1997
Annual Report

Water Resources Division

The National Park Service Water Resources Division is responsible for providing water resources management policy and guidelines, planning, technical assistance, training, and operational 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, watershed studies, fishery management, and aquatic ecology.

TECHNICAL REPORTS

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Fort Collins, CO 80525

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P.O. Box 25287
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Cover Photos

Jean Lafitte National Historical Park & Preserve by L. Krueger
Resurrection River at Kenai Fords National Park by G. Smillie
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1997
ANNUAL REPORT

Water Resources Division

Natural Resources Report NPS/NRWRD/NRR-98/07

April 1998

United States Department of the Interior
National Park Service
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A Word From the Associate Director Natural Resource Stewardship & Science

By Michael Soukup, Ph.D.

This Annual Report provides a summary of the significant accomplishments of the Water Resources Division (WRD) of the National Park Service (NPS) in 1997. WRD provides servicewide technical assistance and advice with respect to the preservation, protection, and management of water and aquatic resources of units of the National Park System. The Division carries out a broad-based water resources program involving leadership in a variety of activities, including water rights; water quality; floodplain management; ground water analysis; watershed and wetlands protection; water resources management planning; fishery management; policy, legislative, and regulatory analysis; information management; and training. The Division's workplan is developed by an annual call to the field to identify park needs and determine WRD priorities. In addition to national program responsibilities, the Division provides day-to-day support to parks, clusters, support offices, regional offices, and the Washington Office (WASO) in addressing the myriad of water resources issues and concerns facing NPS. The Division is located in Fort Collins, Colorado (970-225-3500), with additional offices in Denver, Colorado, Washington, D.C., and Reston, Virginia.

I am extremely pleased with the accomplishments of WRD reflected in this Annual Report. These accomplishments are indicative of the professionalism of the Division and the ability of the Division to work cooperatively with management and staff of parks, clusters, support offices, regional offices, and WASO to effectively address water resources issues of concern to NPS. I should go on to emphasize that these accomplishments would not have been possible without the continuing cooperation and support provided by all organizational levels of NPS. These collective efforts have created the environment necessary to match the level of technical expertise to the water-related threats faced by national parks in a changing landscape.

Comments from the Division Chief

By Dan B. Kimball

As in previous years, 1997 proved to be an exemplary year for the Water Resources Division (WRD) of the National Park Service (NPS). The year was characterized by a number of significant accomplishments that are reflected in this Annual Report. However, 1997 was also a year of challenges for WRD in terms of meeting the ever-growing technical assistance needs of the parks while continuing to provide Servicewide water resources leadership. Some examples of significant accomplishments of WRD in 1997 include the following:

- With support of NPS's Servicewide Inventory & Monitoring Program, preparation of 44 park-specific water quality data inventory and analysis reports.

- Continuation of the operating partnership with the U.S. Geological Survey (USGS) to meet the long-term water quality needs of units of the National Park System by means of USGS's National Water-Quality Assessment Program (NAWQA) (e.g., through joint funding of pilot projects involving 12 parks).

- Major progress in preparing (or assisting in the preparation of) water resources management plans, scoping reports, and issue overviews for more than 20 parks.

- Involvement in major water resources issues facing NPS including the development of an Annual Operating Plan for the Colorado River; assessment of the effects of flooding at Yosemite National Park; evaluation of the proposed Eagle Mountain Landfill Project near Joshua Tree National Park, proposed lead exploration and mining upgradient of Ozark National Scenic Riverways, and a proposed power plant and lignite mine adjacent to Natchez Trace Parkway; restoration of the Elwha River in Olympic National Park; final reclamation of a uranium mill tailings site upstream of Canyonlands National Park; and evaluation of ground water issues at Cape Cod National Seashore and water quality issues at Biscayne National Park and Lake Mead National Recreation Area.

- Assistance in the development of fisheries management plans for St. Croix National Scenic Riverway, Glen Canyon National Recreation Area, Buffalo National River, Shenandoah National Park, and Colonial National Historical Park.

- Completion of a draft "Director's Order #77-1: Wetlands Protection" and draft "Procedures for Implementing Director's Order #77-1: Wetlands Protection."

- Restructuring of the Water Rights Branch of WRD to focus efforts on monitoring and enforcement of NPS water rights and funding of an "NPS water rights attorney" (utilizing an FTE of the Office of the Solicitor).

