, Contaminants, and Aquatic Biology Vital Signs Monitoring under the Natural Resource Challenge* (http://science.nature.nps.gov/im/monitor/protocols/wqPartE.doc).

Posted an updated version of NPSCol2Row v1.12, a data formatting utility used to prepare data for the STORET Import Module, to the EPA's website for anyone to download and use.

Continued to redevelop the Horizon Report software and procedures (with the EPA, Research Triangle Institute, and Horizon Systems) despite contracting obstacles. The contractors now have as target databases: modernized STORET Version 2.0, USGS NWIS database, and a national copy of the STORET Legacy Data Center rebuilt on a server in Fort Collins.

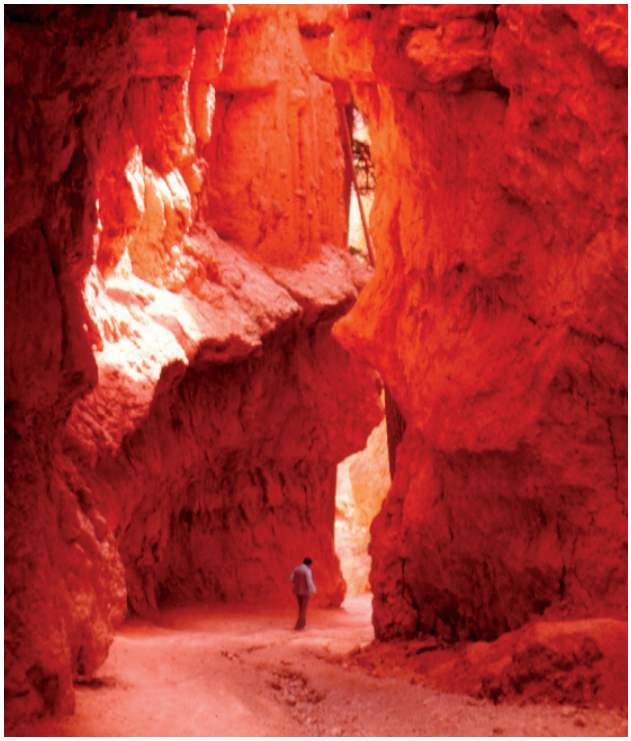
Barker Dam, Joshua Tree National Park (Dan Ng)

Developed a shared drive database of all planning related review comments provided by WRD in FY 2004.

Presented WRD's Watershed Condition Assessment Program and Designated Use and Impairment Database at the servicewide Inventory and Monitoring (I&M) Program's semi-annual Inventory and Monitoring Advisory Committee Meeting.

Presented WRD's Baseline Water Quality Data Inventory and Analysis Report Software Redevelopment Project at the Environmental Protection Agency's National STORET User's Conference.

Provided overview of I&M water quality and water resource inventory themes and a tutorial at the Natural Resource Data Management Workshop.



Bryce Canyon National Park (Christopher Light)

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

Represented the NPS on the Marine Protected Area Interagency Committee.

Represented WRD on the NPS Coral Reef

Restoration Advisory Team.

Contributed to biannual *U.S. Coral Reef Task Force Report to Congress* by drafting Chapter 5 on Marine Protected Areas.

Served as a member of the Fire Technical Advisory Group. Reviewed NEPA documents and implementation plans.

Represented WRD on the Planning Technical Advisory Group.

Represented WRD on the Restoration Technical Advisory Group.

Represented WRD on the Contaminants Technical Advisory Group.

Represented WRD on the Outreach Technical Advisory Group.

Represented WRD on the Monitoring Technical Advisory Group.

Served on the WRD Web Page Development Committee. Researched internet sites that provide water resources data and provided links that are now utilized on the NPS Nature Net page.

Drafted a Cooperative Agreement between NPS ADNRSS and the Reef Environmental Education Foundation to begin utilizing recreational SCUBA divers in volunteer fish counts, promote citizen stewardship, and provide information for assessing marine fish populations in parks.

Presented a panel discussion on water rights to the Natural Resources Law and Policy for Superintendents Workshop.

Provided presentations on *The Applicability of NPS Wetland Protection Policies and Procedures to Oil and Gas Operations* and on *Floodplain Compliance in the NPS* at the NPS 9B Oil and Gas Workshop in Santa Fe, NM.

Designed and completed an educational display on coral reefs in national parks.

Bloody Lane, Antietam National Battlefield (P.J. Mansfield)

Chaired a session concerning native fish management at Wild Trout VIII, a meeting of state and federal resource management agencies, the fishing industry, and recreational fishermen.

Co-chaired the Western Division of the American Fisheries Society's (AFS) Western Native Fish Committee. This committee has undertaken a project to review the status of all native fish within the western regions of the United States and Canada, including NPS areas.

Co-chaired a National Park Fisheries Management Symposium held in conjunction with the AFS's annual national meeting in Madison, WI.

Provided a presentation at the University of Denver Geography Department entitled *Managing Water Resources in our National Parks.*

Briefed Senate staffer Tom Lillie on the role and function of WRD.

Briefed a representative from the South Korean Interior Ministry regarding U.S. and NPS wetland protection policies and programs.

TECHNICAL ASSISTANCE VITAL SIGNS MONITORING NETWORKS

SERVICEWIDE

Provided updated guidelines to the Water Quality Vital Signs Monitoring Networks for the implementation of the Natural Resource Challenge water quality monitoring program.

Evaluated recent developments in monitoring equipment. Continued the gathering of information, field-testing, and study of QA/QC issues surrounding the use of multiparameter water quality equipment for the Natural Resource Challenge program. Helped networks with instrument procurement decisions and made arrangements for staff to evaluate vendor instruments on a trial basis.

Revised Part B guidance document for how to write detailed study plans with QA/QC documentation for long-term I&M aquatic monitoring. Developed a short checklist of items that will be needed as minimums in Phase 3 vital signs monitoring protocols.

Appalachian Highlands Network

Reviewed annual administrative report and workplan and Phase 2 report. Attended meeting at BISO.

Reviewed Phase 3 vital signs monitoring plan, water quality protocols, and other water quality documents.

Provided advice and recommendations on the use and integration of NPSTORET into the network water quality monitoring program.

Great Smoky Mountains National Park (Robert Baker)

Central Alaska Network

Reviewed vital signs monitoring plan and protocols.

Provided review and comment on Phase 2 report and the annual report and work plan.

Reviewed preliminary drafts of protocol development for monitoring ponds and small streams across the network and discussed the application of this aquatic vital signs monitoring approach to document loss of lentic ecosystems.

Cumberland/Piedmont Network

Reviewed Phase 3 vital signs monitoring plan, water quality protocols, and other water quality documents.

Provided advice and recommendations on the use and integration of NPSTORET into the network water quality monitoring program.

Eastern Rivers and Mountains Network

Provided digital water quality data, station locations, Adobe Acrobat PDF versions of the Baseline Water Quality Data Inventory and Analysis Reports, National Hydrography Dataset status, and watershed delineation information.

Provided information on changing feature names in the National Hydrography Dataset.

Great Lakes Network

Reviewed draft documents, including annual work plan and diatom documents, and obtained outside review of certain documents to assist the network with planning for vital signs monitoring.

Provided dataset review and advice on formatting historical data for upload to STORET.

Greater Yellowstone Network

Old Faithful, Yellowstone National Park (John Lincoln Hallowell)

Reviewed an early copy of water portions of a regulatory water quality protocol and QA/QC standard operating procedures. Reviewed entire draft Phase 3 report.

Provided advice and recommendations on the handling of USGS collected water quality data by networks and the integration of the National Hydrography Dataset with STORET.

Provided advice and recommendations on the use and integration of NPSTORET into the network water quality monitoring program.

Gulf Coast Network

Provided programmatic oversight of CESU task agreement for the completion of coastal watershed condition assessments for NPS units, including Gulf Islands National Seashore.

Provided feedback on choosing a cooperator to develop the network's WQ monitoring plan and the need to follow vital signs and WRD guidance documents in developing the plan.

Reviewed network RFP for developing their water quality monitoring plan.

Heartland Network

Reviewed draft Phase 3 water quality monitoring plan and related documents and assisted with planning for vital signs monitoring and with multiple technical issues.

Klamath Network

Initiated a CESU task agreement for coastal watershed condition assessments for coastal NPS units of the network, including Redwood National and State Parks.

Provided assistance for the initiation of a Level 1 Water Quality Inventory.

Advised network staff on strategies for assuring data comparability by using standard EPA marine monitoring protocols used by all coastal states.

Provided technical support on servicewide I&M water related inventories and scoped the availability of data for Oregon Caves National Monument and its suitability for a Level 1 inventory.

Provided background information on data loaded in STORET for network parks.

Provided information on sources of marine data.

Mediterranean Coast Network

Reviewed draft Phase 3 monitoring plan, FY 2004 administrative report, FY 2005 annual work plan, and related documents and suggested approaches for improvements. Reviewed conceptual models and suggested improvements.

Provided advice and background information on water quality datasets that have been compiled by WRD to support the network's Phase 1 analysis and report.

National Capital Region Network

Provided advice and recommendations on the use and integration of NPSTORET into the network water quality monitoring program.

North Coast and Cascades Network

Initiated a CESU task agreement for coastal watershed condition assessments for coastal units, including Olympic National Park, Lewis & Clark National Historical Park, Ebey's Landing National Historical Reserve, and San Juan Island National Historical Park.

Reviewed annual administrative report and workplan and Phase 1 report.

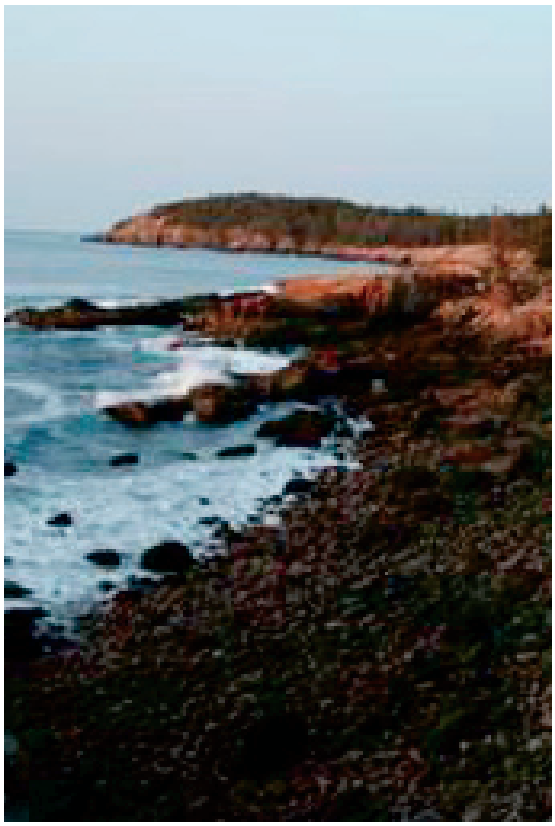
Attended network meeting in Olympia, WA, to scope aquatic resource vital signs monitoring program.

Northeast Coastal and Barrier Network

Reviewed Phase 3 draft report and water quality protocols and provided suggestions for improvements.

Northeast Temperate Network

Provided a summary and assessment of historical water quality monitoring programs conducted by the Massachusetts Water Resources Authority within the vicinity of Boston Harbor.



Otter Cliffs, Acadia National Park (Robert Baker)

Provided review and comment on Phase 1 report, annual administrative report, and work plan.

Northern Colorado Plateau Network

Provided review and comment on the network's Phase 2 report and the annual report and work plan.

Reviewed elements of contract proposal between the network and the USGS WRD Grand Junction office for Phase 3 vital signs activities.

Provided National Hydrography Datatset status update for network subbasins and information about digital park boundaries.

Northern Great Plains Network

Provided digital water quality data, station locations, and Adobe Acrobat PDF versions of the Baseline Water Quality Data Inventory and Analysis Reports.

Pacific Island Network

Initiated assessments of coastal water resources and watershed conditions for seven parks. Selected Investigator (University of Hawaii - Manoa) and planned assessment with park staffs, the network, and the investigator.

Reviewed various water quality technical documents and helped with technical assistance requests.

Provided digital water quality datasets for several parks prior to upload into STORET to support the network's Phase 1 analysis and report.

Provided digital GIS files from the Baseline Water Quality Data Inventory and Analysis Reports.

Rocky Mountain Network

Served on the Hydrology Subcommittee and participated in the proposal review and selection of a Phase 1 cooperator to gather and evaluate historical water quality data.

Provided updated water quality downloads from modernized STORET, legacy STORET, and the USGS NWIS database in Access format to support the network's Phase 1 analysis and report.

Waterton Lake, Glacier National Park (Christopher Light)

Provided advice on the difficulties with reconciling legacy STORET and NWIS parameter codes with the new STORET's characteristic-based model.

Provided NHD status information for network parks.

San Francisco Bay Area Network

Initiated a CESU task agreement for coastal watershed condition assessments for network units, including Golden Gate National Recreation Area and Point Reyes National Seashore.

Golden Gate National Recreation Area (Robert Baker)

Provided advice and recommendations on the use and integration of NPSTORET into the network water quality monitoring program.

Provided a water quality data metadata checklist.

Reviewed draft Phase 3 monitoring plan, FY 2004 administrative report, FY 2005 annual work plan, and related documents and suggested approaches for improvements. Visited the area parks and provided numerous technical comments on network plans for upcoming work.

Sierra Nevada Network

Provided Baseline Water Quality Data Inventory and Analysis Report and data.

Sonoran Desert Network

Reviewed water quality proposals and related documents and provided information on

boron, power analyses, picking vital signs, and diel variability issues.

Southeast Alaska Network

Developed CESU task agreements for coastal watershed condition assessments for Glacier Bay National Park and Preserve, Wrangell-St. Elias National Park and Preserve, Sitka National Historical Park, and Klondike Gold Rush National Historical Park.

Southeast Coast Network

Provided programmatic oversight of CESU task agreements for the completion of coastal watershed condition assessments for Cape Lookout National Seashore, Cape Hatteras National Seashore, Cumberland Island National Seashore, Fort Pulaski National Monument, Timucuan Ecological and Historic Preserve, and Canaveral National Seashore.

Provided Baseline Water Quality Data Inventory and Analysis Report data for Timucuan Ecological and Historic Preserve.

Southern Colorado Plateau Network

Reviewed annual administrative report and workplan. Attended network workshop in Farmington, NM.

Provided NHD status update for network subbasins and information about digital park boundaries.

Provided assistance with the initiation of a Level 1 Water Quality Inventory.

Southwest Alaska Network

Reviewed annual administrative report and workplan.

Provided advice and recommendations on the use and integration of NPSTORET into the network water quality monitoring program.

TECHNICAL ASSISTANCE REGIONS AND PARKS

ALASKA REGION

Provided fiscal and technical management for the WRD funded project *Characterize Water Quality, Hydrology and Aquatic Biology in the Kijik River Basin.*

Wildlife Biologist Jim Lawler processes water samples collected from lakes impacted by severe burns in 2004. Gates of the Arctic National Park and Preserve. (Amy Larsen)

Cape Krusenstern National Monument

Assisted in the review of metals contamination and provided input on diel variability of metals in the water column.

Denali National Park and Preserve

Coordinated funding of a project to assess the hydrology along a state-proposed road corridor through a remote portion of the park. Reviewed study plans and made suggestions to prioritize project goals.

Reviewed a floodplain statement of findings for the Toklat Rest Area.

Reviewed and approved a wetland statement of findings for the park's *Gravel Acquisition Plan.*

Provided programmatic oversight for the initiation of the *Denali National Park Water Resources Management Plan.*

Glacier Bay National Park and Preserve

Reviewed floodplain statement of findings for *Dry Bay Facility Improvements*.

Provided technical review and comment relating to the draft *Project Agreement: Environmental Assessment for Alsek River Management Plan Revision, Glacier Bay National Park and Preserve*.

Worked with park to complete Project Implementation Plans for NRPP and WRD funded studies in the East Alsek River concerning changes occurring in the river hydrology and geomorphology and its effects on sockeye salmon productivity.

Worked with park staff to develop a White Paper entitled *Park Resource Loss Associated with Implementation of the Falls Creek Project (FERC No. 11659)*.

Provided technical review and publication assistance in the completion of a WRD sponsored project report entitled *An Evaluation of Chinook Salmon Freshwater Habitat Use in Glacier Bay National Park*, Technical Report NPS/NRWRD/NRTR-2004/231.

Katmai National Park and Preserve

Provided programmatic oversight, review, and comments for draft *Katmai National Park and Preserves Water Resources Management Plan*.

Kenai Fords National Park

Reviewed floodplain statement of findings for *Maintenance Facility Expansion Project*.

Provided water related policy review and technical advice relating to draft *Exit Glacier Area Plan for Visitor Experience and Resource Protection/GMP Amendment and EIS*.

Klondike Gold Rush National Historical Park

Provided a data report on the results of a channel survey of the Taiya River, detailing a map with 12 cross-sections using AutoCad, for proposed engineered log jams to stabilize the river banks adjacent to the historic Dyea townsite.

Provided programmatic oversight and technical review and evaluation of the design assumptions and construction drawings for the restoration of Nelson Slough.

Lake Clark National Park and Preserve

Provided initial brief review and comment on a draft environmental baseline studies proposal to establish baseline conditions preceding possible development of a copper-gold-molybdenum open pit mine near the park.

Lake trout captured during resident fish study, Lake Clark National Park & Preserve, 2004. (Dan Young)

Sitka National Historical Park

Provided assistance for an appraisal of appropriative water rights on the Indian River.

Provided partial funding to support the USGS stream gage on Indian River.

Provided comments on the Indian River Master Plan.

Wrangell-St. Elias National Park and Preserve

Reviewed and approved a wetland statement of findings for the *Relocation of Seasonal Bunkhouse and Overnight Quarters from Slana Ranger Station*.

Provided technical advice and comment on the *Wrangell-St. Elias National Park and Preserve (WRST) Project Agreement for the Kennecott Facilities Support Plan/GMP Amendment EA*.

Provided programmatic oversight for the project entitled *Investigate Limnological Conditions in Tanada Lake Affecting Sockeye Salmon Production*.

Provided water quality data retrievals and information to park personnel.

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

Provided review and consultation on the analysis of alternatives for redisposition of the Nebesna Mine tailings.

Provided advice on the options available to address stream stability issues for National Creek as it flows through the Kennicott Historic District.

INTERMOUNTAIN REGION

Provided water related policy review and comment on the draft Old Spanish Trail Special Resource Study project agreement.

Attended meeting of Intermountain Region staff, selected park staff, and the Colorado Division of Wildlife concerning NPS and state fisheries management activities within Colorado national park units. Discussed stocking issues, regulation, management authorities, and NPS regulations, policies and guidelines.

Green River, in Lodore Canyon, Dinosaur National Monument (John Wullschleger)

Provided technical assistance to the Intermountain Region in matters related to the Upper Colorado River Endangered Fish Recovery Program.

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

Represented the NPS at a meeting of the Colorado River Cutthroat Conservation Team in Craig, CO.

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

Provided assistance to the Office of the Solicitor regarding a request of the State of Colorado to pay fees associated with NPS decreed water rights.

Provided comments to Department of Justice for the subflow technical report and hearing in Arizona.

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

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.

Amistad National Recreation Area

Provided policy and technical review of the final draft *Bi-national Fisheries Management Plan*.

Arches National Park / Canyonlands National Park

Continued to represent NPS stakeholder interests in the review of documents related to the Moab Mill.

Served on the Moab Mill Site Ground Water Subcommittee and in stakeholder workgroups.

Arches National Park

Developed Core Provisions for settlement of reserved water rights and presented them to the Utah State Engineer.

Reviewed and responded to comments from the Utah School and Institutional Trust Lands Administration to the Core Provisions for settlement of reserved water rights.

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

Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six EPA databases.

Aztec Ruins National Monument

Reviewed and provided comments for a draft EIS describing procedures and predicting effects of a coal bed methane production in the Northern San Juan Basin, CO.

Delineated Animas River floodplain within the park and advised on an eroding bank, two proposed trails, and a proposed footbridge.

Bandelier National Monument

Participated in a 1-day workshop that reviewed the park's *Ecosystem Restoration Plan*.

Bent's Old Fort National Historic Site

Reviewed and evaluated wetland and hydrology affecting the park, including fort foundation flooding issues and the proposed restoration of wetlands in the river floodplain.

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

Big Bend National Park

Provided assistance with alternative water sources, hydrogeologic conditions, and test well drilling at Rio Grande Village.

Strawberry Cactus, Cattail Falls, Big Bend National Park (Bill Kettler)

Reviewed the proposal *Re-establish Native Riparian Vegetation in Suitable Rio Grande Habitats* and provided technical advice regarding implementation.

Conducted technical research and provided guidance regarding rehabilitation/ reconstruction of an artificial pond holding endangered mosquito fish.

Evaluated the restoration of a wetland and drainage system adjacent to one of the largest campgrounds.

Conducted wetlands restoration feasibility assessment of a disturbed area.

Big Hole National Battlefield

Monitored flow on the North Fork Big Hole River to protect park water rights.

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

Big Thicket National Preserve

Reviewed Texas law concerning instream uses based upon riparian rights.

Provided policy review and comment on the Impacts on Wetlands Section of the *Washington Office Policy Review Draft: Oil and Gas Management Plan, Draft Environmental Impact Statement*.

Reviewed and updated WRD's Appendix G guideline for *Detection and Quantification of Contamination at Oil and Gas Operations* for insertion into the park's EIS.

Provided assistance in study design to quantify stage discharge relationships on the Neches River.

Reviewed a floodplain statement of findings for an oil/gas well site.

Researched permit requirements for water well drilled in conjunction with oil/gas exploration on park land.

Reviewed status of water rights and a proposal to construct an upstream dam.

Reviewed and commented on research proposal evaluating the effects of flow changes on bottomland hardwoods on the Neches River.

Provided assistance in study design to quantify stage discharge relationships on the Neches River.

Bighorn Canyon National Recreation Area

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

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 Environmental Impact Statement.

Assisted park, region, and Deputy Director with negotiations on federal reserved water rights.

Assembled and authenticated disclosure index for all documents, analyses, and correspondence developed in preparation for water rights litigation.

Participated in the Aspinall Unit Operations meetings to protect park resources and water rights.

Provided testimony, in coordination with the DOI and the State of Colorado, for the development and filing of a state-based

instream flow claim for the Gunnison River within the park.

Bryce Canyon National Park

Provided technical assistance to park staff and city managers regarding flood protection works and erosion threats to municipal water supplies for the town of Tropic, UT, in and/or adjacent to park boundaries.