- Assistance in the replacement of Vendome Well to protect springs in the vicinity of Chickasaw National Recreation Area.

- Assistance in the development of programmatic oil and gas management plans and Environmental Impact Statements for Padre Island National Seashore, Big Thicket National Preserve, and Lake Meredith National Recreation Area.

- Significant participation in a natural resource management course titled "Fundamentals of Natural Resources for Professionals."

Many of the accomplishments listed above are described in more detail later in this Annual Report.

Consistent with the tradition of WRD, we are dedicated to providing technical assistance and advice of the highest quality to the parks and also to the national leadership on water resources matters which have Servicewide effects on units of the National Park System. I am extremely proud of the hard work and commitment to these goals that are demonstrated on a daily basis by the staff and management of WRD.

I should also note that the Division's efforts are greatly enhanced by the vigilance of park resource management staff in recognizing water resource issues and then contacting the Division for assistance. Our efforts are also supported by key staff in Regional and Support Offices and by the Division's Hydrologic and Fisheries Affiliates Program which is discussed later in this Annual Report.

The Water Resources Division will endeavor to remain focused on our principal mission, providing technical support to the parks. We will also endeavor to develop and implement new and more innovative, efficient, and cost effective ways to provide support to parks in preserving, protecting, and managing water and aquatic resources of the National Park System.

Washington Program Coordination Office Highlights

By William H. Walker, Jr., Ph.D., Program Coordinator and
Sharon Kliwinski, Washington Liaison

During 1997, the Washington Program Coordination Office emphasized providing effective support to the Associate Director, Natural Resource Stewardship and Science, and to the NPS Directorate on water-related and other natural resource issues. Whether participating in NPS and Department of Interior activities or representing the Water Resources Division and the NPS during interagency or intergovernmental endeavors, we tried to keep the preservation of park resources as our guiding focus.

Throughout the year, we continued many ongoing efforts, such as representing the Division and the Associate Director on the NPS Chesapeake Bay Task Force and at various Coastal America activities. The Task Force is becoming increasingly active with projects such as planning for restoration, where appropriate, of riparian forest buffers along park streams and developing, with the assistance of WRD, a manual to aid Chesapeake Bay watershed parks with guidance about "Bay friendly" management practices.

We also continued to serve on the steering team for the development of the multi-agency document "Stream Corridor Restoration: Principles, Processes, and Practices." This document represents a cooperative effort by many federal agencies to produce a common technical reference on stream corridor restoration. The final document will be available this fall.

The establishment in 1997 of the National Water Quality Monitoring Council, on which we represent NPS as one of ten Federal members, constitutes both a continuing and a new activity for us. It officially replaces but continues many of the functions of the former Intergovernmental Task Force on Monitoring Water Quality (ITFM), one task being to effect the recommendations of the ITFM final report. In 1998, the new Council will play a role in implementing the President's new Clean Water Action Plan.

An important task for this Office is serving as the NPS liaison to the Headquarters of the U.S. Geological Survey's (USGS) Water Resources Division and the USGS National Water-Quality Assessment Program (NAWQA). Cooperation in NAWQA, which is assessing status and trends in the quality of the nation's waters, led to new jointly funded projects in parks in 1997 (described elsewhere) and this partnership facilitated USGS assistance on other park resource questions such as groundwater issues. We continued to represent NPS as a member of the NAWQA Federal Agency Advisory Council and as a member of the USGS Ecosystem Program Advisory Committee. The decision by USGS to focus their new Ecosystem Program work in the Yellowstone and Mojave Desert regions should benefit a number of parks with improved ecosystem information.

The Program Office also became deeply involved in a number of new projects and activities in 1997. In October, on the 25th anniversary of the Clean Water Act, Vice President Gore announced a new initiative to tackle our nation's most serious water quality problems. The initiative called for the development of a Clean Water Action Plan within three months, leading to a period of interagency coordination and activity for us and others in NPS. The Action Plan aims to achieve clean water by strengthening public health protections; targeting watershed protection efforts; and preventing polluted runoff. Parks will benefit from this effort if proposed increases for cooperative NPS/USGS water quality monitoring and management activities are approved as part of the FY 1999 budget. The Program Office serves as overall NPS coordinator for the Clean Water Action Plan.

In a related effort, the Program Office represents NPS on the newly formed Federal Nonpoint Source Pollution Task Force, which is tagged with overseeing implementation of several Key Actions in the Clean Water Action Plan.

In 1997, the Program Office initiated a new liaison position with the U.S. Environmental Protection Agency. As NPS's representative to EPA headquarters, the Office intends to serve as a readily available resource to EPA to provide information and guidance about NPS, its mission and programs, and to improve communications and expand coordination and cooperation at the policy level.

During the year, the Program Office also became immersed in several additional new projects or issues. One came as a result of the mid-year decision that a Departmental team was needed to track and help on issues arising from Everglades ecosystem restoration. We participated as a member of that team to provide support and assistance to the Department, the Associate Director, and the three major parks in South Florida. Another new project came about at year's end as a result of a recent report by the International Joint Commission (IJC). The IJC, charged with preventing environmental disputes along the boundary between the United States and Canada, recommended several actions which could affect border parks. We represented NPS at meetings convened by the State Department to examine the report recommendations.

In summary, the year was busy and productive for the Washington Program Office. We continued our commitment to partnerships and our focus on preserving resources. We look forward to serving the Service and the Water Resources Division in 1998 and to working with colleagues at every level of the organization. We wish to serve in any way we can and invite calls if we may be of assistance.

Planning and Evaluation Branch Highlights

By Mark Flora, Branch Chief

The year 1997 was a highly productive and rewarding one for the Planning and Evaluation Branch (PEB). It was also a year of change. Early this year, David Vana-Miller was selected to be the Program Leader for PEB's Planning Program. Dave joined the PEB staff about two years ago after a long career with Denver Service Center. While with PEB, he has been the primary author of the highly successful Timucuan Ecological and Historical Preserve and Roosevelt-Vanderbilt Water Resources Management Plans.

During the year, PEB also lost two key staff members. Dr. Frank Panek accepted a position with the US Fish & Wildlife Service in Arlington, VA, and Dave Sharrow moved to Utah in support of his wife's career advancement. Both had made significant contributions to the Water Resources Division over the last several years and will be missed. However, WRD was extremely fortunate in attracting highly experienced candidates to fill in behind Frank and Dave. Jim Tilmant joined PEB as the Fisheries Program Lead in November, bringing with him almost 20 years of experience working with freshwater and marine fishery resources at Biscayne National Park, Everglades National Park, and, most recently, Glacier National Park. Don Weeks transferred into Dave Sharrow's position from Big Cypress National Preserve where he was instrumental in developing the Preserve's Water Resources Management Plan. Both Jim and Don have transitioned in such a manner that neither program has lost any momentum!

During the year, PEB, working cooperatively with park staff and other agency cooperators, was able to assist in the completion of water resources management plans for eight NPS units. In addition, water resources scoping reports were published for five NPS units. WRD also continued to provide funding support and technical assistance for continuing efforts to complete water resources planning activities at eighteen park units.

PEB's capacity to provide park specific support continues to be enhanced through the Water Resource Division's Hydrological Affiliates Program. This program of cooperative resource sharing between WRD and park personnel with specialized water resource skills, enabled WRD to support efforts by David Mott (Buffalo National River) to lead a water resource scoping assessment at Grand Teton National Park and Joe Meiman (Mammoth Cave National Park) to assist in the analysis of hydrological implications of general management plan alternatives for Oregon Caves National Monument. In addition, Kevin Berghoff (Glen Canyon National Recreation Area), David Mott, and Jon Reidel (North Cascades National Park) completed the water resource scoping reports for Canyonlands National Park/Arches National Park/Natural Bridges National Monument, Saguaro National Park, and Lake Roosevelt National Recreation Area, respectively. We are very pleased that this relatively new program continues to be a win-win situation for WRD/parks, on the one hand, and the Affiliates on the other.