Bryce Canyon National Park (Christopher Light)

Canyon de Chelly National Monument

Traveled to the park as part of an NRPC technical assistance team that evaluated the condition of stream channel and riparian resources in the monument's major canyons. The team's report to the park included assessments of existing conditions and recommendations for management.

Worked with park/regional staff, the Lake Mead EPMT team, and Colorado State University cooperators to prepare a proposal to address removal of exotic shrubs (tamarisk and Russian olive), promote channel and floodplain recovery, and protect cultural resources.

Provided review and comments on the draft *Environmental Assessment for Tamarisk and Russian Olive Management at Canyon de Chelly National Monument*.

Participated in interdisciplinary team to assess watershed conditions and provide recommendations for improved management.

Canyonlands National Park

Canyonlands National Park (Robert Baker)

Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six EPA databases.

Provided policy review and comment on the draft *Environmental Impact Statement for the Lower Duchesne River Wetlands Mitigation Project*.

Capitol Reef National Park

Provided programmatic oversight and technical support in the completion of the *Capitol Reef National Park (Utah) Water Resources Management Plan*.

Evaluated erosion control plans by the Utah Department of Transportation along the Fremont River and assisted with the selection

of a site for borrow material for the repairs of a backcountry road.

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

Researched and field-checked locations of water rights acquired with the Sleeping Rainbow Ranch and made recommendations for their management.

Filed water right claim for a state appropriative right for the Pleasant Creek well at Sleeping Rainbow Ranch.

Planned and completed an aquifer test for the Pleasant Creek well at Sleeping Rainbow Ranch.

Reviewed construction and testing of a new well at Sleeping Rainbow Ranch.

Carlsbad Caverns National Park

Carlsbad Caverns National Park (John Lincoln Hallowell)

Initiated preparation of project plan to participate in Pecos River adjudication and protect the water and water-related resources of Lechuguilla Cave.

Provided recommendations for monitoring spring discharge and restoring natural flow at Rattlesnake Springs.

Funded second year of discharge monitoring at Rattlesnake Springs for the purpose of protecting park resources and water rights.

Continued oversight for stage gages in Sulphur Springs and Lake of the White Roses in Lechugilla Cave for protection of water rights.

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.

Reviewed and provided comments for a draft EIS describing procedures and predicting effects of a coal bed methane production in the Northern San Juan Basin, CO.

Chickasaw National Recreation Area

Provided policy review and technical comment on the draft *Chickasaw National Recreation Area General Management Plan*.

Performed flood hazard assessment of existing nature center and provided recommendations for hazard mitigation.

Provided recommendations for monitoring and stabilization of historic check dam structures.

Performed floodplain assessment for campgrounds and water treatment facility.

Researched NPS water rights.

Testified on potential impacts to park resources at Oklahoma Water Resource Board (OWRB) administrative hearing on (Sparks) water right applications.

Assisted Office of the Solicitor in preparing response to OWRB ruling on the Sparks applications.

Provided oversight for monitoring water levels in two wells constructed in the Arbuckle-Simpson Aquifer.

Coordinated NPS technical studies with the Arbuckle-Simpson Aquifer study being conducted by the State of Oklahoma and the USGS.

Implemented study with the USGS to describe the underlying geologic structure of the park.

Colorado National Monument

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

Provided a policy review of a draft of the general management plan/environment impact statement.

Made recommendations to address flooding and debris flows near boundaries between park and private lands.

Coronado National Memorial

Received an Order and Partial Decree of Stipulated Water Rights in the San Pedro River Watershed from the Special Master to protect ground-water use at the park.

Curecanti National Recreation Area

Compiled water well records and provided hydrogeologic assessment of several developed areas in the park.

Provided fiscal and technical management for the WRD Funded Project entitled *Data Collection and Analysis of Required Water Quality Parameters; Outstanding Waters Designation*.

Devils Tower National Monument

Devils Tower National Monument (Robert Baker)

Delineated on the ground the previously modeled floodplain.

Advised park on road salt alternatives.

Dinosaur National Monument

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

Provided technical input and review to the region on the *Yampa Management Plan*, *Environmental Assessment, and Programmatic Biological Opinion*.

Provided programmatic oversight and technical review of the implementation plan for the BRMD funded study of interactions between native and non-native fishes in the Yampa River.

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

Investigated legal needs regarding re-initiation of well use at Deer Lodge Park Campground.

Issued a Baseline Water Quality Data

Inventory and Analysis Report documenting water quality data retrievals from six EPA databases.

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.

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.

Provided assessment of hydrogeologic conditions and potential for ground water seepage to affect historic inscriptions.

Florissant Fossil Beds National Monument

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

Filed a diligence claim and received a ruling and decree granting the park an extension of time to prove beneficial use for the Sawmill Trail Well for the proposed visitor center.

Submitted a request to change the point of diversion of the A-Frame well to Department of Justice, which was then sent to the state, received a ruling and decree from the state accepting the change.

Prepared a summary of existing water rights. Conducted briefing of Chief of Maintenance and Acting Superintendent on the adequacy of park rights to serve planned visitor center.

Fort Bowie National Historic Site

As part of an interdivisional team, evaluated and suggested alternatives to restore an old dam spillway and an abandoned road crossing. Surveyed wells and springs.

Fort Laramie National Historic Site

Provided hydrogeologic assessment and recommendations for construction of a new water supply well.

Gila Cliff Dwellings National Monument

Provided hydrogeologic assessment and information on water well construction.

Glacier National Park

Canoe on Lake McDonald, Glacier National Park (David Restivo)

Provided information regarding existing wells and hydrogeologic conditions at Two Medicine.

Provided technical assistance related discharge of water from sewage lagoons at Many Glacier.

Provided programmatic oversight and technical support for the NRPP funded Lake McDonald fish and limnological studies.

Traveled to the park to meet with University of Montana, USFWS, and park staff to plan future bull trout evaluation and restoration work on the western side of the park.

Evaluated a potential site at Upper Quartz Lake to construct a fish barrier to prevent further invasion of lake trout into the Quartz Lakes drainage.

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

Provided consultation regarding flood hazards at various locations.

Provided technical recommendations on Apgar Area well issue (Belton Mercantile application) and coordinated with state and applicant's consultant.

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

Glen Canyon National Recreation Area

Researched water rights and historical use at Hite Marina in support of a plan to refurbish an existing well.

Provided hydrogeologic assessment and information on water supply wells at Hite Marina.

With the USGS, completed a final plan to monitor the water quality impacts of personal watercraft.

Participated in WRD funded project to monitor the effects of personal watercraft in recreational reservoirs.

Attended meeting of Lake Powell's Technical Advisory Committee for monitoring recreational beaches in the park.

Grand Canyon National Park

Participated in settlement discussions and status conferences for the Little Colorado River (LCR) Adjudication.

Evaluated potential effects of developing regional water supplies on South Rim springs.

Hopi Point, Grand Canyon National Park (P. J. Mansfield)

Provided park staff with technical review comments on draft ecological risk assessment work plan for Operable Unit 1, Upper Mine Area, Orphan Mine site. Obtained outside expert help for human health risk assessment.

Assisted park with a spring monitoring program on the South Rim.

Provided funding to USGS to map the geology for the Cameron and Valle Quadrangles.

Assisted Office of the Solicitor and Department of Justice in reviewing a general agreement with non-industrial water users in the LCR Adjudication.

Provided guidance for NPS participation on the North Central Arizona Water Supply Technical Committee and the Water Advisory Council.

Grand Teton National Park

Researched requirements for maintaining irrigation ditches and assessed a water right application and enlargement request on Deland Ditch (Snake River).

Traveled to park and met with staff to discuss bank stabilization project along Snake River at Moose and other recent activities undertaken by the park hydrologist.

Provided technical assistance for construction and testing of a water supply well at White Grass Ranch.

Reviewed water use within park boundary and evaluated lease and deed documents between the park and the Teton Valley Ranch.

Mount Moran, Grand Teton National Park (Robert Baker)

Provided logistical support to inventory water use locations and develop GIS-based data to assist management of park water use and water rights.

Grand Teton National Park/ John D. Rockefeller, Jr., Memorial Parkway

Analyzed post-reclamation hydrologic monitoring data from the former Snake River Gravel Mine site.

Developed design specifications and provided onsite supervision of supplemental grading at the Snake River Gravel Mine reclamation site.

Supervised native wetland plant seed collection, storage, and transportation to a contracted nursery for the revegetation work at the Snake River Gravel Pit planned for Summer 2005.

Assisted in addressing the problem of a non-native sedge species that was planted by a contractor as part of the Snake River Gravel Mine reclamation project.

Attended a meeting with University of Wyoming, park staff, state fish and game representatives, and Bureau of Reclamation staff concerning impacts of the unusually large lake level draw downs that are occurring due to several years of drought and studies that should be conducted in conjunction with these draw downs.

Grant-Kohrs Ranch National Historic Site

Advised on potential issues related to arsenic mobilization versus phosphate levels and NPS policy at other locations considering reuse of treated sewage.

Great Sand Dunes National Park and Preserve

Provided policy review and comment on a native cutthroat trout restoration project NRPP proposal for Sand Creek.

Discussed options with park natural resources management staff and The Nature Conservancy for updating the water resources management plan.

Great Sand Dunes National Park & Preserve (Jim Harte)

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

Assisted park, region, and Office of the Solicitor with review of documents and proposals to acquire Baca Ranch.

Initiated well inventories, database

development, and the creation of a ground water model to support an anticipated claim for in-place ground water use.

Completed seepage runs on Deadman, Sand, Big Spring, and Little Spring Creeks and prepared draft report.

Guadalupe Mountains National Park

Advised on the potential for impacts to park resources from ground water withdrawals in the Dell City area.

Provided consultation and examination of a fish specimen (photo) that was captured in one of the uppermost pools on the south fork of McKittrick Creek following large flood events in Spring 2004.

(NPS Photo)

Hovenweep National Monument

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

Assisted with development of a spring monitoring program and conducted field trip to measure park springs.

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

Hubbell Trading Post National Historic Site

Participated in settlement discussions and status conferences for the LCR Adjudication.

Assisted Office of the Solicitor and Department of Justice in reviewing a general agreement with non-industrial water users in the LCR Adjudication.

Lake Meredith National Recreation Area

Advised park staff regarding wetland compliance requirements related to proposed construction of a public access boat ramp and a proposal to lay a pipeline along the lakeshore.

Reviewed floodplain statement of findings for *Plan of Operations for Continued Operations of Two Gas Wells, Associated Pipelines, and Access Road*.

Researched water well records.

Little Bighorn Battlefield National Monument

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

Submitted 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.

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

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

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

Reviewed and provided comments for a draft EIS describing procedures and predicting effects of a coal bed methane production in

the Northern San Juan Basin, CO.

Provided background and metadata on digital GIS data included in Baseline Water Quality Data Inventory and Analysis Report.

Montezuma Castle National Monument

The Castle, Montezuma Castle National Monument (Margaret Carfioli)

Conducted two seepage runs on Beaver Creek and completed a report.

Provided oversight for park operation of a stream gage at Montezuma Well.

Provided funding for the installation of a USGS stream gage on Beaver Creek at the Castle Unit.

Installed a flume on the Montezuma Well irrigation ditch to estimate water delivery to downstream water rights holders.

Compiled database of statements of claimant filed for Verde River Adjudication, active surface water filings, and well registrations.

Continued investigation to determine vulnerability of park water resources to groundwater withdrawals in the region.

Initiated and funded geophysical investigation to determine source of water issuing from Montezuma Well.

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

Organ Pipe Cactus National Monument

Described existing conditions and made recommendations for repair/rehab of the water supply wells at the headquarters area.

Padre Island National Seashore

Continued to support park in its efforts to clean up historic oil and gas production and produced water sites.

Reviewed responsible party work plan for the proposed cleanup of the Six Pigs facility (Mustang Island) and provided comments to a letter documenting closeout of Chevron's former shorebase facility.

Provided policy and technical review of the draft *Assessment of Coastal Water Resources & Watershed Conditions in Padre Island National Seashore Phase I Report*.

Provided policy review and comments on the *Final Environmental Impact Statement: Gulf Intracoastal Waterway Laguna Madre Maintenance Dredging Project*.

Provided wetlands policy review and comment on a briefing paper pertaining to the Gulf Intracoastal Waterway Laguna Madre maintenance project prepared for the NPS Intermountain Regional Director.

Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six EPA databases.

Reviewed three floodplain statements of findings for *Bird Island Basin Recreational Use Plan, BNP Petroleum Corporation Dunn-Peach #1 Well, and Dunn-Peach #2, 3, 4, 5 and 6 Wells*.

Palo Alto Battlefield National Historic Site

Met with USGS BRD National Wetlands Research Center staff to review final products for the WRD funded project *Restore Resaca Wetlands and Associated Habitats – Phase I: Historic Aerial Photo Analysis and Mapping.*

Parashant National Monument

Conducted assessment of water supply alternatives at Shivwits Fire Camp.

Pecos National Historical Park

The 18th Century Mission Ruins, Pecos National Historical Park (Christopher Light)

Evaluated success of the Glorieta Creek wetland and riparian restoration, which was completed in 2000. Provided a report that documented excellent progress in establishment of native wetland and riparian communities and included minor follow-up treatment recommendations.

Reviewed plan for repair/rehabilitation of water supply well.

Petrified Forest National Park

Participated in settlement discussions and status conferences for the LCR Adjudication.

Completed a final report on hydrogeology, ground water resources, and well construction at the park.

Assisted Office of the Solicitor and Department of Justice in reviewing a general agreement with non-industrial water users in the LCR Adjudication.

Pipe Spring National Momument

Investigated hydrogeology and causes of springflow reduction.

Consulted with park management on a USGS geological investigation.

Rocky Mountain National Park

Coordinated with the Hach Company and park staff to establish a beta test site for a new telemetry system. A fully operational water quality and water quantity monitoring station was developed in conjunction with the telemetry beta test.

Coordinated funding and volunteers from the Big Thompson Watershed Forum to do water quality sampling.

Provided technical assistance for the Glacier Creek Livery wetland restoration project.

Assisted with the design and grading plan for a wetland restoration at the Hidden Valley recreation area.

Provided a programmatic oversight and technical review of the final project report for a WRD project entitled *An evaluation of a potential barrier to the upstream movement of brook trout in Rocky Mountain National Park*, which was completed as a cooperative effort with the Department of Fishery and Wildlife Biology at Colorado State University.

Rocky Mountain National Park (NPS Photo)

Viewed potential artificial fish passage barrier sites on the North Fork of the Thompson River.

Provided programmatic oversight and study plan review for a cooperative student project on the cold water temperature effects on native cutthroat trout survival in high alpine streams.

Provided input and policy/technical review of the draft *Environmental assessment to restore greenback cutthroat trout (Oncorhynchus clarki stomias)* in park waters east of the Continental Divide.

Assisted in the assessment of geomorphic injury caused by the failure of the Grand River Ditch. Wrote a successful proposal submitted to the High Priority Project Fund for a LIDAR mapping project.

Assisted in the evaluation of the breach in the Grand River Ditch and with resource damage assessment claims from the resulting debris flow and sedimentation of downstream wetlands.

Provided information on interpreting foam on park waters, reviewed water quality data related to the Grand River Ditch failure, and reviewed QA/QC plans for water quality work.

Conducted testing and evaluation of a well at Hidden Valley and made recommendations for a new well at Moraine Park.

Evaluated alternative water sources for the Alpine Visitor Center.

Investigated Exchange Plan of St.Vrain and Left Hand Water Conservancy District to determine effect on park water rights.

Reviewed courthouse records to determine if Glacier Basin Campground well is supported by a water right.

Assisted in securing approval of plan for augmentation by exchange for Lily Lake.

Prepared petition for reinstatement of water use from a well.

Prepared conveyance documents to complete water rights exchange with Grand Lake Recreation District and prepared Notice of Transfer for filing with water court.

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

Saguaro National Park

Continued preparation of project plan for instream-flow water right application.

Reviewed floodplain statement of findings for *Sandario/Kinney Roads Intersection Improvements Project*.

Performed a longitudinal survey of the Madrona Pools.

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

Operated stream gages on Rincon Creek to support the instream-flow water right application.

Assessed legal status of non-NPS water right claims within the park.

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

Initiated and funded professional surveying of park boundaries and reference

monuments along Rincon Creek.

Filed statement of claimant for instream flow in Rincon Creek for the Upper Santa Cruz Basin Adjudication.

Assisted park in obtaining access on neighboring lands for data collection.

Sand Creek Massacre National Historic Site

Provided a field assessment and review of existing wetland and hydrologic conditions. Worked with park staff to identify baseline conditions and site restoration/preservation opportunities for wetland and riparian resources.

Conducted floodplain assessment and collected channel cross section data for hydraulic modeling.

Conducted analysis of potential for streamflow depletion from pumping ground water.

Southeast Utah Group

Provided national water quality screening criteria and advice.

Sunset Crater Volcano National Monument

Participated in settlement discussions and status conferences for the LCR Adjudication.

Assisted Office of the Solicitor and Department of Justice in reviewing a general agreement with non-industrial water users in the LCR Adjudication.

Timpanogos Cave National Monument

Finalized water rights settlement agreement with State of Utah for federal reserved and state appropriative water rights, including a ground water protection zone and instream flows on the American River.

Kayaker bumping down the American Fork River, Timpanogos Cave National Monument (Jon Jasper)

Coordinated review of water rights settlement agreement with the USFS.

Tumacácori National Historical Park

Conducted site reconnaissance with park staff and superintendent to discuss potential quantification of water rights to protect park resources.

Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six EPA databases.

Walnut Canyon National Monument

Participated in settlement discussions and status conferences for the LCR Adjudication.

Assisted Office of the Solicitor and Department of Justice in reviewing a general agreement with non-industrial water users in the LCR Adjudication.

Assisted with development of a Governmental Agreement and a Technical Advisory Charter to implement the water rights agreement between the U.S. and the City of Flagstaff.

Wind Cave National Park

Provided assessment of hydrogeologic conditions and potential for effluent from sewage lagoons to infiltrate cave resources.

Wupatki National Monument

Participated in settlement discussions and status conferences for the LCR Adjudication.

Assisted Office of the Solicitor and Department of Justice in reviewing a general agreement with non-industrial water users in the LCR Adjudication.

Yellowstone National Park

Advised park staff regarding applicability of Section 404 of the Clean Water Act to isolated wetlands in the park after recent changes in federal wetland regulations.

Worked with the USGS BRD Fish Health Research Lab to solicit a proposal concerning potential biological control of the Lake trout in Yellowstone Lake.

Discussed appropriate funding sources and strategies for funding a fishery management plan with park staff.

Mammoth Hot Springs, Yellowstone National Park (Christopher Light)

Evaluated water right applications to determine impacts on park water rights and submitted annual water use reports to the State of Montana as required by the NPS-Montana Water Rights Compact.

Provided technical advice related to the Gibbon Canyon road realignment project, including advice on restoration of a reach of the Gibbon River. Also inspected and advised on the road embankment erosion at confluence of Soda Butte Creek and the Lamar River.

Obtained funding from the Watershed Assessment Program for the monitoring well installations at a state of Montana proposed repository for the McLaren Tailings.

Continued to fulfill stakeholder representative responsibilities to review and comment on USFS work products generated for the New World Mine District cleanup and its Hydrogeology Technical Workgroup.

Provided review comments on proposed Soda Butte Creek water monitoring protocol.

Assisted USFS legal counsel with proposed water rights transfers from Royal Teton Ranch to the United States.

Evaluated proposed church pipeline and coordinated with USDA legal counsel.

Completed Phase III of a flume recalibration study on Reese Creek and calculated a revised rating table for the Reese Creek upper flume.

Coordinated water right transfer plan with Cooke City - Park County Water District consultant.

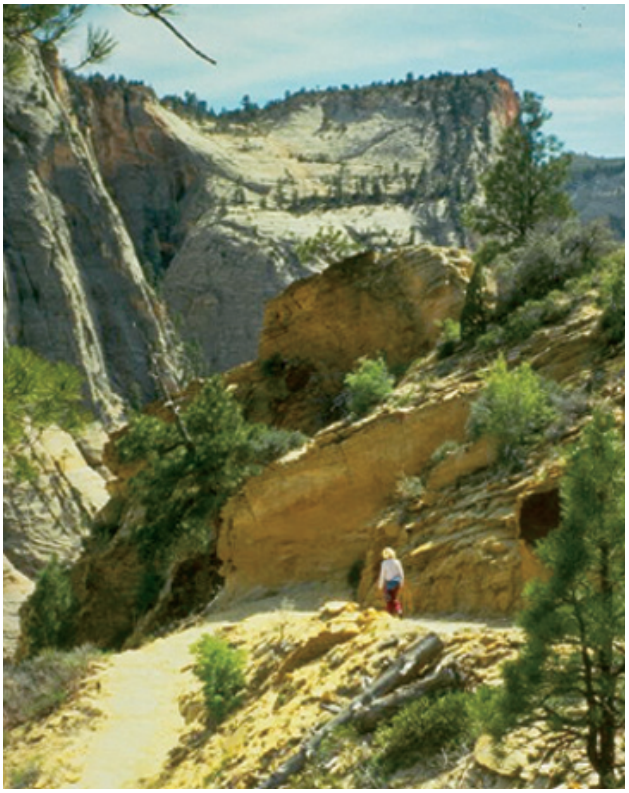
Evaluated water right applications to determine impacts on park water rights pursuant to the NPS-Montana Water Rights Compact.

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

Zion National Park

Assisted in preparing letter of concern to the Utah State Engineer (Lee application).

Advised park on technical issues related to proposed study entitled *Develop Standards and Indicators for Aquatic Invertebrates*.



Zion National Park (NPS Photo)

Evaluated park's agreement with the Town of Springdale and options for managing the park and town's water rights.

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

Transferred files to park that document the studies and data used to quantify state and federal reserved water rights.

Prepared draft ARCVIEW base map for ground-water/surface water report.

MIDWEST REGION

Provided technical advice for a Wild & Scenic Rivers Act Section 7A determination relating to a bank stabilization project proposed on the Little Miami Wild and Scenic River.

Agate Fossil Beds National Monument

Prepared draft report describing hydrogeology and water resources of the park.

Apostle Islands National Lakeshore

Advised park staff regarding wetland compliance requirements for management of borrow ditches.

Apostle Islands National Lakeshore (NPS Photo)

Badlands National Park

Provided a policy review of a draft general management plan/environmental impact statement.

Buffalo National River

Provided oversight and funding in support of hydrologic and biologic (fish assemblage and mussel inventory) studies on Bear Creek.

Buffalo National River (Sue Walter)

Provided programmatic oversight and policy/technical review leading to the completion of the *Buffalo National River Water Resources Management Plan*.

Provided programmatic oversight and review of the annual accomplishment report for the WRD funded project *Characterization of Macroinvertebrate Community and Drift in a Tributary of the Buffalo River, Prior to Damming.*

Reviewed proposal to develop protocol guidance for measuring flow and listed some methods used by USGS and by the Water Rights Branch.

Fulfilled annual report review and work plan approval responsibilities as WRD and NRPP Project Coordinator for NRPC funded project.

Provided assistance to the park for their participation on the Technical Group for the Bear Creek dam proposal.

Cuyahoga Valley National Park

Provided technical review and approval of the study plan for the project *Evaluate Hydrology in Wetlands to Develop Vital Signs*.

Provided technical review and comments on a draft *Degraded Wetland Restoration Plan*.

Provided review and comments on the draft *Combined Statement of Findings for E.O. 11988: Floodplain Management and E.O. 11990: Protection of Wetlands for Riverbank Management of the Cuyahoga River, Cuyahoga Valley National Park*.

Advised park staff regarding wetland compliance requirements for a proposal to renovate portions of the Erie and Ohio Canal and Towpath.

Conducted a 1-day Water Resources Scoping Workshop at the park as the precursor to developing a water resources scoping report.

Blue Hen Falls, Cuyahoga Valley National Park (Christopher Light)

Worked with park staff to refine the draft *Wetland Statement of Findings for the Riverbank Management of the Cuyahoga River*. Calculated the impacts to wetlands and identified the compensatory mitigation restoration necessary to achieve compliance with *Executive Order 11990* and *NPS Director's Order 77-1*.

Fort Union Trading Post National Historic Site

Consulted on issues related to the Missouri River–particularly on proposals to stabilize river banks.

Commented on a macroinvertebrate monitoring plan.

George Washington Carver National Monument

Provided preliminary guidance to initiate the restoration of a small reach of stream channel affected by poor stabilization.

Evaluated hydrologic conditions and dam stability of Williams Pond.

Assessed the potential causes of observed decrease in streamflow.

Conducted investigation of local ground water system with the purpose of assessing potential contamination to park springs.

Herbert Hoover National Historic Site

Consulted on a stream restoration plan for Hoover Creek and the associated NEPA process.

Homestead National Monument of America

Provided technical review and comment on a draft proposal entitled *Riparian Forest Water Source Assessment*.

Assisted with an evaluation of a footbridge over Cub Creek that is potentially threatened by erosion.

Indiana Dunes National Lakeshore

Little Calumet River, Indiana Dunes National Lakeshore (Park Archive)

Continued technical assistance involved with the CERCLA investigation of "The Pines Site," which is believed impacted by metals contamination of ground and surface water discharges from a flyash landfill.

Isle Royale National Park

Reviewed progress and technical documents for a WRD funded project entitled *Assess Hydrocarbon Threats to Park Waters*.

Provided programmatic oversight and technical support in the development of the draft *Isle Royale National Park Water Resources Management Plan*.

Provided technical and policy assistance to park and USFWS personnel working to complete the BRMD funded *Isle Royale Fishery Management Plan* and developed the draft desired future conditions section for the plan.

Knife River Indian Village National Historic Site

Advised park management on a proposal to partner with the Army Corps of Engineers (COE) to address erosion near an archeological site.

Missouri National Recreational River

Reviewed enabling legislation and assisted the park and region in the development of legal questions for review by the Office of the Solicitor.

Conducted a Water Resources Scoping Workshop at the park as part of the development of a water resources scoping report.

Provided technical training to the entire park staff and representatives from other agencies on the geomorphology of the Missouri River.

Provided a considerable effort in preparing a Sec. 7 determination on a proposal from the COE to construct emergent sandbar habitat within the park.

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

Conducted a field reconnaissance of water right and quantity issues on the Missouri River and provided recommendations to the park and region.

Ozark National Scenic Riverways

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

Provided advice related to a proposal to construct bank barbs to protect private property along the Current River.

Ozark National Scenic Riverways (NPS Photo)

Pictured Rocks National Lakeshore

Provided programmatic oversight and review of the completion report for the project *Evaluation of Seasonal Stream Usage and Inter-stream Migration by Coaster Brook Trout in Pictured Rocks National Lakeshore*.

Advised park and region staff on the stocking of coaster brook trout (*Salvelinus fontinalis*) in streams where there is evidence of natural reproduction.

Re-initiated discussions with park and region staff on the development of a water resources scoping report for the lakeshore.

Advised park regarding qualifications of a contractor to design a wetland wastewater treatment system.

Pipestone National Monument

Created a rainfall-runoff model for the Pipestone Creek watershed in order to assess the impact of proposed development on the peak flows and flood volumes.

Reviewed a floodplain statement of findings for the headquarters area.

Saint Croix National Scenic Riverway

Provided policy review and approval of a wetland statement of findings for a proposed electric transmission line river crossing.

Provided oversight for a WRD funded project entitled *Simulation of ground-water/surface water interaction in the St. Croix River Basin Wisconsin and Minnesota*.

Provided background information on the National Watershed Boundaries Dataset.

Reviewed progress report on the WRD funded project *Historical Trends in Phosphorus Loading to the St. Croix National Scenic Riverway from Permitted Point Source Discharges*.

Led small group pre-project peer review and quality control planning for project *Development of an Index for Mercury in Fish Tissues of St. Croix River Basin*.

Scotts Bluff National Monument

Obtained final copy of relinquishment documents to complete records and prepared documents for archiving.

Sleeping Bear Dunes National Lakeshore

Provided technical hydrology and water rights assistance related to Glen Lake/Crystal River water management issues (review of proposed winter flow release algorithms).

Theodore Roosevelt National Park

Conducted assessment of well at Juniper Campground and prepared documents for construction of a new well.

River Bend Overlook and the Little Missouri, Theodore Roosevelt National Park (Christopher Light)

Reviewed a preliminary proposal for a USGS instream flow study on the Little Missouri River.

Established accurate GPS locations for cross section headpins and collected GPS information for photo points.

Established and surveyed cross sections on the Little Missouri River to detect flood plain evolution and channel movement. Conducted progress review of USGS floodplain study.

Calculated flow statistics for the two USGS gages at the park boundaries and for estimating flow at the Watford City gage.

Participated in Vital Signs Program scoping meeting.

Voyageurs National Park

Provided programmatic oversight for completion of the draft *Voyageurs National Parks Water Resources Management Plan*.

Provided programmatic oversight and completed a review of the study implementation plans for a large, multidisciplinary study of the impacts of lake level management on park resources.

Reviewed progress reports and technical documents on two projects entitled *Document Changes in Reservoir Management on Mercury Accumulation in Fish and Other Components of the Aquatic Ecosystem of Voyageurs National Park* and *Impacts of Forest Fires on Levels of Mercury in Lake and Forest Environments*.

NATIONAL CAPITAL REGION

Provided comments on basic QA/QC requirements and reviewed progress reports on a study entitled *Baseline Water Resource Inventory to Support Aquatic and Watershed Management Activities in National Capital Region Parks*.

Provided fiscal and technical management for the NRPP funded project entitled *Assess Condition and Identify Stressors of Aquatic Resources in NCR*.

Conferred on the issue of the exotic snakehead fish (recently discovery within the Potomac River System). Made monitoring recommendations to detect eventual possible occurrence within Rock Creek and other NPS units.

Appalachian National Scenic Trail

Provided comments on a volunteer water quality monitoring program.

Reviewed, commented on, and provided material for inclusion in the water resources section of the park's new resource management plan.

Provided heavy metal water quality data from EPA STORET and USGS NWIS to the Environmental Quality Division to help generate a preliminary estimate of damages for the Palmerton-Zinc Superfund Site.

Chesapeake & Ohio Canal National Historical Park

Chesapeake & Ohio Canal National Historical Park (NPS Photo)

Provided review and comment on NPDES permits for the Washington Aqueduct.

Provided Baseline Water Quality Data Inventory and Analysis Report and data to support TMDL development in the District of Columbia.

George Washington Memorial Parkway

Provided programmatic oversight and technical support for the WRD funded study entitled *Potomac Gorge Wetland Inventory, Mapping and Description*.

Provided programmatic oversight and technical support for the NRPP funded study entitled *Should we Restore Dyke Marsh? – A Management Dilemma*.

Great Falls Park

Provided technical review and comment on a USGS proposal for the study of Potomac River shortnose sturgeon, including distribution of occurrence, habitat use, and spawning near Little Falls.

Great Falls Park (NPS Photo)

Harpers Ferry National Historical Park

Provided programmatic oversight and technical support for the WRD funded study entitled *Wetland Delineation for NEPA and regulatory compliance at Harpers Ferry National Historical Park*.

Manassas National Battlefield Park

Provided technical review and recommended wetland revegetation specifications for the NRPP funded project *Restoration of Disturbed Lands at Manassas National Battlefield Park*.

Provided a water related policy review of the draft *Manassas National Battlefield Park General Management Plan/Environmental Impact Statement*.

National Capitol Parks East

As the request of the region, responded to a citizen's association inquiry regarding how to organize and carry out a wetland clean-up project at Fort Foote.

Prince William Forest Park

Provided technical assistance in the analysis of multiple opportunities to implement a wetland mitigation banking program.

NORTHEAST REGION

Wetland, Valley Forge National Historical Park (Margaret Carfioli)

Provided policy review and technical comment on 2004 draft *PA – Special Resource Study/ Environmental Impact Statement for Coltsville - Hartford, CT.*

Allegheny Portage Railroad National Historic Site (John Charton – Kansas Geological Survey)

Provided water-related policy review and comment on the draft *Great Falls of the Passaic Historic District Special Resource Study.*

Acadia National Park

Briefed a consultant to the park regarding the applicability of *Director's Order 77-1: Wetland Protection* to the proposed removal of an abandoned lead-sealed water line.

Provided a policy review of the *Schoodic General Management Plan Amendment/ Environmental Impact Assessment.*

Continued to provide fisheries related policy advice and consultation relating to state and federal fishery issues pertaining to the park's "great ponds."

Determined flood frequencies in the Echo Lake Beach area.

Reviewed a proposal entitled *Abiotic Controls on the Trophic Status of Oligotrophic Water* and commented on statistical aspects and issues related to diel variability of many of the parameters of concern.

Provided oversight for a WRD funded project to determine wetland susceptibility to hydrologic stresses.

Assateague Island National Seashore

Provided programmatic oversight and technical review/comment for the study plan of a WRD funded project entitled *Evaluate Relationships between Water Quality, Seagrass Habitat and Fish Populations.*

Advised staff on wetland compliance requirements for twelve proposed maintenance projects.

Provided oversight for a region funded project to conduct surveys to characterize direct ground water discharge to the coastal bays.

Reviewed *Floodplain Statement of Findings for Facility Improvement for the Headquarters Complex.*

Boston Harbor Islands National Recreation Area

Presented a poster entitled *Water Resources Management Planning at Boston Harbor Islands National Recreation Area* at the Boston Harbor Islands Science Conference held at the Boston Museum of Science.

Cape Cod National Seashore

Provided assistance regarding potential impact of ground water withdrawals from wells at the North Truro Air Base.

Provided an assessment of hydrogeologic effects of proposed salt marsh restoration in Herring River.

Provided programmatic oversight and technical support for the WRD funded study entitled *Management of Dune Slack Wetlands*.

Colonial National Historical Park

Provided technical assistance in determining fishing pressure and harvest.

Assisted in review of a summary report on Site 12 Superfund contaminants analyses. Pointed out remaining issues on metals and PAHs. Provided advice on future monitoring of Ballard Creek for mercury and sulfate.

Reviewed and commented on the park's proposed *GIS, GPS, Spatial, Attribute, and Metadata Specifications*.

Reviewed and approved a wetland statement of findings for the project *Shoreline Management, Jamestown Island, VA*.

Provided technical review and evaluation of a proposed contracting services agreement for the delineation, surveying, mapping, and COE evaluation of wetland resources.

Provided technical review and comments on wetland delineation reports for proposed visitor services improvements at the Green Springs Historic Site.

Delaware Water Gap National Recreation Area

Advised park regarding requirements for the Columbia Gas Transmission Corporation Line 1278 Replacement Project to comply with *Director's Order 77-1: Wetland Protection*.

Provided technical review and comment on a study proposal for a native fish inventory.

Provided fiscal and technical management for the WRD funded projects *Regional Point Source Management to Support Special Protection Water Quality Regulations* and *Define Existing Water Quality for Development of Special Protection Waters Regulations*.

Reviewed final project report to develop a ground water monitoring plan.

Eisenhower National Historic Site

Reviewed the draft final report for the WRD funded study entitled *Effects of Municipal Water Supply System Operations on Aquatic Habitat in Marsh Creek, Gettysburg, Pennsylvania*.

Gateway National Recreational Area

Provided wetland policy review and technical evaluation of an environmental impact statement entitled *Raritan Bay and Sandy Hook Bay, Union Beach* for potential adverse impacts to the Jamaica Bay Unit from proposed dredging activity.

Evaluated the potential for adverse impacts to park aquatic resources by reviewing both the *Draft EA on Consolidated Implementation of the NY and NJ Harbor Deepening Project* and the *Limited Reevaluation Report and Environmental Assessment on Consolidated Implementation of the NY and NJ Harbor Deepening Project*.

Provided programmatic oversight and technical support for an NRPP funded study entitled *Investigation and Restoration of the Jamaica Bay Saltmarsh Ecosystem*.

George Washington Birthplace National Monument

Assisted regional staff in determining wetland compliance needs and in developing a scope of work for a wetland mapping

contract for the park's general management plan.

Hampton National Historic Site

Provided a policy review of the park's draft general management plan/environmental impact statement.

Morristown National Historical Park

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

New River Gorge National River

Provided a policy review of the project agreement for a general management plan/ environmental impact statement.

Assisted in developing a briefing statement outlining concerns pertaining to sewage treatment issues in the vicinity of Beckley, WV.

Richmond National Battlefield Park

Provided a summary of various comments from past years on contamination from Chesterfield County Landfill and made suggestions for future work.

Reviewed *Surface water Investigation Report for the Fort Darling Sanitary Landfill – DEQ Permit Number 150, September, 2002* in the context of various reviews in past years.

Reviewed report of volunteer monitoring of invertebrates in a creek below the landfill. Advised on the changes needed to make this kind of monitoring optimally useful to other parks.

Sagamore Hill National Historic Site

Provided policy review of a project agreement for a general management plan / environmental impact statement.

Saint-Gaudens National Historic Site

Provided policy and technical review and comment on the draft *Saint-Gaudens National Historic Site Water Resources Issues Overview and Assessment*.

Saint-Gaudens National Historic Site (Alan C. Ellsworth)

Shenandoah National Park

Completed and published the *Shenandoah National Park Water Resources Scoping Report*.

Provided comments on buffer zone requirements related to the use of water soluble pesticides such as Imidacloprid.

Provided programmatic oversight and technical support for an NRPP funded study entitled *Assess Hydrology for Sensitive Wetlands Systems at Big Meadows, Shenandoah National Park*.

Upper Delaware Scenic and Recreational River

Provided programmatic oversight and technical review and comment on the first draft of *Upper Delaware Scenic*

and Recreational River's NRPP Study Implementation Plan for a study of the endangered dwarf wedge mussels.

Provided review on proposed Silress application to concrete on a bridge.

Valley Forge National Historical Park

Issued a Baseline Water Quality Data Inventory and Analysis Report, documenting water quality data retrievals from six EPA databases.

Valley Forge National Historical Park (Alan C. Ellsworth)

PACIFIC WEST REGION

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

Provided assistance to the Office of the Solicitor of DOI's position to not pay the fees assessed by the State of California for NPS licensed rights. Notified California Parks.

Submitted Reports of Licensee and Progress Reports for California parks.

Worked with the Pacific West Region wetlands specialist in formulating a proposal to consolidate wetland delineation efforts for many small parks into one funding request.

Provided regional staff with advice and contacts on environmental issues related to the use of fire retardants.

Don't try this at home! At Mount Rainier, construction of emergency engineered log jam to reduce flood damage in a fish-friendly manner. (Paul Kennard)

Cabrillo National Monument

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

Helped summarize past data collected by the US Navy and others and plan vital signs aquatic monitoring.

Channel Islands National Park

Re-evaluated the condition of riparian-wetland areas after removal of livestock.

Identified alternative approaches to restoring to pre-settlement conditions the wetlands at Prisoners Harbor on Santa Cruz Island. Provided a multiple step process to begin achieving the objectives of the preferred alternative.

Participated in restoration design and data collection program to initiate a coastal wetland restoration project.

Provided assessment of hydrogeology and alternative water supply well locations on Santa Rosa Island.

Reviewed a floodplain statement of findings for the Scorpion Valley developed area.

City of Rocks National Reserve

Prepared for the Office of the Solicitor a draft amended quitclaim deed of water rights for property exchange with Idaho Department of Parks and Recreation and researched adjudication history of rights.

Created affidavits and assembled documents to deliver to the Department of Justice to submit to the Court in support of federal reserved water right claim for the park.

Received partial decree from the Court granting a federal reserved water right for five springs.

Crater Lake National Park

Prepared and commented on the appraisal report to value water rights held by Jacox Ranch and prepared recommendations for the park superintendent.

Provided water related policy review and consistency review and comment on the draft *Crater Lake National Park General Management Plan*.

Provided advice on relative hazards of various wood treatment products.

Crater Lake National Park (NPS Photo)

Reviewed the water quality data in the Crater Lake long-term Access database, compared these data to the Crater Lake Annual Limnological Reports issued from 1983-2002, and provided the discrepancies to the park.

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

Completed "Extension of Time" applications for Annie Creek and Sand Creek water rights.

Briefed the assistant regional director about the construction of a replacement well in the South Yard.

Craters of the Moon National Monument and Preserve

Assisted Office of the Solicitor and Department of Justice with an ongoing review of water right documents related to the Snake River Basin Adjudication.

Provided technical advice and comment on the draft *Craters of the Moon National Monument and Preserve Management Plan/EIS*.

Death Valley National Park

Evaluated Nevada water right applications for potential impacts to park resources and water rights. Filed protests when needed. Prepared a summary of water right permits and applications in Amargosa Desert hydrographic basin.

Participated in DOI Amargosa Coordination Meetings with California and Nevada DOI managers and presented NPS water right protection concerns in the Death Valley region.

Visited park immediately following the August 2004 flash flood in Furnace Creek Wash, staked high water marks, and made general observations. Returned in November to performed channel survey of Furnace Creek and Gower Gulch in the area of Zabrieski Point. Made additional field investigations to quantify flood magnitude and frequency.

Initiated discussions with Nye County, NV, to explore opportunities for collaboration and coordination on water rights issues.

Badwater's Lake, Death Valley National Park (Dan Ng)

Provided assistance in identifying alternative water supplies for Furnace Creek. Coordinated with the Denver Service Center, park staff, and environmental consultants on the water right and resource protection implications of the proposed Furnace Creek Water Supply Development project and recommended additional ground-water monitoring measures in the project.

Provided technical assistance to the park and the Water Rights Branch on matters related to Devils Hole, the Devils Hole pupfish (*Cyprinodon diabolis*), and the Devils Hole Pupfish Recovery Team.

Provided advice regarding the hydraulic effects associated with monitoring equipment in Devils Hole.

Developed methods to filter the Devils Hole water-level record for the effects of Earth tides and barometric pressure and produced a report documenting these methods.

Presented the following talks at the 2004 Devils Hole Workshop: *Death Valley National Park Regional Flow System Science and Management 2004 and Beyond…* and *Water-Level Changes at Devils Hole Associated with Barometric Pressure, Earth Tides and Earthquakes.*

Attended the American Geophysical Union Annual Fall Meeting in San Francisco and presented a poster entitled *Response of Water Levels in Devils Hole, Death Valley National Park, Nevada, to Atmospheric Loading, Earth Tides, and Earthquakes.*

Coordinated the preparation of a journal article entitled *Analytical-Regression Analysis of Stage Fluctuations in Devils Hole, Death Valley National Park, Nevada* by NPS consultants.

Investigated the effect of a low-permeability fault zone between Rockview Farms and Devils Hole, using numerical model techniques.

Prepared a revised monitoring plan and proposed settlement for Rockview Dairies, including recommendations for metering.

Coordinated the preparation of expert testimony by NPS's consultant at the Nevada State Engineer's hearing on Southern Nevada Water Authority applications in Three Lakes and Tikapoo Valleys and provided testimony at the hearing.

Evaluated adequacy of existing data and possible changes to the cooperative monitoring program with DOE to assist protection of park water rights.

Completed multi-year study of evapotranspiration at Grapevine Springs Area (final USGS report pending).

Attended the USGS Death Valley Regional Flow System Model Demonstration Workshop in Henderson, NV.

Provided expert hydrogeology oversight and assistance to the USGS Death Valley Regional Ground-water Flow Model Project.

Completed study of regional flow potential and ground-water contributions to Death Valley from California basins and cooperated with USGS to include study as an appendix in the final report on the Death Valley Regional Ground-water Flow Model.

Carpet of Desert Gold, Death Valley National Park (Dan Ng)

Provided oversight for park operation of stream discharge and water level monitoring gages at Devils Hole and Texas, Travertine, and Nevares Springs and compiled and processed data.

Assisted park with the development of a work plan for a water resources management plan. Devils Postpile National Monument.

Visited the monument to determine how to mitigate bank erosion threatening a well house.

Ebey's Landing National Historical Reserve

Initiated a cooperative effort with EASI which will lead to the joint development of a conceptual model for upland aquatic and nearshore marine environments.

Reviewed proposal for hydrologic restoration of prairie.

Eugene O'Neill National Historic Site

Advised park management on the alternatives for managing a nearby stagnant irrigation pond to improve the water quality and aesthetic values.

Golden Gate National Recreation Area

Reviewed and commented on proposed NMFS monitoring plan for Redwood Creek.

Provided technical assistance on watershed and landfill restoration proposals in the Presidio, surveying wells for a wetland restoration at Stinson Beach, and erosion reduction on roads and trails at Fort Cronkite.

Fort Point and Marin Headlands, Golden Gate National Recreation Area (Kristen Keteles)

Provided onsite assistance to Presidio Trust staff regarding potential reclamation of several disturbed sites (Nike Swale, Landfill 8, and Graded Area 9).

Assisted in planning a project to study pharmaceuticals and the active ingredients in personal care products (PPCPs) in runoff from irrigation of Crissy Field with treated sewage.

Found engineering experts to advise park on maximizing treatment of PPCPs in MBR sewage treatment plants. Advised park on nutrients, urban runoff, and diel variation issues.

Reviewed stormwater management plan. Toured Superfund sites at the Presidio and fish-kill concern areas at Rodeo Lagoon. Advised park on strategies for studying contaminants and nutrients in Rodeo Lagoon.