It was also a productive year for the Division's Wetlands Program. PEB wetlands staff approved study plans and funding for FY 97 projects at Ozark National Scenic Riverways (riparian wetland studies), Delaware Water Gap National Recreation Area (wetlands restoration), Pecos National Historical Park (stream and floodplain restoration design), Petrified Forest National Park (riparian zone restoration), and Glen Canyon National Recreation Area/Canyonlands National Park/Grand Canyon National Park (inventory and characterize springs and associated wetlands). Wetlands staff also guided the proposal development and funding process for seven additional projects scheduled to begin in FY 98 at Jean Lafitte National Historical Park and Preserve (evaluate control of Chinese tallow in forested wetlands), San Juan Island National Historical Park (inventory and characterize wetlands), Fire Island National Seashore (monitor estuarine wetlands), Big Bend National Park (restore wetlands), Capitol Reef National Park (evaluate hydrology/ecology of a threatened wetland), Pecos National Historical Park (restore stream and floodplain), and Denali National Park and Preserve (map wetlands).

PEB's wetland scientists worked closely with other WRD and park staff on a broad range of wetlands technical assistance projects during the year. Examples included: 1) assisting in preparing wetland/floodplain Statements of Findings for two flood control projects at Wrangell-St. Elias National Park and Preserve; 2) designing a restoration plan for a drained savannah wetland at Moores Creek National Battlefield; 3) studying the vegetation, topography, and hydrology of "reference" wetlands for use in restoring the Snake River Gravel Pit at John D. Rockefeller, Jr. Memorial Parkway; 4) assisting Padre Island National Seashore, Big Thicket National Preserve, and Lake Meredith National Recreation Area in developing oil & gas management plans/EIS's, and; 5) assisting Buffalo National River in preparing a response to a Section 404 permit application for construction of a dam that would threaten park resources.

Servicewide activities were also an important Wetlands Program component in FY 97. PEB staff prepared NPS comments on several proposed federal wetlands laws and regulations. The most significant was the "State Water Sovereignty Protection Act," which would have restricted NPS use of federal reserved water rights and would have allowed states to restrict or remove federal authority to regulate wetlands under the Clean Water Act. Comments on this bill focused on the effects of losing these vital resource protection tools. Comments were also sent to the U.S. Fish and Wildlife Service's National Wetland Inventory program on a proposed riparian definition and on proposed riparian inventory/mapping procedures for the western United States.

Wetlands staff also completed (draft) final versions of "Director's Order 77.1: Wetlands Protection" and "Procedural Manual #77.1: Wetlands Protection." Once approved by the Director, these documents will clarify, update, and streamline NPS policies and procedures for protecting the more than 16 million acres of wetlands managed by NPS. These proposed procedures and recent changes in federal wetland regulations were incorporated into three wetland training sessions presented to resource managers during the year.

WRD's Fishery Management Program assisted with funded projects at five parks in 1997. The first of these involved stream habitat restoration at the old Hidden Valley Ski Area in Rocky

Mountain National Park. Log coverings were removed from the Hidden Valley Creek and favorable riffle-pool ratios restored to a one-mile stretch of stream, improving aquatic habitat for the greenback cutthroat trout. WRD funding was also provided to Pictured Rocks National Lakeshore to conduct investigations into the nature of bottom sediments at Beaver Lake and to determine possible sedimentation effects on walleye reproduction and recruitment. Beaver Lake has been subjected to annual stocking of walleye by the Michigan Department of Natural Resources but has sustained only limited reproduction. This study provided information that is now assisting the park in formulating long-term fishery management objectives for Beaver Lake. At Antietam National Battlefield, WRD's Fisheries Program assisted in the design and funding of a project to reduce the adverse impacts of cattle grazing on tributary streams to Chesapeake Bay. The project was a part of an interagency program to reduce nutrient loading and subsequent eutrophication of the Chesapeake Bay system.

Two new fishery related projects were started this year with WRD funding and staff assistance. At Saint Croix National Scenic Riverway, an aquatic habitat assessment and classification project was initiated that involves the development of a hierarchical framework through which aquatic habitats are classified. At Rock Creek Park, WRD has assisted in a project initiated to improve vernal and persistent pool habitat for declining amphibian species. Of sixteen species of amphibians recorded in the park during the 1940's, six have been extirpated and seven have populations that are at risk of disappearance. One of the key habitats for amphibians, vernal pools, has become severely limited due to hydrologic changes stemming from urbanization of the watershed. This project is seeking to identify historic and opportunistic sites where vernal and more persistent pools could be re-established and, in the second year, develop those sites.