Reviewed California water law regarding the severance of riparian rights in support of Stinson Beach water right alternatives.

Determined water rights of record for Redwood Creek and Green Gulch watersheds and helped assess alternatives for water rights exchange in support of wetlands rehabilitation.

Researched legal alternatives to secure a water supply and protect park instream flow needs.

Reviewed deeds and California case law to determine whether water rights were conveyed to Zen Center by Wheelwright.

Provided technical review and comments on the draft report *Wetland Habitat Changes in the Rodeo Lagoon Watershed, Golden Gate National Recreation Area, CA*.

Investigated opportunities for restoring the former Willow Camp Lake at Stinson Beach.

Evaluated the potential for creating open water habitats for the benefit of the endangered San Francisco garter snake at Mori Point.

Provided final technical review and approval of the *Wetland Statement of Findings for the Marine Mammal Center Site and Facilities Improvement Project*.

Provided technical review of the *Eastkoot Creek Restoration Project Final Report*.

Great Basin National Park

Reviewed draft *Aquatic Inventory Field Manual*.

Evaluated Nevada water right applications for potential to impact park rights and resources.

Briefed two acting superintendents and new superintendent on park water rights issues and hydrologic studies being conducted by the USGS in support of water rights administration.

Evaluated potential impacts of an exploratory well developed by Baker Water and Sewer General Improvement District (BGID) for the Lehman Creek Residential Area adjacent to Lehman Caves and identified alternative water supply well sites in an effort to keep the well out of the carbonate aquifer thought to be associated with the caves.

Filed a protest to BGID's water right application, after BGID constructed their well in the carbonate aquifer.

Coordinated and facilitated a written letter report from USGS addressing the hydrologic effects of pumping from the various proposed alternative well designs for BGID's water-supply well.

Prepared a written hydrogeologic analysis and a water rights summary in response to a NEPA scoping request by USDA Rural Development, regarding the proposed BGID water-supply well.

Mixing antimycin into Johnson Lake, Great Basin National Park (Cole Neill)

Assisted park management in negotiations with BGID and USDA to resolve the NPS protest of BGID's water right application by trying to find consensus on water-supply alternatives.

Provided technical oversight of USGS hydrology study to determine susceptibility of park water resources to groundwater pumping adjacent to the park.

Reviewed proposals to settle the Garrett Family Trust water right issue.

Evaluated Nevada State Engineer's abstract of Baker/Lehman Creek system to determine amount of water adjudicated or otherwise permitted in Snake Valley hydrographic basin.

Provided programmatic oversight and a technical review of the completion report for the WRD funded project *Aquatic Survey and Condition Assessment of Great Basin National Park*.

Bonneville Cutthroat Trout, Great Basin National Park (Gretchen Baker)

Provided programmatic oversight and a technical review of the completion report for the NRPP funded project titled *Bonneville Cutthroat Trout Reintroduction*.

Hagerman Fossil Beds National Monument

Verified and responded to Preliminary Recommendations for water rights made by the Idaho Department of Water Resources.

Provided oversight for a WRD funded project to perform a large scale ground water tracer test.

Provided oversight for a WRD funded project on water quality impacts to the Snake River from landslides.

Provided guidance on QA/QC issues.

Haleakala National Park

Provided advice and review of a scope of work for a flood hazard warning system in the Kipahulu Stream area.

John Muir National Historic Site

Inspected a storm water drainage recently built by the county near Mount Wanda and the John Muir gravesite. Evaluated field methods used to collect geomorphic data of drainages for a watershed management plan.

Assisted with the collection of additional cross-section monitoring data evaluating the stability of John Muir's gravesite due to the concern regarding illegally placed rubble.

Kaloko-Honokohau National Historical Park

Researched state water law regarding native Hawaiian water rights.

Reviewed technical issues and helped plan monitoring efforts on a project to study nutrient sources and fluxes from polluted ground water into park ponds.

Advised park on contaminant and eutrophication issues, including when to filter nutrients, which nutrient species to monitor, and diel variation issues related to nitrates and chlorophyll.

Provided programmatic oversight and technical review on an NRPP funded algal removal project for the Kaloko Fishponds.

Lake Mead National Recreation Area

Monitored progress of chemical and isotopic composition study of ground water in the immediate region of Rogers and Blue Point Springs.

Continued USGS agreements to provide continuous monitoring of discharge at Rogers and Blue Point Springs and at Virgin River near Overton.

Worked with the USGS to complete the final plan to monitor the water quality impacts of personal watercraft.

Provided recommendations for rewriting sections of the *Lake Mead NRA Management Plan and Environmental Impact Statement*.

Continued to advise the park on the results of modeled predictions of the impacts of Las Vegas wastewater discharge alternatives being developed by the Clean Water Coalition Systems Conveyance and Operations Program.

Advised park on USGS findings related to endocrine impacts, the need to meet with dischargers to reduce impacts to endangered fish and other resources, and issues related to diel variability in nutrients and chlorophyll.

Drought results in a "bathtub ring," Lake Mead National Recreation Area (Bill Jackson)

Provided technical oversight of work by GeoTrans, Inc., to develop a numerical ground-water flow model of the Lower Colorado Flow System (LCFS).

Compiled summaries of all existing water rights and pending water right applications in Eldorado Valley adjacent to the park and in Cave Valley north of the park.
Prepared and submitted a written report to the Nevada State Engineer concerning the likely causes for the decline of water levels in the carbonate-rock aquifer, which is the source of springflows in the Muddy River Springs area and in the Overton Arm of Lake Mead.

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., through participation in Technical Review Panels and in accordance with Nevada State Engineer's Order 1169 and Ruling 5181.

LAME hot spring pools in Goldstrike Canyon (Tom Culhane)

Reviewed progress of SNWA aquifer-test plan, including rehabilitation of Pederson Spring (Moapa NWR) stream-gaging station, and coordinated study reviews with Nevada State Engineer and study participants.

Participated in a meeting with Nevada State Engineer and representatives from Lincoln

County, Vidler Water Company, and Virgin Valley Water District to review progress of monitoring plan to detect effects of groundwater pumping in Tule Desert basin.

Prepared comments on draft testimony of Assistant Secretary, Land and Minerals Management to House Subcommittee on H.R. 4593, Lincoln County Conservation, Recreation and Development Act.

Prepared briefings for superintendent, region director, Office of the Solicitor, and Assistant Secretary on NPS concerns for a proposed water rights settlement between Moapa Band of Paiutes and southern Nevada water developers.

Negotiated with Moapa Band of Paiutes to resolve concerns for the Tribe's proposed water rights settlement.

Prepared proposal to secure funds through the Southern Nevada Public Lands Management Act (SNPLMA) for a three-year project to develop a numerical ground-water flow model of the LCFS to predict future effects of groundwater pumping in the region on park water resources.

Presented to NPS, BLM, and USFWS executive managers a status report on water rights and science activities in the LCFS of southern Nevada.

Conducted a field reconnaissance trip of hot springs in the Black Canyon of the Colorado area (below Hoover Dam) and wrote a proposal for a study to assess the source of the springs.
Evaluated Nevada water right applications and filed protests as needed to protect park water rights and resources.

Completed a geologic map of the LCFS, which includes part of the park.

Seep in Lake Mead's Boy Scout Canyon (Tom Culhane)

Provided technical oversight of USGS project to conduct surface geophysical surveys and geologic cross-sections of the LCFS area.

Provided technical oversight of USGS hydrology study to quantify evapotranspiration in the LCFS area.

Lake Roosevelt National Recreation Area

Participated in interdisciplinary team to perform Proper Functioning Condition (PFC) assessments to provide input for grazing management plan.

Provided technical/policy review and comments on draft *Livestock Management Plan and Environmental Assessment*.

Advised on strategies and proper QA/QC for monitoring sediments and fish at a Superfund site.

Lassen Volcanic National Park

Continued assessment of Kings Creek and coordinated with USDA OGC recognition of water use on national forest land and right-of-way requirements.

Analyzed SUPs, advisements, and approvals granted by the USFS in the early 1900s pertaining to Lees' claims on Kings Creek.

Researched transfer of Indian allotment federal reserved water.

Provided programmatic oversight and technical review of a WRD funded project entitled *Restoration of Drakesbad Meadow*.

Lava Beds National Monument

Prepared draft report describing hydrogeologic conditions and assessing potential threats to ground water resources.

Manzanar National Historic Site

Evaluated conditions of drainage, past flooding, related erosion, and proposed treatments.

Coordinated an interagency exercise between the NPS and the NRCS to perform a watershed assessment to produce a flood management strategy.

Mojave National Preserve

Prepared information obtained from the California State Water Resources Control Board to create dockets. Contacted the Board regarding Notice of Ground Water Diversion.

Participated in development of a draft letter to Molycorp, explaining that their proposed plume delineation approach on park lands would not be acceptable to NPS. An alternative approach was provided to BLM and state regulators with justification for their review and concurrence.

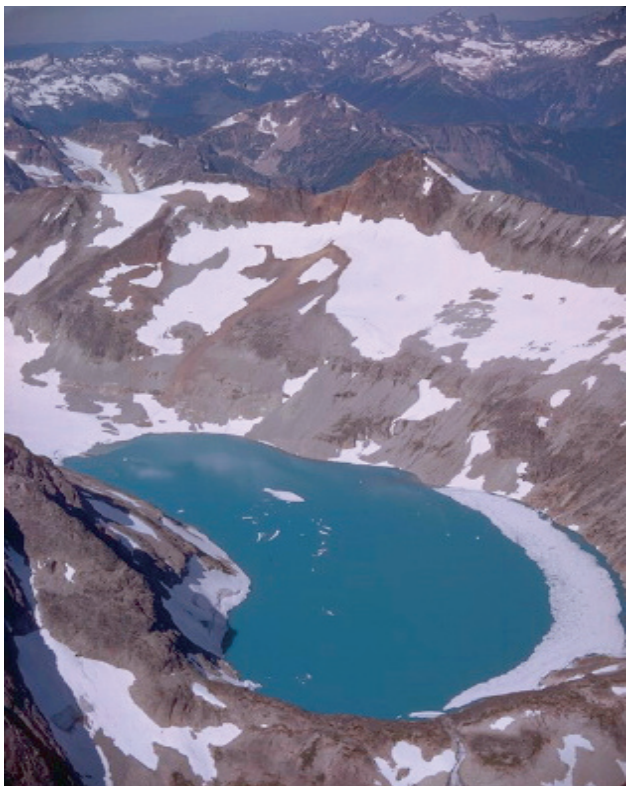
Mount Rainier National Park

Provided contaminants advice on scattering cremation ashes.

Nez Perce National Historical Park

Verified and responded to Preliminary Recommendations for water rights made by the Idaho Department of Water Resources.

North Cascades National Park



North Cascades National Park (NPS Photo)

Provided technical input on statistical and water quality issues and reviewed progress report on WRD funded project entitled *Development of Stream Benthic Macroinvertebrate Biomonitoring Protocols for North Cascades NPS Complex and Adjacent USFS Lands*.

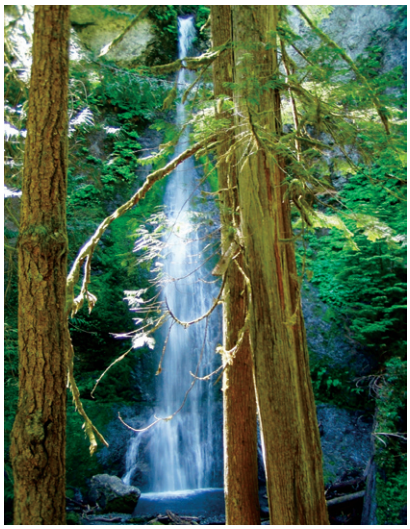
Advised on potential use of calcium lignosulfonate for dust control and road stabilization.

Provided advice and contacts on environmental issues related to the use of fire retardants.

Provided policy and technical assistance to Environmental Quality Division on high mountain lakes fish stocking issue and draft environmental impact statement.

Olympic National Park, Fort Clatsop National Memorial, San Juan Island National Historical Park, and Ebey's Landing National Historical Reserve

Provided programmatic oversight and technical review of the annual accomplishment for the NRPP funded project *Determine Migratory Pathways, Spawning Areas and Potential Sources of Threats to Bull Trout.*



Marymere Falls, Olympic National Park (Christopher Light)

Provided continuing assistance related to the proposed removal of two dams on the Elwha River, including traveling to Minneapolis twice to advise on the Lake Mills physical model constructed at the St. Anthony Falls Hydraulic Laboratory.

Provided hydrologic assistance to the park on the Hoh and Quinault River basins.

Review two floodplain statements of findings for *Elwha River Ecosystem Restoration and Removal of Elwha and Glines Canyon Dams and Associated Mitigation.*

Created contour maps of the Finley Creek area from LiDAR grids.

Served as WRD project coordinator for *Constructing a Sediment Source and Deposition History of Lake Ozette.*

Pacific Northwest Cooperative Ecosystems Studies Unit

Provided technical review and comment on the draft task agreement entitled *A Functional Assessment of Wetland/Riparian Communities in Crater Lake National Park, Lassen Volcanic National Park, and Oregon Caves National Monument.*

Pinnacles National Monument

Reviewed and amended assessment of conjunctive use. Evaluated with park staff instream flow needs, reservoir uses, and upstream development on Chalone Creek and Bear Gulch. Researched state water right records to assess risk to park resources.

Provided digital water quality datasets for the monument prior to uploading to STORET.

Point Reyes National Seashore

Prepared request for legal opinion on behalf of PWR on issue of whether NPS acquired a water right from Giacomini in purchase of 534 acre parcel.

Coordinated with California Fish & Game and park staff concerning viability of instream flow conversions under State Order 1707. Prepared applications and reviewed previous cases of water right conversion.

Proposed vital signs monitoring sites at the Giacomini Wetland Restoration Project Study Area.

Point Reyes National Seashore (NPS Photo)

Provided technical review and comments on the draft report *Giacomini Wetland Restoration Project, Long-Term Monitoring Program Part 1: Monitoring Framework*.

Provided detailed comments on nutrient monitoring and proposed plans for future water quality monitoring.

Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six EPA databases.

Reviewed progress on two WRD funded projects entitled *Enhanced Wetlands Mapping for Tomales Bay Watershed and Restoration of Horseshoe Pond to a Coastal Lagoon*.

Provided wetlands policy and technical review of a draft environmental assessment entitled *Restoration of Horseshoe Pond to a Coastal Lagoon/Tidal Estuary*. Recommended a strategy for completing regulatory compliance with *Executive Order 77-1: Wetland Protection*.

Provided programmatic oversight including the review of the completion report and Master of Science thesis for the project *Impacts of Commercial Oyster Farming on the Biota of Drakes Estero*.

Reviewed and approved the study plan for a project to develop a water resources management plan.

Redwood National and State Parks

Initiated assessments of coastal water resources and watershed conditions. Selected Investigator (Humboldt State University) and planned assessment with park staff and investigators.

Participated in a workshop on park coastal marine resources monitoring.

Provided final technical review and approval of *Wetland Statement of Findings for the Rehabilitation of Alder Camp Road Project*.

Redwood National and State Parks (Kristen Keteles)

San Juan Island National Historical Park

Provided information for existing wells and hydrogeologic conditions at American Camp.

Provided advice and good examples of conceptual models to be used in planning vital signs monitoring.

Continued legal framework assessment. Investigated requirements for state designation of the park as a utility.

Completed publication requested by the North Coast and Cascades Inventory and Monitoring Network entitled *A Conceptual Model of the Upland Aquatic & Nearshore Marine Habitats of San Juan Island National Historical Park (Washington)*, Technical Report NPS/NRWRD/NRTR-2004/318.

Sequoia and Kings Canyon National Parks

Provided review and comments on the draft *Environmental Assessment: Trail Bridge Construction at Upper Paradise Valley on the*

South Fork of the Kings River.

Conducted site visit to provide advice related to road rehabilitation project through Halstead Meadow. Also provided assessment of restoration potential for wetlands.

Participated in Sequoia/Kings Canyon National Parks' scoping workshop in November 2003, which was attended by 24 water professionals who identified water-related issues within the parks' watersheds.

Provided policy review and technical comment on draft *General Management Plan / Wild & Scenic River Management Plan for Kings River and North Fork of the Kern River/EIS.*

Whiskeytown-Shasta-Trinity National Recreation Area

Provided technical advice on various contaminants and monitoring issues for the Willow Creek monitoring project.

Advised park on strategies to minimize problems related to getting nutrient data below detection limits.

Reviewed several technical reports and issues related to a study trying to relate nutrient concentrations to salmon returns at Tanada Lake.

Yosemite National Park

Provided a review of past well drilling, made a hydrogeologic analysis, and made recommendations for alternative water supplies for the Yosemite Institute in the Crane Flat area.

Assisted in evaluating potential impacts of proposed ground water withdrawals on Crane Flat wetland habitats.

Compiled information on hydrogeology, test well drilling, and existing wells in the Yosemite Valley.

Yosemite National Park (Bill Jackson)

Facilitated a workshop held in the park for geomorphologists and fluvial restoration experts to identify restoration alternatives for the Merced River in the campground areas of Yosemite Valley.

Participated in Visitor Experience Resource Protection Workshop to help define erosion and water quality monitoring parameters and protocols for the Merced River Management Plan.

Advised park staff on the environmental effects of asphalt used to pave trails in wilderness areas.

Reviewed the draft task agreement for *Data Gathering for Ecological Restoration of Flooded Campgrounds, Yosemite Valley, Yosemite National Park, California* and advised park staff regarding implementation.

Reviewed and approved a revised *Wetland Statement of Findings for the East Yosemite Valley Utilities Improvement Plan.*

Reviewed and approved a revised *Wetland and Floodplain Statement of Findings for*

Redevelopment of the Yosemite Lodge Area.

Provided technical support and assistance to refine the draft *Wetland Statement of Findings for the Curry Village and East Yosemite Valley Campground Improvements Environmental Assessment*.

SOUTHEAST REGION

Provided water related policy review and comment on the draft *Corinth Civil War Special Resource Study*.

Provided water related policy review and comment on the draft *Vicksburg Campaign Special Resource Study*.

Provided policy review of a draft *Special Resource Study/Environmental Assessment for Miami Circle*.

Provided advice and copies of previous NPS correspondence in response to inquires from PETA concerning fishing in national park units.

Big South Fork National River and Recreation Area

Provided support in communicating water quantity concerns to the Office of Surface Mining on a proposed permit.

Provided support in responding to an Aquatic Alteration Permit Application to build an impoundment upstream of the park.

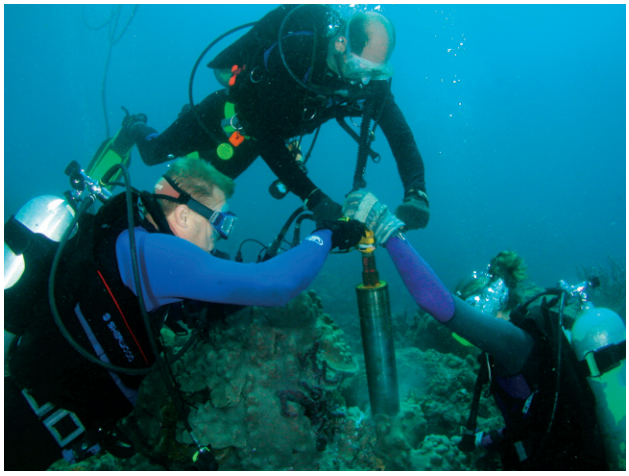
Biscayne National Park

Provided review and comment on the revised draft alternatives for the new general management plan.

Continued to assist with development of a fishery management plan.

Commented on landfill/ammonia issues and coral reef issues for project entitled *Development and Implementation of Water Flow Needs for Biscayne National Park Using Adjacent Coastal Wetland Indicators*.

Provided advice relative to diurnal changes in nutrients and chlorophyll.



Biscayne National Park (Soriano-Fields)

Provided water quality and project planning advice on salinity, glyphosphate, strontium, and diurnal variability of parameters of concern.

Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six EPA databases.

Worked with USGS algae experts to provide advice to the park on periphyton monitoring protocols of both EPA and USGS.

Blue Ridge Parkway

Assisted the park with Roanoke County's request for monitoring well installation on park lands and with follow-up technical review of landfill closure and monitoring documents.

Reviewed and approved the final wetland/floodplain statement of findings associated with a proposed land exchange between Blue Ridge Parkway, Great Smoky Mountains National Park, and the Eastern Band of the Cherokee Nation.

Blue Ridge Parkway (Robert Baker)

Cape Hatteras National Seashore

Participated on NPS working group to develop a policy statement and decision framework on beach nourishment to assist in minimizing impacts on natural shoreline processes.

Provided information for an environmental assessment to modify the network of drainage ditches in the vicinity of Cape Point Campground.

Provided comments for an environmental assessment for expansion of the Ocracoke Water Treatment Plant.

Worked with Incident Management Team to assess damages from Hurricane Isabel. Completed reports on flooding and drainage issues at Ramp 49 near Frisco and in the Cape Point Campground areas.

Cape Lookout National Seashore

Provided technical review, comment and publication assistance for the completion of *Assessment of Coastal Water Resources and Watershed Conditions at Cape Lookout National Seashore*, Technical Report NPS/NRWRD/NRTR-2004/322.

Chattahoochee River National Recreation Area

Assisted park with preparation of research needs to develop supporting data for ACF Allocation Formula Negotiations.

Reviewed floodplain statement of findings.

Completed formulation and review of needs and estimated costs for *Assessment of Instream Flow and Other Aquatic Resource Research Needs*.

Completed review and comments for the *ACF Unimpaired Flow Report January 1994-December 2001, Hydrologic and Biologic Monitoring Plan for the ACT River Basin* and *Middle Chattahoochee Project EA FERC #2177-053*.

Provided water related policy review and comment on the draft *Chattahoochee River National Recreation Area General Management Plan*.

Provided technical review and advice regarding opportunities for restoring wetlands and stream channels at Johnson Ferry.

Congaree National Park

Provided programmatic oversight and a technical review of the draft final report for the NRPP project *Species Diversity and Condition of the Fish Community of Congaree Swamp National Monument*.

Served as WRD project coordinator for *Assessing the Impact of Water Releases from the Saluda Dam During Peaking and Modified Run-of-river Operations on the Congaree National Park Floodplain - Hopkins, South Carolina*.

Fulfilled annual report review and work plan approval responsibilities as WRD and NRPP project coordinator for NRPC funded project.

Cumberland Island National Seashore

Provided policy and technical review and comment on the draft *Cumberland Island National Seashore Coastal Water Resources and Watershed Condition Assessment*.

Traveled to the park to analyze six old artesian wells and make recommendations for their capping, sealing, and abandonment.

Provided a background paper outlining the effects of feral horses on the functional values of park wetlands. WRD staff identified the adverse impacts from trampling, effluent input, and herbivory produced by the herd of 250 horses.

Investigated areas of leaking underground water pipes that pose a continuous threat to cultural features and provided recommendations for alleviating the problem.

Assessed the scope and feasibility of restoring several wetland areas that have been affected by construction of causeways and ditches.

Dry Tortugas National Park

Assisted in developing a marine resource management plan and monitoring of newly established Research Natural Area.

Everglades National Park

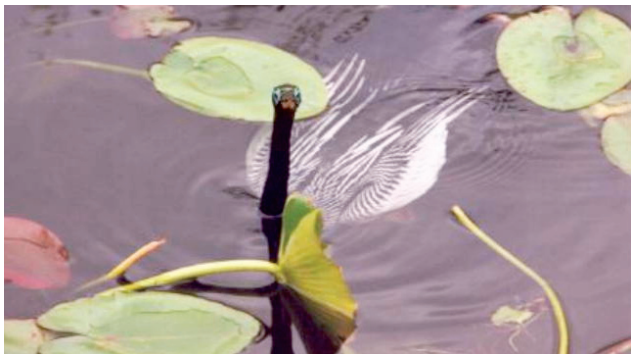
Participated in technical team visit to identify, evaluate, and develop alternatives and recommendations for mitigating failed canal plugs and associated resource implications.

Attended mercury issue teleconferences and advised park on issues important to mercury, given diel variation in nutrients and chlorophyll.

Provided advice on how to handle analyses of data with missing values, options for censoring values below detection limits, and one-sided confidence intervals.

Provided copy of a previous study on the impacts of roller-frame trawling on benthic hardbottom communities.

Conferred with the park on a sportfish tournament issue involving culling of caught fish and provided recommendations for tournament management.



Anhinga, Everglades National Park (Bill Kettler)

Fort Sumter National Monument

Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six EPA databases.

Great Smoky Mountains National Park

Provided wetland policy review and technical comment on the wetland-related sections of the *Elkmont Historic District Preliminary Draft Environmental Impact Statement and General Management Plan Amendment*.

Reviewed and approved the final wetland/floodplain statement of findings associated with a proposed land exchange between Blue Ridge Parkway, Great Smoky Mountains National Park, and the Eastern Band of the Cherokee Nation.

Gulf Islands National Seashore

Conducted ground water assessment, evaluating local occurrence, movement and contamination potential.

Conducted wetland restoration assessment and reviewed an on-going ground water/wetland monitoring operation.

Identified technical information necessary to

evaluate future dredge spoil placement.

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

Advised on remote sensing issues, including resolution vs. precision.

Provided technical review and comment on a draft coastal watershed condition assessment report.

Assisted USGS WRD staff in Tallahassee, FL, regarding how to prepare a proposal for a water quality project.

Jean Lafitte National Historical Park and Preserve

Reviewed COE draft report entitled *Wetlands Restoration Study, West Jefferson Parish, LA* and advised park on policy and technical issues related to potentially accepting treated sewage effluent in park wetlands. Provided advice on nutrient issues.

Reviewed and evaluated the request for exemption and the environmental assessment entitled *Couba Island Field Drilled Beneath the Barataria Preserve, Jean Lafitte National Historic Park and Preserve*.

Kings Mountain National Military Park

Provided technical review and comments on the draft report *Development of a Geo-referenced Database to Identify and Inventory Wetlands at Kings Mountain National Military Park*.

Mammoth Cave National Park

Provided programmatic oversight and technical support leading to the development of the *Mammoth Cave National Park Water Resources Management Plan*.

Reviewed water quality data and QC reports and provided comments on diel variation, the difference between lab precision and repeatability, and field duplicates used for precision reproducibility plus some true heterogeneity. Advised on lab precision values and detection limits and obtained an expert review of dioxin data.

Drapery Room, Mammoth Cave National Park (Gary Berdeaux)

Moores Creek National Battlefield

Continued contract management and technical advice on a project to reintroduce native wetland grasses at the battlefield.

Natchez Trace Parkway

Assisted with revising *Wetland Statement of Findings for Bridge Replacements at TN Highway 13, County Road 85, Threat Creek and Lindsey Creek*.

Obed Wild and Scenic River

Coordinated progress report to park management on studies being conducted by USGS on Obed River watershed hydrology.

Briefed new park manager on water quantity issues.

Continued oversight of a multi-year paired-basin study by the USGS to investigate the effects of small and medium-sized impoundments on streamflow, conducted a field review of data collection activities, and reviewed the draft study completion report.

Assisted the Natural Resource Information Division in determining watershed areas for impoundments in the park watershed.

Initiated and directed USGS study of streamflow associated with geomorphologic processes and vegetation of alluvial surfaces.

Participated in a meeting between the NPS and the USGS Instream Flow group to discuss research needs for the Obed River.

Russell Cave National Monument

Fulfilled annual report review and work plan approval responsibilities as WRD and NRPP Project Coordinator for NRPC funded project at RUCA-CHCH.

Russell Cave National Monument (NPS Photo)

Provided technical and programmatic guidance to the Vital Signs Program concerning Russell Cave National Monument.

Timucuan Ecological & Historic Preserve

Assessed the existing ground water resources in terms of the safe yield and the potential for saltwater intrusion.

Provided wetland policy and technical review of a proposal from the COE to dredge and restore the hydrologic connection between a bay area and White Shell Bay.

Tuskegee Airmen National Historic Site

Provided policy review of a project agreement for a general management plan/ environmental impact statement.

TECHNICAL ASSISTANCE PROVIDED BY NATURAL RESOURCE CHALLENGE AQUATIC RESOURCE FIELD PROFESSIONALS

The upper river near Pruitt, Buffalo National River (Sue Walter)

TECHNICAL ASSISTANCE SERVICEWIDE

Served as reviewer on Servicewide Comprehensive Call proposal national review panel for NRPP Disturbed Lands funding.

TECHNICAL ASSISTANCE REGIONS, NETWORKS, AND PARKS

ALASKA REGION

Represented the NPS in a strategic planning workshop for the Subsistence Fisheries Resource Monitoring Program for southwest Alaska.

Central Alaska Network

Developed protocols for monitoring shallow lakes.

Lake Clark National Park and Preserve

Developed successful aquatic research proposals. Two projects, one monitoring the escapement of sockeye salmon to Lake Clark and one assessing the distribution, seasonal movement, and life history of humpback whitefish, will be funded in FY 2005, FY 2006, and FY 2007.

Conducted a successful study estimating the age, size, and escapement of sockeye salmon to Lake Clark.

Coordinated and assisted with Lake Clark resident fish study. Provided project oversight, technical assistance, logistical support, and field assistance to this graduate research project.

Provided technical and administrative assistance for two water quality projects in Lake Clark National Park and Preserve.

Southwest Alaska Inventory and Monitoring Network

Participated in a vital signs monitoring workshop for freshwater fish and water resources in the network.

Boats on the Bay, Kenai Fjords National Park (Joy Pietschmann)

Yukon-Charley Rivers National Preserve

Published the final report for the vascular plant inventory entitled *Vascular Plants of Yukon-Charley Rivers National Preserve,* NPS Final Technical Report CAKN-04-02.

Continued pilot study of shallow lake monitoring.

INTERMOUNTAIN REGION

Participated in the Upper Colorado River Endangered Fish Recovery Program, representing NPS and 6 park units.

Served as Chairman of the Upper Colorado River Basin Recovery Program Biology Committee.

Provided review and comment on several major EISes, compliance reports, and numerous other program reports.

Represented NPS at three workshops on non-native fish control.

Represented NPS in the San Juan River Recovery Program.

Assisted in the preparation of water-related funding to conduct hydrologic studies at Fort Bowie National Historic Site, Big Bend National Park, Coronado National Memorial, and selected parks of the Southern Colorado Plateau Inventory and Monitoring Network.

Provided assistance to more than ten region parks in the development of proposals for Level I water quality baseline inventories.

Big Bend National Park

Prepared a preproposal for the development of a sub-regional scale ground water flow model to evaluate the potential impacts of increased ground water withdrawals from the Edwards-Trinity Aquifer on river and spring flows at Big Bend National Park, Rio Grande Wild and Scenic River, and Lake Amistad National Recreation Area.

Chickasaw National Recreation Area

Provided technical and logistical support for the Arbuckle-Simpson Hydrology Study, a five-year investigation sponsored by the Oklahoma Water Resources Board to evaluate the potential impacts of proposed large-scale ground water development in the basin of the park.

Significantly expanded spring and stream flow monitoring and made provisions to expand ground water level monitoring in the area of the park with the aim of documenting pre-development conditions and ensuring participation in basin-wide evaluations/ planning to protect historic spring, stream, and artesian well flows.

Fort Bowie National Historic Site

Conducted a hydrological condition study.

Glen Canyon National Recreational Area

Developed a partnership proposal with the Utah Division of Wildlife Resources for non-federal matching funds for a project evaluating stocked Colorado pikeminnow in the San Juan River.

Glen Canyon National Recreation Area (Sara Bartels)

Lyndon B. Johnson National Historical Park

Facilitated the development of a cooperative agreement with the University of Texas at Austin Center for Research in Water Resources to evaluate trends in the migration of the Pedernales River, bank erosion, and the effectiveness of bank stabilization efforts in the Ranch District.

Sonoran Desert Network

Provided review and technical comments on documents related to water quality and quantity monitoring.

Provided hydrological field assistance to parks in Arizona and New Mexico, including installation and maintenance of ground water and surface water monitoring equipment, collection of water samples from wells, decommissioning of damaged monitoring equipment, installation of well caps, stream gaging, surveying, and troubleshooting of seismic data collection instrumentation.

Southern Colorado Plateau Network

Provided review and technical comments on documents related to water quality and quantity monitoring.

Contributed a substantial portion of the planning and writing of the *Southern Colorado Plateau Inventory and Monitoring Network Phase II Water Quality Report*.

Participated in preliminary scoping sessions for the development of Vital Signs Monitoring Programs at Lake Meredith National Recreation Area, Washita Battlefield National Historic Site, and Chickasaw National Recreation Area.

Attended the annual meeting of the Southern Plains Inventory & Monitoring Network Program in Austin, TX.

Southern Plains Network

Assisted the region in the identification of potential FY 2005 water resources projects in network parks.

Tumacácori National Historical Park

Initiated the preparation of a report on water quality and hydrogeologic conditions at a riparian seep.

Zion National Park

Represented the park and the NPS in three Virgin River and Spinedace Recovery Team meetings for endangered fish in the Virgin River Recovery Program.

Zion National Park (Robert Baker)

Assisted in securing funding for needed stream gaging equipment.

MIDWEST REGION

Assisted in the identification of potential FY 2005 water resources projects at Buffalo National River, Ozark National Scenic Riverways, Tallgrass Prairie National Preserve, Missouri National Recreational River, and Saint Croix National Scenic Riverway.

Represented the region on the Ozarks Interior Partnership Team, established with the aim of pooling the financial and technical resources of DOI agencies working in Arkansas, Missouri, and Oklahoma to restore and sustain the natural resources of the Ozarks.

Participated in Great Lakes and Upper Mississippi River Basin regional forums and discussions regarding a Great Lakes invasive species rapid response model, the proposed Great Lakes - St. Lawrence navigation corridor improvements, and a draft nutrient and sediment research strategy for the Upper Mississippi Basin assembled by the USGS.

Great Lakes Network

Developed successful aquatic research proposals for Great Lakes parks. Two of these, one addressing nutrient-induced deep water anoxia in Lake St. Croix and one addressing spiny water flea (*Bythotrephes longimanus*, an exotic, invasive zooplankton) invasions in Great Lakes parks, will be funded in FY 2005 and 2006, respectively.

Worked with regional Aquatic Ecologist located at Saint Croix National Scenic River to complete draft Aquatic Synthesis for the Great Lakes Network (GLKN). This project summarizes all aquatic research and monitoring efforts that have occurred at the nine GLKN parks and provides recommendations for future efforts.

Presented information on coaster brook trout restoration efforts at four GLKN parks at the American Fisheries Society annual national meeting held in Madison, WI, in August 2004.

Isle Royale National Park

Worked with the Regional Aquatic Ecologist, park natural resources staff, and the Great Lakes Commission on the *Isle Royale Water Resources Management Plan*.

Contributed information for the *Isle Royale Fisheries Management Plan*. Assisted with first stage of development of desired future conditions for this document, as well as several other sections.

Assisted USGS and USFWS with fisheries surveys at Isle Royale. Nearshore fisheries surveys in Lake Superior are the first thorough nearshore surveys conducted at this park.

Ozark National Scenic Riverways

Facilitated the development of a cooperative agreement with the University of Texas at Austin Center for Research in Water Resources to prepare GIS coverages as a first step in assessing the vulnerability of park springs and rivers to contamination.

Attended the annual multi-agency technical advisory meeting on the impacts of proposed lead mining in the Mark Twain National Forest (recharge area for Big Spring), including presentations of hydrologic and ecological research conducted as part of a five-year study.

Pictured Rocks National Lakeshore

Began work on fisheries based project statements.

St. Croix National Scenic Riverway

Analyzed trends for 30 years of water quality data.

Voyageurs National Park

Analyzed data on crayfish mercury concentrations, integrated the results with ongoing mercury food web research, and presented the data at regional and national scientific conferences.

NATIONAL CAPITAL REGION

Consulted with WASO and the Maryland Department of Natural Resources regarding the invasive northern snakehead.

Participated in Washington Aqueduct project reviews.

Assisted in Maryland Biological Stream Survey (MBSS) water quality protocol development.

Planned and developed a cooperative agreement between the NPS and the MBSS and Frostburg State University. Through this project, protocols for I&M/WRD funded monitoring of benthic invertebrates, fish, and stream habitats will be developed.

Antietam National Battlefield (John Lincoln Hallowell)

Developed a water monitoring lab for future use by the NCR I&M Program.

Collaborated with the NRCS to develop enhanced soils maps of NCR parks for GIS.

Served as NCR-NER GPRA contact for Land Health - Wetlands and Riparian goals.

Purchased water quality equipment for loan to the NCR parks.

Purchased equipment for use in a continuous water quality sampling programs.

Served as Web master for Center for Urban Ecology website (http://www.nps.gov/cue) and the Center's presence on InsideNPS.

Represented the region at planning meetings for the development of a National Ecological Observatory Network.

Continued collaboration with Steve Goetz and Claire Jantz of the Woods Hole Research Institute on a project measuring the percent of impervious surfaces for selected watersheds in the region.

Catoctin Mountain Park

Continued work on water resources scoping report project.

Continued trend analysis of water quality data.

Conducted a site visit to assess surface water pollution.

Chesapeake and Ohio Canal National Historical Park

Consulted with Clara Barton Parkway and canal erosion prevention project.

Evaluated environmental damage by a horseback riding concessionaire.

Consulted on Washington Aqueduct issues.

George Washington Memorial Parkway

Reviewed technical documents pursuant to development of a rowing facility on the Potomac River.

Monocacy National Battlefield

Consulted on pond eutrification and possible septic system involvement.

National Capital Parks — East

Provided document review regarding the placement of a storm water drainage pipeline.

Prince William Forest Park

Assisted with the development of a Visual Stream Assessment Protocol and provided training in implementing the protocol.

Continued trend analysis of water quality data for Prince William Forest Park.

Potomac Heritage National Scenic Trail

Provided review of WWW project conducted by Georgetown University graduate students.

Rock Creek Park

Provided consultation regarding stream bank erosion consultation, disturbed wetlands, and wetlands remediation.

Developed a project proposal for submission for Disturbed Lands funding.

NORTHEAST REGION

Alleghany Portage Railroad National Historic Site

Investigated damage to water resources and identified an appropriate USGS cooperator to identify appropriate acid mine drainage treatment for waters emptying from the park into the Little Connemaugh River.

Delaware Water Gap National Recreation Area

Provided bathymetric data to support the construction of a water quality model to be used for assessing impacts to special protection waters in the Delaware River.

Established a voting seat for NPS on the Delaware River Basin Commission's Subcommittee for Ecological Flows and provide technical guidance to the committee.

Provided technical advice regarding protocols for the development of a minimum flow requirements program.

Delaware Water Gap National Recreation Area (Edmund 'Ted' Hart)

Fire Island National Seashore

Participated in the environmental and technical management, inlet modification, and restoration committees as a technical resource and as a representative for NPS in the *Fire Island to Montauk Point Reformulation Plan: USACE Storm Damage Protection Planning for Fire Island National Seashore*.

Worked with park staff and other NPS professionals in preparing a funding proposal under the NPS Cooperative Conservation Initiative. If funded, this proposal will allow the park to develop a scientifically based plan for restoration of mosquito ditches in the Otis Pike Wilderness.

Served as coordinator for research, assisting researchers with the NPS research permit system and providing logistical support.

Represented the park on the Bluepoints Bottomlands Council, an interdisciplinary team that is working with The Nature Conservancy to develop a long-term management plan for the Conservancy's underwater lands as well as the restoration and protection of the Great South Bay ecosystem.

Reviewed and provided written comments for the NCBN on a report entitled *An Assessment of Contamination Threats at Fire Island National Seashore*.

Gateway National Recreation Area

Worked with COE and the State of New York to develop a restoration project for Elders Island.

Assisted park staff with marsh sediment elevation and sulfide sampling.

Gateway NRA, Jamaica Bay, New York City, from Plumb Beach (John Lincoln Hallowell)

Morristown National Historical Park

Completed the transition of water quality data from a local dataset to a STORET compatible spreadsheet.

Continued trend analysis of water quality data.

Northeast Temperate Network

Participated in the network workshop to select vital signs for coastal ecosystems.

Northeast Coastal and Barrier Network

Assisted researchers in completing sediment elevation and accretion monitoring at marshes at Fire Island National Seashore and Gateway National Recreation Area.

Sagamore Hill National Historic Site

Assisted on a site reconnaissance trip prior to initiation of wetland inventory protocols.

Saugus Iron Works National Historic Site

Worked with park staff and other NPS professionals in preparing a funding proposal under the NPS Cooperative Conservation Initiative. If funded, the proposal will increase spawning habitat for anadromous fish in the Saugus River.

Valley Forge National Historical Park

Served as the primary technical contact point for the NRPP Small Park funded sediment load study.

Provided environmental assessment review and recommendations for a NPS/ Pennsylvania Department of Transportation cooperative streambank stabilization project.

PACIFIC WEST REGION

Served on technical review panels associated with negotiated water-rights settlements and the implementation of monitoring and management conditions set forth by the Nevada State Engineer.

Collaborated with resource managers of small parks to design and fund a project to efficiently map and characterize the condition of park wetlands.

Collaborated on the design of estuary restoration projects at Point Reyes National Seashore, Golden Gate National Recreation Area, and Channel Islands National Park.

Served as a consultant to natural resources management specialists in several parks. Assistance included reviewing research and monitoring proposals, scoping issues, and recommending strategies for restoration and protection of aquatic ecosystems. Developed teaching materials and co-taught a BLM class entitled *Measuring and Monitoring Plant Populations*.

Completed a detail with the BOR Trinity River Restoration Project in northern California.

Death Valley National Park

Participated in technical review panel activities associated with water-rights

applications by Las Vegas Valley Water District in Tikapoo and Three Lakes Valleys.

Co-managed the response to an endangered species monsoon/flash flood related take incident at Death Valley National Park.

Joshua Tree National Park

Represented NPS regarding several projects involving the development of ground water resources, including the Metropolitan Water District of Southern California's proposed Hayfield and Chuckwalla aquifer storage and recovery projects.

Lake Mead National Recreation Area

Worked to establish a study to assess the threat to springs within the Black Canyon posed by potential nearby water development and assisted on ground water supply issues associated with the Temple Bar area.

Mojave Desert Network

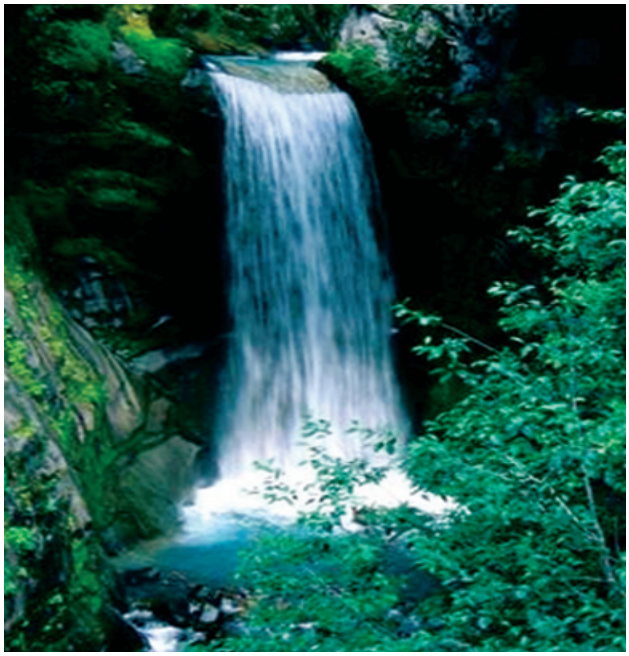
Continued to help establish various water resources monitoring activities.

Mount Rainier National Park

Wrote a proposal to estimate imminent and under-recognized geologic hazards in Mount Rainier National Park.

In response to an October 2003 flood event, worked with outside consultants and the State of Washington Department of Transportation to install a temporary engineered log jam to divert the mainstem of the White River, in a resource sensitive manner, back into the main channel and off the Mather Memorial Highway (SR 410)– where it had eroded the road surface and flooded residential properties.

Performed forensic geomorphology on several in-park debris flows to better understand the initiation mechanisms so future debris flow hazards can be recognized. Efforts are continuing to estimate the hazard resulting from the interaction of debris flows and moderate river flooding (resulting in exceptional park damage) in order to protect visitor safety and park infrastructure.



Mount Rainier National Park (Robert Baker)

Mount Rainier National Park / Olympic National Park

Successfully solicited funding to conduct a project to anticipate future road and infrastructure problems from floods and proactively develop solutions to prevent future problems.

Parashant National Monument

Worked to establish a reconnaissance study to determine the source of water to two major springs as a first step in determining what is needed to protect springs within the monument. Organized a meeting of NPS, BLM, and USGS management and technical staff to discuss this issue.

Point Reyes National Seashore

Horseshoe Pond Restoration
ED. COMMENT Show the pre and post restoration photos, 2 or 4 of the selections

SOUTHEAST REGION

Consulted with North American Native Fish Association to develop a volunteer fish monitoring program.

Participated on the Natural Resource Assessment Team to conduct a comprehensive field review and assessment of the ecological impacts of Hurricane Isabel.