The Fishery Management Program continued to provide technical assistance. A technical evaluation team, pulled together by WRD, visited Guadalupe Mountains to assist the park with an assessment and feasibility study for the re-establishment of native Rio Grande cutthroat trout and the Rio Grande chub into McKittrick Creek. WRD staff also made a trip to Kalaupapa and Kaloko-Honokohau National Historic Parks to assist with fisheries issues. At Kalaupapa, coastal reef resources within the park are being subjected to increased fishing harvest and there is concern for adequate protection of reef resources. At Kaloko-Honokohau, naturally occurring wetland ponds exist that were historically used by the native people to capture and rear native fishes for religious and subsistence purposes. Restoration of these structures has been given a high priority by park management and assistance is needed to establish and maintain a healthy pond system and restore native species that were historically raised within these ponds. The Fisheries Program has continued to work with the resource management staff at New River George and provide technical assistance in developing long-range management plans for their fishery resources and to address state stocking issues in New River tributaries. Through the WRD funded Fisheries Affiliates program, Great Smoky Mountains provided assistance to Shenandoah National Park with the compilation and statistical analysis of trout stream survey data, and Saint Croix National Scenic Riverway provided assistance to WRD in developing a technical review and guidance to parks on freshwater mussels.

The Water Resources Planning Program

By David Vana-Miller, Hydrologist

The preservation, conservation, and protection of water resources within units of the National Park Service is strongly supported in federal legislation, such as the National Park Service Organic Act, Clean Water Act, Safe Drinking Water Act, National Environmental Policy Act, Endangered Species Act, and several executive orders. Additional protection for water resources is found within state-specific water resource statutes, and may also be found in a park's enabling legislation. Proper management of water resources within National Park System units is becoming more complex and challenging as threats to this precious resource, both internal and external to park boundaries, increase. Planning is an essential step in comprehensively understanding the hydrologic environment and addressing complex water resource issues faced by many of these park units. A growing program, initiated by the Water Resources Division in 1991, involves assisting units of the national park system with their water resources planning needs. This program offers several products, depending on the specific needs of parks. These products include Water Resource Issues Overviews, Water Resources Scoping Reports, and Water Resources Management Plans.

Water Resource Issues Overviews, Scoping Reports, and Management Plans are guided by a park's General Management Plan, the overarching plan for a park unit, and complement a park's Resources Management Plan by expanding on the water resource information, objectives, issues, and needs. In addition, the program offers basic procedural assistance and review of draft General Management Plans and Resources Management Plans. This planning program is implemented via project funding and technical assistance from the Service's Water Resources Division.

Water Resource Issues Overviews
Water Resource Issues Overviews provide a preliminary identification of major water resource issues and management concerns. They are often done to support other, ongoing planning efforts such as the development of General Management Plans and Resources Management Plans. Typically, Water Resource Issues Overviews are quick response documents requiring a minimal turn-around time.

Water Resources Scoping Reports
Water Resources Scoping Reports typically identify and analyze major water resource issues and management concerns; summarize existing hydrological information; and determine if the National Park Service unit warrants the preparation of a more comprehensive Water Resources Management Plan. If a Water Resources Management Plan is needed, its cost is estimated and mechanisms for its completion are recommended. Otherwise, project statements are developed to address the major water resource issues/concerns. In certain cases, when already known water resource issues/concerns are complex and/or numerous, a National Park Service unit

may default to the development of a Water Resources Management Plan. Water Resources Scoping Reports usually require approximately six months to complete.

Water Resources Management Plans

Water Resources Management Plans structure and use information about a National Park Service unit's water resources and water-related environments to: 1) identify and thoroughly analyze water resource issues and management concerns; 2) provide a detailed description of the hydrologic environment and summary of existing water resource information and data; 3) assist management in developing and evaluating alternative actions (i.e. project statements), as appropriate, concerning the issues; and 4) select a preferred course of action. The Water Resources Management Plan defines a programmatic approach for addressing complex water-related issues, and, as such, is a blueprint for the resolution of water resource issues over a 5 to 10 year period. One to two years are required to complete a Water Resources Management Plan.

Interagency Coordination

Water Resources Scoping Reports and Management Plans typically pave the way for cooperative efforts between the National Park Service and other stakeholders, including federal, state, and local agencies, and Native Americans. During the development of these documents, emphasis is placed on multi-agency participation and review. This has produced local and regional endorsement of National Park Service's management direction for addressing water resource issues at several park units. For example, federal, state, and local agencies, and two local Native American Tribes were actively involved in the review of the 1996 Water Resources Management Plan for Big Cypress National Preserve, Florida. Many of their comments were incorporated into the final plan, resulting in a common agreement toward preserving and protecting South Florida's water resources.