Developed and held a mini-workshop on proposal writing through the Servicewide Comprehensive Call for the natural resource staff in region parks.

Blue Ridge Parkway

Developed and presented a Power Point presentation on the significance of wetlands and listed species found within the park.

Carl Sandburg Home National Historic Site

Advised on the removal of non-historic trees along a riparian zone in an environmentally friendly manner in order to restore the historic landscape and viewshed.

Chattahoochee River National Recreation Area

Stocked and surveyed young-of-year shoal bass for restoration.

Provided technical assistance in developing stream restoration techniques and plans for a project to control streambank erosion.

Chattahoochee River National Recreation Area (John Lincoln Hallowell)

Cumberland Island National Seashore

Accompanied the WRD staff on a site visit to assess the feasibility of capping six free-flowing artesian wells.

Guilford Courthouse National Military Park

Conducted a fish inventory.

Timucuan Ecological and Historic Preserve

Conducted data analysis of long-term benthic macroinvertebrate sampling data to assist in detecting changes due to water quality concerns.

Vicksburg National Military Park

Provided technical assistance and environmental review on a proposed project which would have cleared all vegetation along a riparian corridor within a 9.5 acre site. Through development of a 3-D GIS map, assisted the park in selecting an alternative which met the project purpose of restoring a historic vista while maintaining the forested riparian corridor.

APPENDIX B

SUMMARY OF WATER RESOURCES DIVISION FUNDING

FY 2004 base funding for the Water Resources Division was $12,049,000 (Table 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 (Table 2).

Table 1. Water Resources Program FY 2004 Funding

Funding Available in FY 2003	$11,613,000
Pay Increase	20,000
Natural Resource Challenge Increase in FY 2004	600,000
	$12,233,000
Net across-the-board reductions	-121,000
IT reduction	-5,000
General reduction	-22,000
IT assessment	-21,000
Travel reduction	-15,000
Reduction Total	-184,000
Total available in FY 2004	**$12,049,000**

Table 2. Water Resources Program - FY 2004 Base Funding by Category

Water Resource Projects		
Water Resource Protection		$1,138,700
Competitive Projects		371,400
Other Projects		15,000
Water Quality Monitoring		**2,375,000**
Water Resource Protection – Aquatic Resource Professionals		**1,200,000**
Watershed Condition Assessment Program		**2,952,700**
Competitive Projects	($1,122,955)	
Critical Projects	($376,380)	
Coastal Projects	($428,772)	
Other Projects	($1,024,593)	
Water Resource Technical Assistance		3,996,200
Total		**$12,049,000**

A summary of accomplishments derived from the FY 2004 base budget and the FY 2004 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 FY 2001. As shown in Table 3, FY 2004 expenditures for this budget increase expanded 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 new 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, and 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 permit 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 often intended to support settlement negotiations conducted to avoid contested case hearings or contested land use decisions or to support the implementation of settlements.

Researchers in the Canyon of Lodore (Dinosaur NM) track populations of nonnative fish such as smallmouth bass (Melissa Trammell)

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 FY 2004 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.

Table 3. Water Resource Protection Projects - FY 2004

Park	Region	PROJECT TITLE(S)	FY04 Funding $(000s)
ALL	ALL	Support to the Office of the Solicitor	178.4
AZ Parks	IMR	Hydrologic Data Collection in Support of the Adjudication of the Little Colorado River Basin in Arizona	4.6
BLCA	IMR	Participation in the Adjudication of Colorado Water Div. # 4	15.0
CAVE	IMR	Hydrologic Investigation, Restore Stream Flow	25.0
CHIC	IMR	Hydrologic Data Collection, Participation in State Administrative Process	22.8
GRCA	IMR	Ground Water Study, Spring Protection	84.0
MEVE	IMR	Implementation of Water Rights Decree	1.3
MOCA	IMR	Hydrologic Data Collection in Support of the Adjudication of the Verde River Basin in Arizona	128.9
MT Parks	IMR	Implementation of the Montana-NPS Compact	3.6
SAGU	IMR	Investigation of Hydrology and Water Related Values	125.9
ARCH	IMR	Hydrologic Data Collection	3.0
BUFF	MWR	Investigation of Hydrology and Water Related Values	51.0
GRSA	IMR	Hydrogeologic Data Analysis	38.7
THRO	MWR	Investigation of Hydrology and Water Related Values	4.0
SITK	AR	Hydrologic Data Collection	2.0
DEVA	PWR	Devils Hole and Spring Flow Monitoring, Ground Water Study, Participation in Ground Water Model Development	41.8
GRBA	PWR	Assessment of Hydrologic Conditions and Vulnerability of Park Streams to Ground Water Development	32.0
LAME	PWR	Spring Flow Monitoring, Participation in Cooperative Aquifer Stress Test, Ground Water Model Development	150.2
OBRI	SER	Stream Flow Monitoring, Investigation of Hydrology and Water Related Values	63.0
ALL	ALL	Technical and Administrative Support to All Projects	163.5
		TOTAL FOR WATER RESOURCE PROTECTION PROJECTS	1,138.7

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 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 quality baseline conditions or contaminants. Projects support National Park Service Strategic Goal I.b.4 (water quality) and the new Department of Interior strategic goals for Land Health, water quality, and water quantity.

WRD competitive project funding for FY 2004 totaled $1,494,355. This funding was derived from WRD base project funds ($371,400) and support to the backlog of watershed and water quality assessment needs currently identified in the NPS Project Management Information System (PMIS) from the new Watershed Condition Assessment program before it transitions to a long-term program of systematic park based assessments of NPS watershed conditions ($2,952,700).

Fully Funded Projects: Fully funded projects are projects that received the final funding installment in FY 2004. Although these projects will not receive additional funding from WRD beyond FY 2004, fieldwork, data analysis, report writing, or peer review may continue into the next year. A total of 25 projects received their last year of funding in FY 2004. Table 4 shows projects that received their final year funding in FY 2004. Appendix A contains a summary of these fully funded projects.

Table 4. Water Resource Division Competitive Projects
Final-Year Funded Projects - FY 2004

Park	Region	PROJECT TITLE(S)	FY04 Funding $(000s)
REDW	PWR	Evaluate Stream Temperature Regimes for Juvenile Coho	4.1
PORE	PWR	Restoration of Horseshoe Pond to Coastal Lagoon	12.5
CACO	NER	Management of Dune Slack Wetlands	15.0
WRST	AKR	Investigate Liminological Conditions in Tanada Lake Affecting Sockeye Salmon Production	17.3
BUFF	MWR	Characterization of Macroinvertebrate Community and Drift in a Tributary of BUFF, Prior to Damming	19.2
KLGO	AKR	Nelson Slough Wetland Restoration	20.0
HAFO	PWR	Water Quality Impacts to the Snake River from Landslides	25.0
MACA	SER	Develop Water Resources Management Plan	25.0
GOGA	PWR	Plan Rodeo Lagoon watershed Wetland Riparian Habitat Restoration	25.5
PEFO	IMR	Stream and Riparian Characterization Analysis	26.0
BISC	SER	Identify Restoration, Reservations, and Minimum Flows, and Level Targets for Biscayne NP	36.5
BUFF	MWR	Ground and Surface water Interactions of the Buffalo National River	40.0
SACN	MWR	Determine Ground Water Impacts to the St. Croix NSR	40.0

Table 4. continued

Park	Region	PROJECT TITLE(S)	FY04 Funding $(000s)
GRBA	PWR	Aquatic Survey and Condition Assessment	41.5
SACN	MWR	Classify Critical Aquatic Habitat for the St. Croix NSR	45.2
WABA	IMR	Conduct a Riparian Corridor Restoration Study	47.4
MULTI	NCR	Capture and Assess Stream Health in Highly Fragmented Parks	47.8
ISRO	MWR	Assess Hydrocarbon Pollution Threats to Park Waters	49.8
CURE	IMR	Data Collection & Analysis of Required Water Quality Parameters: Outstanding Waters Designation	49.8
BUFF	MWR	Inventory and Assess Springs and Perennial Streams	50.0
DEWA	NER	Regional Point Source Management to Support Special Protection Water Quality Regulations	50.0
CACO	NER	Pilgrim Lake Dynamics	50.0
PORE	PWR	Enhanced Wetlands Mapping for Tomales Bay Watershed	50.6
INDU	MWR	Determine Source of E. coli Contamination at Central Avenue Beach	64.3
KAHO	PWR	Assess and Remove Alien Marine Alga from Kaloko Fishpond	86.3
		TOTAL	938.0

Continuing Projects: Many WRD competitive projects receive funding for 2 years. Table 5 identifies projects with funding that extend at least one year beyond FY 2004.

Table 5. Water Resources Division Competitive Projects
Continuing Projects - FY 2004

Park	Region	PROJECT TITLE(S)	FY04 Funding $(000s)
RUCA	SER	Karst Ground Water Delineation at RUCA and CHCH of the CUPN	10.306
CUVA	MWR	Evaluate Hydrology in Wetlands to Develop Vital Signs	11.0
DEWA	NER	Define Existing Water Quality for Development of Special Protection Waters Regulations	14.3
DENA	AKR	Aquatic Resources Synoptic Study Along State-Proposed Road Corridor	25.0
ZION	IMR	Develop Standards and Indicators for Aquatic Invertebrates for VERP Planning	26.6
GLBA	AKR	Evaluate East Alsek River Sockeye Salmon Habitat	29.3
BIBE	IMR	Repair Endangered Big Ben Mosquitofish Pond	30.0
ACAD	NER	Develop Ground Water Flow Model	32.1
BISC	SER	Assessing the Occurrence, Dissipation, & Potential Risks of Glyphosate to Coastal Areas of BISC	32.5
BISC	SER	Developing Numeric Non-Degradation Water Quality Standards for Biscayne National Park	32.7
PORE	PWR	Develop Water and Aquatic Resources Management Plan	40.1
BITH	IMR	Flood Pulse Systems: Analyzing Potential Changes in Corridor Dynamics Due to Changes in Stream Flow	50.0
KAHO	PWR	Assess Nutrient Sources, Fluxes, and Water Quality of Ponds	50.5

Table 5. continued

Park	Region	PROJECT TITLE(S)	FY04 Funding $(000s)
ASIS	NER	Evaluate Relationships between Water Quality, Seagrass Habitat, and Fish Populations	52.849
SACN	NWR	Survey Mercury Levels in Fish in the St. Croix River	59.1
LACL	AKR	Characterize Water Quality, Hydrology, and Aquatic Biology in the Kijik River Basin	60.0
		TOTAL	556.355

OTHER PROJECTS

Cooperative Academic Program for Fisheries: Because of the limited professional fishery expertise within the National Park Service, this program uses a small amount of WRD base funding to further develop and increase cooperative relationships between the academic community and the NPS fisheries program. Funds are set aside to help foster graduate student research at National Park System units and to help cooperatively fund fishery students engaged in NPS park projects. Potential high priority projects suitable for graduate student research are identified through the PMIS project need data system and matched to student availability through discussions with fishery professors. The program helps introduce top caliber fishery students to National Park Service programs, as well as expanding the level of expertise made available to parks. In FY 2004, two new projects were initiated, one in conjunction with Colorado State University and one with Montana State University.

Young-of-year shoal bass stocked in the Chattahoochee River in 2004 (NPS Photo)

WATER QUALITY MONITORING

FY 2004 Funding

In FY 2004, the Water Resources Division received $2,375,000 for the Water Quality Monitoring component of the Natural Resource Challenge. This was the 4th 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.

Full program funding was allocated to 24 Park Vital Signs Networks in FY 2004 (Table 6). In addition, funds supported the development of an NPS servicewide water quality data management program within the U.S. Environmental Protection Agency (EPA) STORET national water quality database. While not shown in Table 6, 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 6. Allocation of Water Quality Park Vital Signs Monitoring Funding FY 2004

Network	Region	Number of Affected Parks	FY04 Funding $(000s)
Central Alaska	Alaska	5	98
Heartland	Midwest	15	82
NE Coastal and Barrier	Northeast	8	90
National Capital Region	National Capital	11	71
Cumberland/Piedmont	Southeast	14	59
Appalachian Highlands	Southeast	4	70
Northern Colorado Plateau	Intermountain	16	108
Greater Yellowstone	Intermountain	3	71
Sonoran Desert	Intermountain	11	64
North Coast & Cascades	Pacific West	7	82
San Francisco Bay Area	Pacific West	6	70
Mediterranean Coast	Pacific West	3	76
Southwest Alaska	Alaska	5	139
Northeast Temperate	Northeast	10	60
Southern Colorado Plateau	Intermountain	19	124
Pacific Island	Pacific West	9	151
Great Lakes	Midwest	9	123
Gulf Coast	Intermountain	8	89
Rocky Mountain	Intermountain	6	61
Sierra Nevada	Pacific West	3	63
Eastern Rivers and Mountains	Northeast	9	63
Arctic	Alaska	5	151
Klamath	Pacific West	6	76
Southeast Coast	Southeast	17	121
TOTAL: 2004 Network Monitoring	**7 NPS REGIONS**	**199**	**2,162**
Servicewide Data Management			**213**
GRAND TOTAL			**2,375**

Vital Signs Monitoring Networks: In FY 2004, 23 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 one network initiated its monitoring plan. The Water Resources Division supported network water quality monitoring programs by: providing national program administration and reporting, establishing a baseline inventory and analysis of available water quality data, supporting compilations of bibliographic information on other related reports, and establishing a servicewide water quality database in the EPA-STORET national water quality database.

Individual network accomplishments are summarized in Appendix C (budget numbers are summarized and rounded; detailed budgets are provided in individual NPS Network Administrative Reports).

WATER RESOURCE PROTECTION

Aquatic Resource Professionals

In FY 2004, the National Park Service received $1,200,000 to fund aquatic resource specialists in the field. Fifteen positions were fully funded in FY 2004. 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 7.

Table 7. Park Based Aquatic Resource Professionals
Natural Resource Challenge

REGION	INCUMBENT	SPECIALIZATIOIN	DUTY STATION	GEOGRAPHIC FOCUS AREA	SUPERVISOR	WRD POC
AKR	Amy Larson	Aquatic Ecologist	YUCH	Central and Northwest Alaska Network Parks	Tom Liebscher, YUCH	Weeks
AKR	Dan Young	Fishery Biologist	LACL	Southwest and Southeast Alaska Network Parks	Judy Putera, LACL	Tilmant
IMR	Melissa Trammel	Fishery Biologist	Utah State Coordinators Office, Salt Lake City, UT	Upper Colorado River Basin Parks	John Reber	Wullschleger
IMR	Colleen Filippone	Ground Water Hydrologist	Sonoran Desert Network I&M Office Tucson, AZ	Arizona and New Mexico Parks	John Reber	Martin, L.
IMR/ MWR	Sue Braumiller	Ground Water Hydrologist	CHIC	Southern Plains / Heartland Network Parks	John Reber/ Steve Cinnamon	Christensen
MWR	Brenda Moraska Lafrancois	Aquatic Ecologist	SACN	Great Lakes Network Parks	Steve Cinnamon	Vana-Miller
MWR	Jay Glase	Fishery Biologist	ISRO	Great Lakes Network Parks	Steve Cinnamon	Wullschleger
NER/NCR	Jeff Runde	Aquatic Ecologist	Center Urban Ecology Washington, DC	National Capitol / Mid-Atlantic Network Parks	Doug Curtis	Rosenlieb
NER	Alan Ellsworth	Hydrologist	DEWA	Eastern Rivers & Mountains / NE Coastal & Barrier Network Parks	Dave Reynolds	Flora

Table 7. continued

REGION	INCUMBENT	SPECIALIZATIOIN	DUTY STATION	GEOGRAPHIC FOCUS AREA	SUPERVISOR	WRD POC
NER	Patricia Rafferty	Marine Ecologist	FIIS	NE Temperate / NE Coastal & Barrier Network Parks	Mary Foley	Tilmant
PWR	Marie Denn	Aquatic Ecologist	PORE	San Francisco Bay / Sierra / Klamath / Mediterranean Coast Network Parks	Superintendent, PORE	Wullschleger
PWR	Paul Kennard	Geomorphologist	MORA	North Coast & Cascades / Klamath Network Parks	Superintendent, MORA	Smillie
PWR	Tom Culhane	Ground Water Hydrologist	LAME	Mojave Desert Network Parks	Kent Turner, LAME	Van Liew
SER	Jim Long	Fishery Biologist	CHAT	Southeast Coast / Gulf Coast / Appalachian Highlands / Cumberland-Piedmont Network Parks	Sherri Fields	Tilmant
SER	Cherry Green	Wetlands Ecologist	CHAT	Southeast Coast / Gulf Coast / Appalachian Highlands /Cumberland-Piedmont / South Florida - Caribbean Network Parks	Sherri Fields	Wagner

WATERSHED CONDITION ASSESSMENT PROGRAM

The Water Resources Division received $2.944 million in FY 2004 as part of the Natural Resource Challenge to assess watershed conditions on a system-wide basis. FY 2004 was the second year for the newly established Watershed Condition Assessment Program (WCAP), a program supported by a permanent increase to the WRD base. The WCAP will integrate data and knowledge pertaining to water and other watershed resources to help define desired conditions and assess existing conditions within park managed uplands, streams, riparian areas, wetlands, and coastal/marine areas. The information developed through assessments of watershed conditions will support the information needs of park planning, resource protection, and resource restoration activities.

This new program is timely in light of the movement towards condition-based resource planning and decision making by the NPS. Information developed by the WCAP will complement information from the Vital Signs Program (also a component of the Natural Resource Challenge) to develop science-based information on conditions and trends relative to important park resources. Information from these Challenge programs will be useful to the new Resource Stewardship Plans that parks will be required to develop over the next

several years, as outlined in draft Director's Order 2-1. Resource condition information is also fundamental to the needs of the Department of the Interior Strategic Plan that identifies the health of landscapes and watersheds as a key Outcome Goal. Significant program accomplishments in FY 2004 are described below. Table 8 shows the budget allocation in FY 2004 for the watershed condition assessment program.

Table 8. Watershed Condition Assessment Program

PROGRAM ELEMENT	FY04 Funding $(000s)
Watershed Condition Assessment Workshops and Technical Guidance	35.0
Water Resources Competitive Project Program	1123.0
NPS-USGS Water Quality Assessment Partnership Program	531.6
WRD Watershed Condition Assessment – Critical Projects	376.4
Coastal Parks Phase 1 Watershed Condition Assessments	428.7
Marine Science Advisor	170.0
Other (incl. staff)	288.0
TOTAL	**2952.7**

Implementation of long-range program plan: Program efforts in FY 2004 emphasized continuation of baseline condition assessments at coastal and marine parks, continued development of a compendium of watershed assessment methods and classification systems for potential use by parks, and funding of backlogged watershed resource and water quality assessment projects identified in PMIS. Two full-time staff members were hired in the latter part of FY 2004 to provide dedicated support to implement long-range program components. This includes one federal employee who will serve as program coordinator and a Coastal Resource Analyst who will assist coordination of resource assessments in NPS-managed coastal/marine environments. These staff members will oversee transition of the WCAP to a systematic program of park based assessments of NPS watershed resource conditions 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.

Coastal Parks Watershed Assessments: The WCAP recognizes that the assessment needs of coastal areas differ from strictly upland environments because of salinity regimes, the potential transport of pollutants or invasive species from ocean currents, and the high degree of development on the coast. Working through universities in the Cooperative Ecosystem Studies Unit Networks, Water Resources Division obligated $293,000 in FY 2003 to a pilot study of seven coastal parks on the South Atlantic and Gulf Coasts. Investigators reviewed and synthesized existing information to determine the status of coastal park resources, including water quality, habitat condition, invasive and feral species, extractive uses, physical impacts from resource use and coastal development, and other issues affecting their condition. The reports also made recommendations for further studies to address known resource problems and fill information gaps to more fully evaluate conditions.

As of FY 2004, draft reports have been received for Padre Island National Seashore and Cumberland Island National Seashore and a final report on Cape Lookout National Seashore is currently in press. These reports provided baseline condition assessments and

valuable insights into factors affecting the health of park resources for use by park managers. Additional assessments funded in FY 2004 that are still in progress include Fort Pulaski National Monument, Canaveral National Seashore, Timucuan Ecological and Historic Preserve, and Gulf Islands National Seashore. The Water Resources Division is providing the Coastal Watershed Condition Assessment Reports to parks and the Inventory and Monitoring Networks to help guide resource management planning and support the development of Vital Signs Monitoring Plans. The NPS also plans to work collaboratively with the EPA National Coastal Assessment, USGS, NOAA, state and local agencies, watershed councils, landowners, and other community stakeholders to address issues cooperatively on a local watershed or regional oceanographic scale. As shown in Table 9, WRD obligated $428,722 in FY 2004 to initiate assessments in 18 additional coastal parks.

Table 9. Allocation of Coastal Watershed Condition Assessment Funding-FY 2004

REGION	CESU	STATE	PARKS	FY04 Funding $
Alaska	SE Alaska	AK	GLBA, WRST, SITK, KLGO	69.8
Pacific West	Hawaii-Pacific Islands	HI, CNMI, GU	KALA, KAHO, PUHO, PUHE, WAPA, AMME, NPSA	117.1
Pacific West	Pacific NW	WA	OLYM, LEWI, EBLA, SAJU	105.7
Pacific West	Humboldt State University Foundation	CA	REDW	52.5
Pacific West	California	CA	PORE, GOGA	83.6
TOTAL			**18 parks**	**428.7**

Watershed Condition Assessment Methods Compendium: In FY 2003, the Water Resources Division initiated a contract with the Cooperative Ecosystem Studies Units (CESU) system member at George Mason University to conduct a review, evaluation, and classification of condition assessment methods and to develop a compendium of methods applicable to NPS needs (as well as guidance in methods selection). As of the end of FY 2004, much progress has been made by the contracting team. Nearly 600 different publications, incorporating assessment methods for the various landscape types (e.g., wetlands, riparian zones) have been identified as candidates for review. Review criteria and format have been determined and reviews are underway. The review information is input into a web-based decision support system that assists users in selecting assessment methods for a particular application. The compendium is on schedule to be completed by the end of FY 2005.

Water Resources Competitive Project Program: There remains a backlog of watershed resource and water quality assessment projects identified in PMIS. Thirty-two of these projects were funded through the WRD Competitive Project Program process. Summaries of those projects that received their final funding in FY 2004 are included in Appendix A.

NPS-USGS Water Quality Assessment Partnership Program: The NPS-USGS Water Quality Assessment and Monitoring Partnership Program was initiated under the Clean Water Action Plan and is funded primarily by the USGS. In FY 2004, NPS expanded the program by contributing $531,580 of Water Condition Assessment Program funds to support 9 multi-year partnership projects in parks. The projects funded in FY 2004 include studies at Canaveral National Seashore, New River Gorge National River, and the Southern Colorado Plateau Network.

WRD Watershed Condition Assessment – Critical Projects: In FY 2004, 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 FY 2004 new starts include an evaluation of geomorphic conditions related to the Grand Ditch in Rocky Mountain National Park and an evaluation of the effects of fire on water quality in Glacier National Park. Partnering with other federal agencies, state agencies, and/or local watershed groups in carrying out these projects was emphasized. Table 10 shows the funding allocation for this project category.

Table 10. WRD Watershed Condition Assessment – Critical Projects Funded in FY 2004

New Starts

REGION/STATE	PARK	PROJECT TITLE	FY04 Funding $(000s)
IMR/MT	GLAC	Evaluate Direct Effects of Wildfire on Water Quality	50
IMR/CO	ROMO	Assess Geomorphic Conditions Related to the Grand Ditch Failure	45
IMR/WY, MT, ID	YELL	Install Wells and Monitor Ground water at the Proposed McLaren Tailings/Great Republic Smelter Repository Site	14.9
PWR/CA	GOGA	Provide Bioassessment and Emergent Contaminant Monitoring For Crissy Field	28
PWR/CA	LAVO	Assess Techniques for Restoration of Drakesbad Meadow	5.98

Continuing Projects

REGION/STATE	PARK	PROJECT TITLE	FY04 Funding $(000s)
PW/NV	GRBA	Susceptibility of Great Basin NP Resources to Ground water Withdrawals in Cross-boundary Ground-watersheds	164
SER/SC	COSW	Effects of Modified Dam Operations and Run-of-River Flow in the Congaree River to Floodplain Hydrology	68.5
		TOTAL for New and Continuing Projects	**376.38**

Marine Science Advisor: The program continued to support Natural Resource Stewardship and Science's senior scientist/marine science advisor for an additional year.

NPS-USGS WATER QUALITY ASSESSMENT & MONITORING PARTNERSHIP PROGRAM

The NPS-USGS Water Quality Assessment and Monitoring Partnership Program was initiated under the Clean Water Action Plan and is funded primarily by the USGS Water Resources Division Office of Water Quality. Since 1999, more than $15 million has been allocated for partnership water quality projects in parks. Through 2004, 100 partnership projects have been initiated in 61 national park units; 77 of these projects have been completed. Additional information on the program is available at: http://water.usgs.gov/nps_partnership/.

Table 11. USGS Water Quality Assessment and Monitoring Partnership Projects
Final-Year Funded Projects FY 2004

NPS REGION	PARK	PROJECT TITLE	FY04 Request $(000s)
Intermountain	PISP	Tech. Assis. for Water Quality Vital Signs - Northern Colorado Plateau Network	20.00
Alaska	GAAR	Effects of Wastewater Effluent on the Water Quality of the John Wild River	85.00
Intermountain	BAND	Document Hydrologic Response to Watershed Restoration: Measure Runoff and Suspended Sediment	42.50
Intermountain	GLAC	Occurrence of Persistent Organic Pollutants and Current-Use Pesticides in Seasonal Snowpacks, Lake Water and Lake Sediment	36.50
Midwest	BUFF	Determine the Dependence of Aquatic Resources on Streamflow in Response to Proposed Tributary Impoundment	68.90
National Capital	ROCR	Ecological Health Assessment in Riverine Faunal Communities	85.00
National Capital	ROCR*	Effects of Fungicide Runoff on Aquatic Fungal Communities on Leaf Litter	42.50
Northeast	DEWA	Determining Impacts on Special-Protection Waters	85.00
Northeast	SHEN	Develop Park Wide Episodic Acidification Vulnerability Map	85.00
Pacific West	NOCA	Persistent Organic Pollution & Heavy Metals in Glacial Fed Lakes & Aquatic Biota	34.00
Pacific West	WHIS	Identification of Contamination Associated with Abandoned Mine Lands	44.60
Southeast	MACA*	Develop a Continuous Stream Flow Monitoring Station	22.00
		TOTAL	**651.00**

Table 12. USGS Water Quality Assessment and Monitoring Partnership Projects
Continuing Projects FY 2004

NPS REGION	PARK	PROJECT TITLE	FY04 Allocation $(000s)
Alaska	LACL	Potential Effects of Logging on Water Quality in Crescent River Watershed	85.00
Intermountain	CANY*	Streamflow and Water Quality Monitoring Station for Salt Creek	22.00
Intermountain	CURE	Quality Assurance and Publication of Water Quality Data Collected From Streams, Rivers and Reservoirs	19.70
Midwest	NIOB*	Research and Monitor Water Quality of Niobrara National Scenic River	84.90
Midwest	OZAR	303(d) - Source Identification of Fecal Indicator Bacteria in Water and Streambed Sediments	42.50
Northeast	ACAD	Determine/Model Sources of Ground Water and Nutrients	85.00
Northeast	CACO	Robowell: Automated Ground Water Monitoring	42.50
Pacific West	LARO*	Effects of Trace Elements on Water Quality and Biological Health	85.00
Pacific West	YOSE*	Risk Assessment for Aquatic Ecosystems in Wilderness Areas	68.40
Southeast	BISO	Restoration of Federally Listed Mussel Species and Water Quality Monitoring in Heavily Coal Mined Area	100.50
Intermountain	GLCA	Evaluate Hydrocarbon Contamination in Lake Powell	100.00
Midwest	HOSP	Delineation of Recharge Area for Cold Water Component of Geothermal Springs	73.70
Pacific West	LAME	Occurrence and Toxicity of Incomplete Combustion of PWCs	76.00
Intermountain	SAGU	Determine Wildfire Effects on Water Quality of Lowland Leopard Frog Habitat	85.00
National Capital	CHOH	Ecological & Physical Effects of Sediment Loads to the Potomac River Due to Flushing of Sludge from Reservoirs - Part 1: Chemical Evaluation of Sediment	100.00
Intermountain	CHIC	Assessment of Sources of Septic Contamination of Rock Creek	66.20
Pacific West	OLYM	Transport of Suspended Sediment & Effect on Aquatic Habitat in Elwha River	84.00
Pacific West	PORE	Tomales Bay Watershed Sediment Transport Monitoring	100.00
Pacific West	WHIS	Assess the Instream Biological, Habitat, and Water Quality Conditions	100.00
Southeast	CANA*	Complete Phase 2 Implementation of Water Quality Monitoring Program	66.70
Intermountain	AMIS	Water Quality and Biological Assessment Along the Rio Grande	49.30
Northeast	CACO	Review and Storage of Long-Term Water-Quality Monitoring Data for the Kettle-Hole Ponds	13.50
Midwest	CUVA	Develop a Method to Rapidly Estimate Fecal-Indicator Bacteria Concentrations	90.10
Northeast	SHEN	Assess Effects of Human Activities and Recreational Use on Bacteria Concentrations in Streams	50.00
		Total	1690.00
		NPS/USGS Administration	111.70
		Table 11. Final Year Projects	651.00
		Table 12. Continuing and New Projects	1690.00
		NPS-NRC Watershed Assessment Contributed Funding *(totaling 324.80)	
		TOTAL	**2452.70**

APPENDIX C

SUMMARIES OF WATER QUALITY MONITORING PROGRAM FUNDING IN PARK VITAL SIGNS MONITORING NETWORKS

Appalachian Highlands Network (APHN)

In FY 2004, the network continued its third year of water quality monitoring funding. Total network funding was $70,000. $31,000 was provided to USGS under an interagency agreement to complete the analysis of existing water quality data and to assist in the development of a long-term monitoring protocol. The project to gather, evaluate, and analyze existing long-term physical, chemical, and biological monitoring data for water resources for three network parks (BISO, BLRI, and OBRI) was completed. All historic data were collected from multiple databases maintained by state and federal agencies, including EPA STORET, USGS NWIS, USFS, NPS, OSM, TVA, the Tennessee Department of Environment and Conservation, the Kentucky Department of Natural Resources and Environmental Protection, and the North Carolina Division of Water Quality. A large database of water quality data was found for BISO and OBRI. Very little data were found from within BLRI, and what was found was from pre-1987 sampling. Trend analyses were performed at sites with sufficient data.

Wet Meadow, Blue Ridge Parkway (NPS Photo)

Major water quality issues for BISO are contamination from oil and gas extraction and coal mining (both current and historic), municipal pollution, and water withdrawal for municipal drinking water supplies. For OBRI, major issues are acid mine drainage from historic coal mines within the park, pollution from ongoing oil, gas, and coal extraction in the park's headwaters, municipal pollution, and water withdrawal for municipal drinking water supplies. At BLRI, significant issues related to long-term trends in water quality were atmospheric deposition of contaminants and acid precipitation, runoff and siltation associated with agricultural operations, and municipal pollution. A protocol for monitoring water resources in network parks was initiated in FY 2004. GIS project maps have been completed for BISO, OBRI, and BLRI, showing all 303d listed water bodies.

Arctic Network (ARCN)

FY 2004 was the first year of WRD funding ($151,000) for the water quality monitoring component in the network. Water Quality funds ($33,000) were used to initiate a cooperative agreement between NPS and the Arctic Research Consortium of the United States to help organize, facilitate, and implement two scoping workshops. Water quality funds ($60,000) were also used to set up a cooperative agreement through the Rocky Mountain CESU with Utah State University to begin to classify freshwater resources in ARCN using remotely sensed data and GIS layers. The balance ($58,000) was spent on operations, equipment, and logistics for field work and sample analysis.

Melanie Cook, Biotechnician for Yukon-Charley Rivers National Preserve, processes macroinvertebrate samples along the margin of a lake sampled in 2004. Gates of the Arctic National Park and Preserve. (Amy Larsen)

At a freshwater scoping workshop (the first of four planned) held in Fairbanks, AK, in June 2004, the network formulated its key water quality vital sign objectives, including 1) development of a network-wide monitoring plan, 2) coordination and selection of key personnel to implement a scientifically sound program, 3) conduct data mining activities, 4) develop conceptual models, 5) hold scoping workshops as needed, and 6) initiate baseline surveys and preliminary protocol development. Also at this workshop, Dr. Steve Young, Director of the Center for Northern Studies, presented a series of conceptual models depicting anthropogenic disturbances and potential effects of those disturbances on ARCN ecosystems. Formal, one day parkwide meetings were held with Western Arctic National Parklands (NOAT, CAKR, and KOVA) and GAAR staff to discuss water quality monitoring and other vital signs components. A remotely sensed baseline freshwater ecosystem survey was initiated in order to collect background information in GAAR.

Pilot Jay Martin lends a hand collecting macroinvertebrate samples along the edge of a lake sampled in 2004 after a forest fire burned all but the most saturated habitats. Gates of the Arctic National Park and Preserve. (Amy Larsen)

Central Alaska Network (CAKN)

Water quality monitoring funding for FY 2004 ($98,000) was allocated among salary for a term Stream Ecologist ($30,000), development of monitoring protocol for flowing water (lotic systems) and small lakes (lentic systems) through a University of Alaska CESU ($58,000), and holding a river scoping workshop ($10,000). Contracted tasks included the development and writing of protocols for water quantity and water chemistry monitoring and writing the final report for water quality. The network continues its efforts to establish an integrated sample design consistent with the overall landscape monitoring approach with a primary goal of aquatic resource monitoring to determine key factors that affect community structure and productivity in ponds and streams. The pilot project conducted in Yukon-Charley Rivers National Preserve was completed. The results were reported at the Technical Committee Meeting in April 2004 and incorporated into the sampling design for the network's small lakes. Hart Crowser, Inc., was contracted to research, compile, and synthesize Standard Operating Procedures most appropriate for measuring water chemistry, water level, littoral zone vegetation, macroinvertebrates, and chlorophyll "a" and to evaluate all methods used by other agencies to provide the highest level of data comparability. A cooperative agreement was established with Dr. Dave Verbyla of the University of Alaska Fairbanks to develop a protocol to measure water quantity of small lakes in the network that are susceptible to landscape drying and warming in response to climate change. This protocol will incorporate fine-beam Radarsat imagery to determine the surface dynamics of small lakes (<20 ha) on a weekly basis throughout the growing season.

Cumberland Piedmont Network (CUPN)

CUPN received $57,000 from WRD to initiate their Phase 3 Water Quality Monitoring Plan. All funds were used to support a water quality laboratory. $35,000 was dedicated to a water quality lab manager and $22,000 to laboratory operational costs, supplies, and equipment. With the assistance of the MACA geohydrologist, water quality sampling was performed at each of 39 fixed sampling locations, totaling 394 samples. Samples were analyzed for field parameters (air temperature, water temperature, specific conductance, dissolved oxygen, pH, and acid neutralizing capacity) and MACA lab parameters (selected cations, anions, total organic carbon, suspended solids, chlorophyll "a", fecal coliform, atrazine, and turbidity). Over 12,000 data records were entered into the database. The first round of WQ sampling at CHCH, STRI, NISI, and GUCO were completed as scheduled. The MACA lab was combined with three Western Kentucky University laboratories and relocated to the campus.

Viewshed of barn, associated pastures, and riparian zone of nearby stream at Carl Sandburg Home National Historic Site. (NPS Photo)

Eastern Rivers and Mountains Network (ERMN)

In FY 2004, the network received $63,000 from WRD. These funds were used to establish a cooperative agreement with Pennsylvania State University to review and summarize WRD's Baseline Water Quality Data Inventory and Analysis Reports for all NPS units in the network and to summarize existing 305(b) and 303(d) information on assessment and impairment status of all river

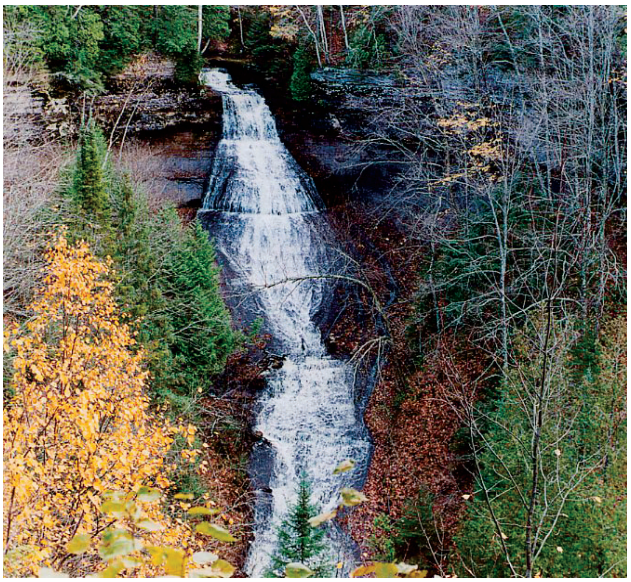
reaches within the watersheds containing each NPS unit in the ERMN. In addition, the university will 1) compile information on state-identified outstanding waters, special protection waters, and other water bodies in the network not officially recognized as such, but that are thought to be both pristine and ecologically highly significant at the park or network scale, and 2) identify ecologically significant stressors that have the potential to impact water quality within network parks. ERMN staff, park staff, and WRD worked together to develop a proposal to conduct a Level 1 water quality assessment.

Great Lakes Network (GLKN)

GLKN received $123,000 from WRD in FY 2004. With these funds the network completed a synthesis of past research and monitoring efforts of aquatic resources in the nine parks. Through an interagency agreement, the network partnered with the USFWS to develop a strategic approach for the identification of nuisance species and subsequent monitoring guidelines. The network allocated $24,721 for this project and an inland lake fish inventory at PIRO.

Blooms of blue-green algae (cyanobacteria) have been documented each summer on Kabetogama Lake in VOYA since the 1940s. More recently, parts of the lake were dominated by blue-green algae, igniting local concerns that the algae were becoming more widespread. The network allocated $8,000 for a private contractor to analyze fossil blue-green algae from a sediment core taken from the lake. Results of this investigation will reveal how the concentration and species composition of blue-green algae and other microfossils have varied throughout the last 150 years.

Several years worth of mussel specimen vouchers from SACN, MISS, and other network parks have accumulated at the Bell Museum of Natural History at the University of Minnesota. The network allocated $19,318 for the museum to process these vouchers and enter the information into a database. In addition, some salary was committed for network and SACN personnel to search other museum databases for network park mussel records, update all relevant NPS databases with the information, and update an educational mobile display of mussel vouchers. The final products for this project are expected in 2005.



Chapel Falls, Pictured Rocks National Lakeshore (NPS)

Network staff hosted an aquatic and air resources workshop in February 2004 and invited subject experts to discuss and score the candidate vital signs. Using criteria adopted by the network, participants scored the potential vital signs based on ecological significance and sensitivity/measurability. The network contracted with University of Minnesota Natural Resources Research Institute (NRRI) and the St. Croix Watershed Research Station (SCWRS) to assist in the development of written protocols and standard operating procedures for inland lakes (NRRI) and large rivers (SCWRS). This work will begin with the core water quality suite and add advanced parameters when logistically and economically feasible. The network spent approximately $61,000 in FY 2004 for this effort.

Greater Yellowstone Network (GRYN)

In 2004, the network received $71,000 from WRD to develop a monitoring plan for impaired (303d) streams on the Bighorn and Shoshone Rivers in BICA and for Soda Butte and Reese Creeks in YELL. This proved to a valuable step in understanding the content and format of the monitoring protocol and Standard Operating Procedures. Also, WRD funds were used to add contemporary YELL water monitoring meta-data into NPSTORET and the data cross-walked with the NPSTORET data fields. The network received final reports about using benthic macroinvertebrates as biological indicators and surface water classification in the network parks.

Gulf Coast Network (GULN)

GULN received FY 2004 funds totaling $89,000. Almost all of these funds were used to initiate a project with the USGS WRD (Baton Rouge, LA) and National Wetlands Research Center (Lafayette, LA) to development a water quality monitoring plan that will include a specific approach for identifying and prioritizing the network's short- and long-term water quality monitoring needs; identify water resource inventory data gaps; develop monitoring protocols and QA/QC plan; define network goals for project planning, funding, logistics, and implementation; and determine data management needs and protocols. A water quality coordination/kickoff meeting was held with the USGS on August 25, 2004.

Heartland Network (HTLN)

In FY 2004, HRLN received $90,000 for design and implementation of the water quality monitoring program. An interagency agreement with USGS was amended ($46,000) to continue implementing the USGS recommended monitoring plan for the contaminated portion of the Jacks Fork River at OZAR. Samples were collected using USGS water quality data collection protocols to ensure representative quality assured data for the spring or stream of concern. All samples were analyzed for nutrients, major ions, and suspended solids by the USGS National Water Quality Laboratory in Denver, CO. Measurements for pH, specific conductance, indicator bacteria, temperature, dissolved oxygen, and alkalinity were collected in the field. Microbial source tracking was utilized in a separate, but related, effort to identify bacterial sources.

The USGS also installed a real-time water monitoring site at HEHO at nominal cost to the network. This was an opportunity for the USGS to test the feasibility of using this technology at an easily accessible location where water quality monitoring was a high priority. This monitoring is in addition to the stage, temperature, precipitation, and discharge calculation that are part of a USGS demonstration at the park. The Core-5 parameters (temperature, specific conductance, pH, dissolved oxygen, and flow) were measured at the site. Data are available in tabular format for transfer to the network.

Support for water quality monitoring at the site also caused interest on the part of the State of Iowa in doing monthly water quality. A cooperative agreement with the State of Iowa ($13,000) resulted in an extensive sampling effort, involving several federal agencies and several divisions within the Department of Natural Resources, to sample the Core-5, nutrients, chlorides, bacteria, and other parameters on the Yellow River and its tributaries. Although the network only funded $15,255 for sampling immediately above EFMO (at the first location unaffected by Mississippi River backwatering), the activity spawned a large scale sampling effort throughout the watershed. Value obtained through the partnerships included approximately $46,000 of in-kind services on the Yellow River data collection. Data from the 2004 season are in the network database, and analysis will be done by the State.

The State of Minnesota is developing a TMDL for Pipestone River, which flows through PIPE. The network supported ($5,028) a seasonal employee to assist in sampling, data mining, and purchasing materials. The State will use data collected by the NPS and its partners to establish TMDLs. Finally, WICR began seasonal bioassessment work in June 2004 and added bacteria sampling to the bioassessment ($1,000).

Several FY 2004 projects address monitoring the water quality of impaired 303d listed streams. Network parks with identified 303d streams include CUVA, WICR, OZAR, EFMO, and PIPE. WRD-303(d) funds contributed to field testing of protocol, data collection, and cooperative ventures with state and county agencies tasked with TMDL determination and monitoring.

Klamath Network (KLMN)

The KLMN network received FY 2004 funds totaling $76,000 for the implementation of their water quality monitoring plan. Accomplishments included the retrieval of all water quality related reference material in all six parks, which was placed into the NatureBib database. The network contracted with the USGS Western Ecological Research Center (WERC) to conduct the baseline water quality inventories in LAVO, ORCA, and LABE. The Klamath Network held a vital signs workshop in May of 2004, at which an aquatic subgroup met to identify issues and develop conceptual models. KLMN staff also cooperated in the Pacific West Region Marine Workshop held in Oakland, CA, in March 2004 by compiling a short report on what marine inventory and monitoring was being done by the EPA EMAP for the west coast (sampling parameters, protocols, sites, and schedules). KLMN also entered into an interagency agreement with the USGS Forest and Rangeland Ecosystem Science Center and the USGS WERC to provide technical assistance to the parks through preparation of Phase 2 and Phase 3 water quality monitoring reports.

Mediterranean Coast Network (MEDN)

The network received $76,000 from WRD to support water quality monitoring activities. Water quality monitoring planning workshops were held at SAMO and CABR during the second quarter of FY 2004. Findings from these workshops assisted in summarizing water quality activities in and adjacent to network parks and in planning the network's approach to water quality monitoring. In April of 2004, the Resource Conservation District of the Santa Monica Mountains (in cooperation with MEDN) produced a summary report for network parks entitled Water Quality Monitoring Programs: Information Compilation and Evaluation. In addition, Dr. Hong-lie Qiu of the Department of Geography at California State University at Los Angeles was tasked with developing an interactive web based GIS database for presentation and analysis of water quality programs, activities, and resources that are of direct and indirect importance to network parks. This project was one of the first projects tasked under the newly established California CESU.

National Capital Region Network (NCRN)

In FY 2004, NCRN received $71,000 from WRD. These funds primarily supported a Network Water Quality Specialist, who conducted a variety of tasks related to development of a long-term water quality monitoring plan. A summary of sampling programs for mercury in waters, sediments, and fish tissues in DC, MD, and VA was completed. A listing of the surface waters in the region and their 303b and 305d status was completed, and the status of Total Maximum Daily Loads set by the states was summarized. The draft Phase 2 Monitoring Plan was disseminated for review and appropriate comments were incorporated in the final draft. Protocol Development Summaries for all water related vital signs

and draft protocol and SOPs for water chemistry monitoring were developed. A sampling schedule incorporating existing park monitoring sites was developed. Protocols for determining Physical Habitat Index, Macroinvertebrates, and Fish Index for Biological Integrity were developed.