Colonial National Historical Park was established to preserve the site of the first permanent English settlement in North America and the scene of the culminating battle of the American Revolution. However, water resources are important landscape features in this park that need protection. Wetlands cover approximately 27 percent of the 9,327-acre park. More than 33 miles of shoreline along the James and York rivers bounds the park, and 55 miles of perennial and intermittent streams flow through the park.

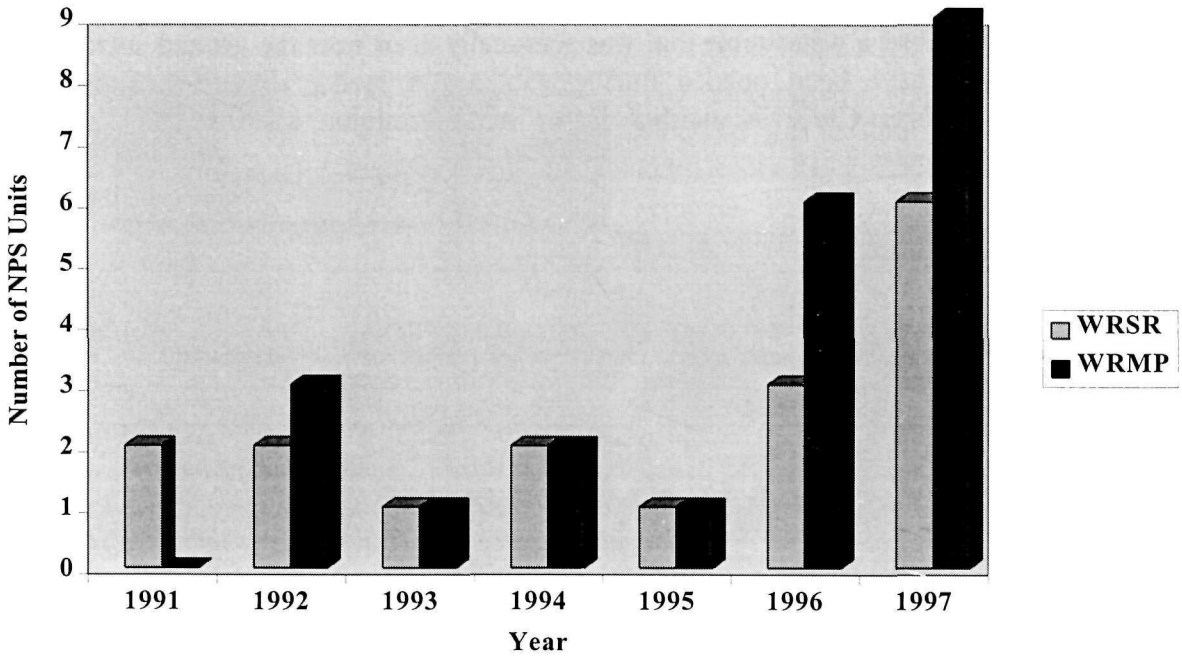
The park's 1994 Water Resources Management Plan was the first step towards a holistic approach to protection of these important water resources. This plan has increased cooperation between the park and local governments in addressing erosion/sedimentation and stormwater issues, and resulted in several cooperative agreements with state and federal agencies and universities on such projects as mapping and analysis of springs and seeps, developing a regional geohydrological framework, and understanding sinkholes.

Public Awareness and Education

A logical step after completion of a Water Resources Scoping Report or Management Plan is the transfer of the technology to the general public. This process requires active involvement

between a park unit's resource management and interpretive staff. A summary is completed that captures the primary water resource issues and management objectives for the park unit. This informative summary should assist the public in better understanding the management direction of the park unit.