North Coast and Cascades Network (NCCN)

In FY 2004, NCCN utilized $82,000 in WRD water quality monitoring funds to develop a stream protocol, to test montane lake and pond protocols, to conduct water quality planning, to test a synthetic hydrograph model for the network, and to develop intertidal and water quality monitoring in marine systems. MORA biological technicians updated the geo-referenced data bases and land-use maps for MORA, EBLA, SAJH, and FOCL with assistance from the MORA GIS specialist. An initial selection of potential field sites was made, but further review will be necessary. Pilot monthly field sampling was conducted on Lake Crescent (OLYM). Preliminary stable isotope analyses were conducted on nuisance blooms of periphyton in Lake Crescent. These data suggest that the technique is a promising one for determining the source of nutrient enrichment (i.e., anthropogenic vs. natural).

OLYM staff downloaded and maintained intertidal temperature dataloggers. The pilot data will be used to develop final intertidal protocol. OLYM staff also continued collection of pilot intertidal invertebrate and macroalgal community data at 5 rocky intertidal and 7 sandy beach sites.

An annual cycle of bacteriological sampling in collaboration with Surfrider Foundation volunteers was completed. But, because sampling results showed little to no bacteriological signal across the annual cycle and funding was limited, sampling was curtailed. The results will be used as a baseline for future potential sampling comparisons.

Northeast Coastal and Barrier Network (NCBN)

In FY 2004, NCBN received $90,000 from WRD. The funds were primarily used to support an effort by the USGS to evaluate data and information collected during field tests and to develop Phase 3 monitoring protocols for estuarine nutrient enrichment. The USGS also prepared draft Standard Operating Procedures (SOPs) for Spatial Sampling Design, Preparation of Logging Stations, Continuous Water Quality Monitoring, Spatial Water Quality Monitoring with YSI Sonde, Spatial Light Monitoring with LiCor PAR Meter, Chlorophyll “a” Sampling and Analysis, and Water Quality Data Reduction. The SOP for Spatial Sampling Design includes probabilistic sampling designs for all North Atlantic Coastal Parks (NCBN parks plus Acadia and Boston Harbor Islands) that were developed using methodology of the US EPA National Coastal Assessment with technical assistance of NCBN. Pilot studies for monitoring CACO seagrass sites were conducted in October, May, and July to determine the appropriate variables for inclusion in long-term monitoring and to provide a baseline for interpreting future annual data. Several projects initiated in previous years were brought to completion. A complete draft of the report Wetland and Water Quality Issues for Parks of the Northeastern US: A Scoping Report for the Coastal and Barrier Network (developed for ASIS, CACO, COLO, GATE, GEWA, FIIS, SAHI, THST) has been completed and reviewed. In addition, through a cooperative agreement with the University of Rhode Island, principle investigator Scott Nixon completed databases for Land Use, U.S. Census, Agricultural, Sewage, and Atmospheric N Deposition data. An extension of the Nitrogen Loading Model (NLM-E) was completed using the most accurate and recent land use data (1992). NLM-E was run for each park, including at 30-year historical analysis for ASIS. Lastly, an attempt at running the MANAGE nitrogen

source model resulted in the decision that the complexity of the model and time dedication required were not feasible for use in this project.

Northeast Temperate Network (NETN)

In FY 2004, NETN received $60,000 from WRD to continue the design of a water quality monitoring program. The funds were used in cooperation with USGS through an interagency agreement. The USGS cooperators worked closely with the network as a component of the core science team to select water quality and water quantity related vital signs presented in the NETN Phase 2 report. Network accomplishments included drafting a list of all potential freshwater vital signs that could potentially be important in NETN parks, facilitating a freshwater aquatic workgroup of water quality professionals to prioritize a draft list of water quality vital signs and justifications, compiling workshop proceedings, and preparing a final list of water quality vital signs and justifications with guidance from a technical steering committee.

Northern Colorado Plateau Network (NCPN)

In FY 2004, the network began its Phase 3 effort with the continuing $108,000 in water quality funding from the WRD. $42,800 was used to pay core permanent and term staff salaries, and $20,000 supported participation (0.25 FTE) of a term hydrologist (Zion National Park) in water quality planning to serve as the lead NPS contact and liaison between USGS WRD and NCPN. The balance of funds ($27,200) went to acquire instrumentation, equipment, and supplies to support implementation of water quality monitoring.

In June 2004, USGS WRD delivered an updated Microsoft Access water quality database, as well as updated GIS coverages, to the network. An assistance agreement was established to fund continued USGS WRD support during the first three years of water quality monitoring implementation. Also, an agreement was established with Dr. Anne Brasher of the USGS WRD to conduct a literature review, create conceptual models and write a monitoring protocol for aquatic invertebrates for NCPN and the Southern Colorado Plateau Network (SCPN). A draft literature review was submitted in September 2004, and conceptual models were provided in October 2004.

The network collaborated with SCPN through a Colorado Plateau CESU agreement with Northern Arizona University to develop inventory protocols and conduct an inventory of springs across both networks. Cooperators Abe Springer and Larry Stevens completed a literature review and conceptual model report, a classification report describing Colorado Plateau spring types, and draft inventory protocols in July 2004.

Pacific Island Network (PACN)

In FY 2004, PACN received $151,000 for its water quality monitoring planning efforts. Water quality monitoring funds were used to assist in identification of vital signs and in preparation of the monitoring plan. Also, an interagency agreement with the USGS was initiated for the entire PACN region to complete the water quality data inventory initiated by the Horizon Reports (completed only for Hawaii parks). Remaining funds were used to acquire field monitoring equipment for use in inventory and future monitoring projects (primarily an YSI multi-probe). Additional work completed in FY 2004 included water quality sampling as part of the EPA EMAP Coastal Watershed Assessment. This effort relied heavily on local park staff to conduct field work as well as contract out additional components of the sampling program.

In cooperation with the USGS WRD, Hawaii

District Office, the network is developing a tool that allows managers to quickly access all digital data, including identifying "exceedences" (where available data may have exceeded local, state, territory, or commonwealth standards). Through the preparation of Phase 2 of the network vital signs monitoring plan, a short list of water quality vital signs was identified for the 11 PACN parks. Additionally, a water quality topical report synthesized current knowledge of water quality issues throughout the network, provided hints of trends from available data, and provided access to additional information.

Rocky Mountain Network (ROMN)

In FY 2004, the network continued its second year of WRD water quality monitoring funding ($60,980). $59,780 was allocated to the USGS through a cooperative agreement to conduct water quality data mining and planning, and $1,200 covered a regional office assessment (2%) for management costs. Additional funding of $14,020 for the USGS interagency agreement was made through the I&M Vital Signs Monitoring Program due to the high priority given this vital sign and the final USGS negotiated cost exceeding WRD funding. During 2004, vital signs (including water quality) scoping meetings were conducted at all network parks. The network established a water quality workgroup to facilitate planning and develop strategies.

Following the model of NCPN and SCPN, the workgroup developed a request for proposals for water quality data mining/management. The workgroup reviewed three proposals and selected the USGS Denver District with Alisa Mast as principal investigator. Network staff will work jointly with USGS cooperators in a collaborative process to prioritize data sets and provide non-STORET and non-NWIS datasets to the USGS. The primary product will be a geospatial database with water quality data of high integrity for all network parks that can be used to manage future water quality monitoring data.

San Francisco Bay Area Network (SFAN)

In FY 2004, SFAN received $70,000 from WRD. These funds primarily supported a GS-09 Network Water Quality Specialist who conducted a variety of tasks related to development of a long-term water quality monitoring plan. A Preliminary Water Quality Status Report was completed for the network. This is a comprehensive report that includes information on surface hydrology, beneficial uses of water bodies, monitoring history, water quality issues, priorities, and recommendations for future monitoring. The report also includes summaries of water quality scoping meetings, a preliminary data analysis by UC Berkeley, and a summary of data in the WRD Baseline Water Quality Inventory and Analysis Reports. Monitoring continued for the Tomales Bay pathogen TMDL program (PORE/GOGA). Winter and spring water quality monitoring was conducted at five sites within PINN. Winter, spring, and summer water quality monitoring was conducted throughout GOGA (including the new Southlands and PRES). Sampling was conducted during a storm event at JOMU as well as in the spring and summer. NPS staff began monthly monitoring within PORE at significant fisheries watersheds with potential grazing impacts. Aquatic macroinvertebrate sampling was completed at twenty-three sites total within PORE, GOGA, PINN, and JOMU. A GS-7 (temporary) network hydrologic technician was hired in April 2004 to assist with operation and maintenance of hydrologic and meteorologic stations and protocol development for weather and freshwater dynamics (stream hydrology), two top indicators for the network.

Sierra Nevada Network (SIEN)

In FY 2004, the network received $63,000. $10,600 was dedicated to the salary of a physical scientist, who will be responsible for

conducting planning and implementation of the SIEN water quality monitoring program, assisting the Network Coordinator and Data Specialist with integrating water resources monitoring with the Vital Signs Program, and providing data management and planning support to other aspects of the Vital Signs Program. Existing water resources information was summarized for SEKI and DEPO. The final products were a literature review and report summarizing SEKI and DEPO water resources, management issues, stressors, and current and historic water resources monitoring sites and data. An EndNote database was also created and populated with the results from literature searches. $38,500 was used to establish an interagency agreement with USGS WRD to develop a water quality geodatabase for SIEN parks. Water quality data sets were prepared for upload into the geodatabase. STORET and NWIS data were prepared by USGS, while other park data sets were prepared by SIEN's physical scientist

Sonoran Desert Network (SODN)

The SODN received $64,000 from WRD in FY 2004 to continue the development of their final water quality monitoring plan. Over 50% ($41,000) of these funds were used to support the detail of a hydrologist from the Sonoran Institute, who compiled and reviewed water quality monitoring protocols from agency and research partners to evaluate their relevance to the SODN high priority vital signs related to water quality. The detailee gathered and assessed protocols from other agencies (Arizona Department of Water Quality, Arizona Department of Water Resources, USGS, and New Mexico Department of Water Resources). This information was used to refine candidate sampling designs for water quality and establish relationships for cooperative approaches to water quality monitoring with interested agencies and entities. An implementation plan was created to guide the development of monitoring protocols and strategies for SODN parks.

The remainder of the funds was used to purchase water quality monitoring equipment and to pay a regional 2% overhead assessment. USGS cooperators completed field data collection and analysis for baseline assessments of water quality parameters at selected SODN surface water bodies. Detailed inventories of aquatic macroinvertebrate communities were completed at TUMA and along the Santa Cruz River upstream of TUMA in conjunction with the baseline water quality data. Substantial progress was made in 2004 on cooperative approaches to water quality monitoring, a key facet in SODN's overall monitoring strategy. Potential sampling locations for SODN water quality vital signs developed in Phase 2 were refined in Phase 3 by site visits and staff interviews for each SODN park and through consultation with relevant agencies and subject matter experts. SODN produced a draft Phase 3 Monitoring Plan than integrates both vital signs and water quality monitoring into one document. A draft SODN Water Quality Implementation Plan was developed to support the integrated SODN Phase 3 Monitoring Plan.

Southeast Coast Network (SECN)

In FY 2004, SECN received $121,000 for water quality monitoring planning. Water Quality monitoring funds were used primarily to 1) compile existing water quality data, 2) determine whether existing monitoring was sufficient to meet NPS needs, 3) identify waterbodies of interest by compiling information on state-identified outstanding, special-protection, and imperiled waters, and 4) identify priority water quality issues for all network parks. Results were summarized in Appendix 8 of the SECN Phase 1 Vital Signs Monitoring Report, which was completed one year ahead of schedule. This appendix will be significantly revised, pending completion of total watershed assessment projects at

the network's coastal parks (CAHA, CALO, FOPU, CUIS, TIMU, and CANA).

As a part of completing the its Phase 1 report, the network reviewed existing historical water quality data (from the NPS Horizon Reports) and water resources management plans for potential water quality "red flags." Although the Horizon Reports provide a very thorough summary of baseline water quality data in most SECN parks, some of these reports are more than a decade old. As a result, recent trends in water quality will be further investigated in FY 2005.

Southern Colorado Plateau Network (SCPN)

For FY 2004 the network was allocated $124,000 from WRD to continue development of water quality monitoring for the network. Following subtraction of a 2% assessment from NPS, the network received $121,520 for water quality monitoring. The WRD funds were used to support scoping of water resource issues, to continue a project with USGS WRD to synthesize available water quality data, to hold a vital signs workshop concerning riparian and aquatic ecosystems, and to initiate protocol development for riparian ecosystems and aquatic macroinvertebrates.

SCPN continued an agreement with the Colorado District of USGS WRD (Principal Investigator: Kirby Wynn) to compile and summarize existing SCPN park water quality data in an Access database. USGS WRD will incorporate water-quality data pertinent to SCPN from the EPA Legacy STOrage and RETrieval (STORET) and STORET X (modern STORET) databases, the USGS National Water Information System (NWIS) database, state databases, and selected additional SCPN datasets into the Access database. With these USGS WRD efforts now including SCPN parks, an earlier cooperative endeavor between the Colorado District and NCPN expands the Access water quality database, now populated with a synthesis of data from across the entire Colorado Plateau.

Network staff, the region hydrologist and cooperators further developed management and scientific issues associated with park resources. Conceptual models for water resources have been fully integrated into the NCPN/SCPN conceptual model framework. Abe Springer and Larry Stevens of Northern Arizona University completed a literature review and conceptual model development for Colorado Plateau springs ecosystems, and a USGS BRD riparian ecologist completed a literature review and drafted preliminary riparian models for Colorado Plateau streams and rivers in FY 2004. SCPN held a vital signs workshop focused on riparian and aquatic ecosystems in March 2004. Results of the workshop are reported in SCPN Phase 2 Report.

Southwest Alaska Network (SWAN)

In FY 2004, $139,000 was allocated to this network, which is in the fourth year of planning for water quality monitoring. Funding was used to support a contract with Littorial Ecological and Environmental Services of Leucadia, CA, to characterize the composition and distribution of infaunal invertebrate assemblages inhabiting soft sediment intertidal flats. The contractor and NPS staff collected infaunal samples at 30 sites in KEFJ and 9 sites in LACL during May-June 2004. Sediment samples were collected at all sites for analysis of grain size, organic carbon, and nitrogen. In January 2004, the Network Technical Committee reviewed candidate vital signs in the context of how they relate to the conceptual ecosystem models and numerically ranked each of the vital signs based on ecological significance and relevance to park resource management and protection issues.

Water quality data collection in the Kijik River watershed, Lake Clark National Park & Preserve, 2004. (Dan Young)

The network continued to compile existing water quality data for SWAN parks, including USGS water quality data for warm springs in ANIA and published reports on water quality in ALAG. A seasonal water quality technician was hired to accompany the KEFJ fish inventory crew during the Summer of 2004. Core water quality parameters plus turbidity were sampled at all fish inventory sites, and profiles were taken at lakes and deep lagoons. Discharge was measured at all applicable sampling sites. A draft WQ Access database was developed for the KEFJ water quality sampling, and a final report on the FY 2003 water quality sampling in ANIA was completed in July 2004. $32,000 was allocated to USGS WRD Alaska for operation of the Johnson River gauging site in LACL. This site is of management concern and now includes a multiparameter water quality probe to collect water quality parameters required by WRD plus turbidity. $61, 734 was allocated to the University of Washington to provide the SWAN with recommendations for aquatic monitoring.

APPENDIX D

PUBLICATIONS/CONTRIBUTIONS AWARDS

PUBLICATIONS/CONTRIBUTIONS

Bedinger, M.S. and J.R. Harrill. 2004. *Analytical-Regression Analysis of Stage Fluctuations in Devils Hole, Death Valley National Park, Nevada*. Prepared under contract to the National Park Service. 10 pgs.

Back, J. Water Resources and Hydrogeologic Setting of the Chickasaw National Recreation Area. Testimony Presented Before the Oklahoma Resources Board, In Re: Application of Carolyn Hunt Sparks, October 28, 2003, and January 6, 2004.

Back, J. and T.T. Fisk. "Death Valley National Park Regional Flow System Science and Management 2004 and Beyond." Presentation at Devils Hole Workshop, Pahrump, NV. June 2, 2004.

Bell, R.2003. *Boston Harbor Islands National Park Area: National Wetlands Inventory Inland Habitat Accuracy Assessment*. Boston, MA: New England Aquarium, Edgerton Research Lab. 13 pgs

Cudlip, L., S. Kunkle, T. Clark, D. Worthington, J. Harte, W. Hansen, D. Vana-Miller, and J. Burghardt. 2004. *Capitol Reef National Park (Utah) Water Resources Management Plan*. Torrey, UT: National Park Service, Capitol Reef National Park. 170 pages.

Cutillo, P.A. Potential Impacts to Buffalo and Antelope Springs due to Proposed Groundwater Withdrawals. Testimony Presented Before the Oklahoma Resources Board, In Re: Application of Carolyn Hunt Sparks, January 6, 2004.

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AWARDS

Jim Harte received a STAR Award for his outstanding work in planning and implementing synoptic discharge projects to study ground-water and surface water interactions at MOCA and SAGU.

Cliff McCreedy received a Quality Step

Increase for his initiative and leadership demonstrated in the development and implementation of the coastal and marine component of the WRD's Watershed Condition Assessment Program. Through his efforts, he has been successful in attracting qualified CESU partners to assist initial coastal condition assessments for more than 22 units of the National Park system.

Joel Wagner received a STAR award for his oversight of a $1.3 million effort to restore the abandoned Snake River Gravel Mine at John D. Rockefeller Memorial Parkway into a mix of properly functioning wetlands, oxbow ponds and upland habitats.

Chuck Pettee received a Star Award for the outstanding job performed while serving as Acting Water Resources Division Chief November 2003 – February 2004.

Gary Rosenlieb received a Star Award for the outstanding job performed while serving as Acting Water Operations Branch Chief since February 2004.

Barry Long received a Star Award for the outstanding job performed while serving as Acting Water Operations Branch Chief December 2003 – February 2004.

Mark Flora received a Star Award for the high level of support provided to the WRD management team during the extended period when the Division Chief was on detail assignment, while at the same time continuing to perform his responsibilities as Planning and Evaluation Branch Chief at a high level.

Sharon Kliwinski received a Star Award for the outstanding level of support and leadership provided to the Division throughout 2004.

Gary Smillie received a Star Award for the outstanding job performed while serving as Acting Water Operations Branch Chief October 2003 – December 2004.
Debi Cox received a Star Award for the high level of support provided to the WRD management team during FY 04.

Flora Romero and Pat Wiese received Certificates of Appreciation for the high level of support provided to the ODC during the absence of a lead administrative assistant while at the same time continuing to perform their responsibilities for WOB and WRB.

APPENDIX E

STAFF

OFFICE OF THE DIVISION CHIEF STAFF

Bill Jackson: Acting 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 and water and natural resource policy issues.

Elizabeth Crisfield: Water Resources Washington Liaison for Everglades Restoration, BS in Physics, MS in Soil Physics. Specialty areas include Everglades soils and hydrology, Comprehensive Everglades Restoration Plan, and associated Everglades policies.

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

Kris Parker: Lead Administrative Assistant, AA in History and Business Management.

Carol Liester: Purchasing Assistant.

Laura Harte: Colorado State University Archivist, MA in Archival Science, MA in Historical Archaeology, BA in History with specialization in environmental and western history.

Kristin Martin: Administrative Support Staff, BA in Modern Languages (German).

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, and water quality.

Don Weeks: Hydrologist, MS in Geology (Hydrologeology). Specialty areas include water resources management planning, ground water monitoring, and wetland management.

Lael Wagner: Administrative Assistant.

WATER OPERATIONS BRANCH STAFF

Gary Rosenlieb: Acting 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 Assessment Program Coordinator, MS in Watershed Management. Specialty areas include surface water hydrology and data management.

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

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

Larry Martin: Hydrogeologist, MS in Hydrology. Specialty areas include 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.

Kim Johnson: Hydrologist. BS in Watershed Science.

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.

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.

John Christiansen: Colorado State University Research Associate, Clean Water Act Impaired Waters Project, MS in Civil Engineering.

Pat Wiese: Colorado State University Administrative Assistant, BS in Biology.

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 Leader, MS in Hydrology. Specialty areas include water rights policy and adjudications, surface water hydrology, and watershed management.

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

Jennifer Back: Hydrologist, MS in Watershed Science. Specialty areas include

surface water hydrology and water law.

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

Kathryn Converse: Research Associate, Colorado State University, BS in Earth Sciences, MS in Watershed Science.

Paula Cutillo: Hydrologist, BA in Environmental Policy and Analysis, MS in Ground Water Hydrology, 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.

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: Student Trainee (Hydrology), BS in Natural Resources Management, MS candidate in Watershed Science.

Bill Van Liew: Hydrologist, BS in Civil Engineering and 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.

Jennifer Friedman: Research Associate, Colorado State University, Monitoring and Enforcement Group, BS in Natural Resource Management (Environmental Policy).

Carmia Fiechtner: Student Hourly, Colorado State University, Adjudication Group, BS in Watershed Science.

Eric Lord: Research Associate, Colorado State University, Monitoring and Enforcement Group, BS in Mineral Land Management, JD, MS in Forestry.

Flora Romero: Colorado State University Administrative Assistant.

Water Resources Division

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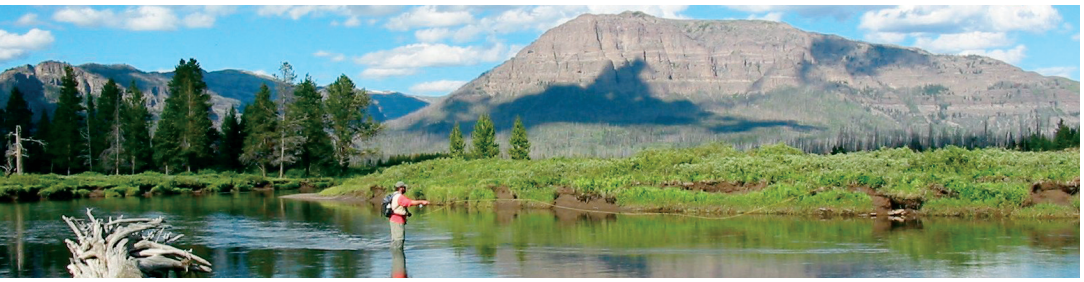

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