Annual Production of Water Resources Management Plans (WRMPs) and Water Resources Scoping Reports (WRSRs) for National Park Service Units



Progress in Restoring a Savannah Wetland at Moores Creek National Battlefield, North Carolina

By Joel Wagner, Hydrologist and
Michael Martin, Hydrologist

Moores Creek National Battlefield is working with the Water Resources Division, the U.S. Environmental Protection Agency (Region 4-Atlanta), and the North Carolina Natural Heritage Program to restore a partially-drained wet meadow north of the park's visitor center back to historic conditions. Prior to drainage and other management activities early in this century, the historic wetland system included pocosin[1], savannah[2], and bottomland hardwood forest community types. Fire frequency and topography were critical factors in determining which of these communities existed at any given time or location. The historic system would have had a water table that was seasonally at or near the ground surface in most years, and would have been ponded during winter and spring in wetter years. Periodic flooding from Moores Creek is another factor in determining historic and present plant communities at this site.

Since the early 1900's, this 3.5-acre area has been subjected to a variety of management activities, including drainage, mowing, burning, seeding, and fertilizing. At present, a drainage ditch and periodic mowing and burning are maintaining the site as a meadow dominated by weedy herbaceous and woody plants. However, portions of the site still harbor relic populations of insectivorous plants such as Venus' fly-trap (Dionaea muscipula) and yellow pitcher plant (Sarracenia flava), state endangered plants such as Carolina Grass-of-Parnassus (Parnassia caroliniana) and spring-flowering goldenrod (Solidago verna), and a number of other plants native to the historic savannah/pocosin/bottomland hardwood forest systems. In keeping with its mandate to preserve and manage the historic landscape, Moores Creek National Battlefield now wants to restore a savannah wetland habitat at this site.

A number of significant steps have been taken toward meeting the park's savannah restoration objectives. In late 1996, we installed 14 shallow observation wells and completed a

topographic map of the area in order to evaluate site hydrology under existing (disturbed) and future (restored) conditions. Park personnel measure water levels biweekly and transmit the data to the Water Resources Division for data entry, verification, and analysis. By monitoring water levels and vegetation conditions before and after restoration actions have been implemented, we can evaluate restoration success and assess the need for plantings or other management actions, if needed.

During 1997, the Water Resources Division, the Environmental Protection Agency, and the North Carolina Natural Heritage Program collaborated on several other preliminary steps in the restoration process. First, we completed an assessment of existing vegetation conditions, including a map of plant communities, locations of rare species, and identification of relic savannah/pocosin species. Second, we developed recommendations for a prescribed burn regime that will help control invasive weeds and promote recovery of native savannah plant species once hydrology is restored. Third, we recommended a hydrologic experiment that will allow us to preview and evaluate the effects of permanently removing the drainage system.

The proposed experiment involves blocking the existing drainage system at key locations in order to simulate its removal. Park personnel will monitor the well network over the course of the experiment, and the Water Resources Division will characterize and evaluate the "restored" hydrologic regime. This temporary hydrologic restoration will be made permanent if the experimental results meet park management objectives. The new fire regime will be instituted during the experimental period in order to begin controlling invasive plant species (primarily sweetgum and briars) and to establish conditions necessary to restore the historic savannah habitat. Hydrology and vegetation monitoring will continue after the drainage system is removed to allow periodic evaluation of restoration success.

Footnotes:

[1]***Pocosins*** *are wetlands that are dominated by evergreen shrubs such as titi (Cyrilla racemiflora), red bay (Persea borbonia), and fetterbush (Lyonia lucida). They typically form on saturated, acidic, nutrient-poor sandy or peaty soils located on broad, flat plateaus that are subject to periodic burning (approximately 10-25 year cycle).*

[2]***Savannahs*** *are wetlands that are typically associated with pocosins, but tend to occur on slightly higher ground. As a result of their more frequent burn cycle (approximately 3-5 years), they are more open, grass- and herb-dominated communities with scattered longleaf pine (Pinus palustris). Insectivorous wetland plants such as Venus' flytraps (Dionaea muscipula) and yellow pitcher plants (Sarracenia flava) are also found in savannahs due to the more open canopies.*

Water Rights Branch Highlights

By Chuck Pettee, Branch Chief

The 1997 calendar year was a year of introspection and personnel shuffling for the water rights program. As a result, the branch has a modified internal structure and, while there are not many new faces in the office, there are some different faces in leadership roles. I am personally excited about these program changes and believe the NPS water rights program will greatly benefit.

We have recently planned and implemented an internal restructure. The instigation for restructuring came from a realization by branch staff that, while adjudications have not disappeared, more and more of our work is related to monitoring and enforcement of NPS water rights. Adjudication settlements must be implemented and, as the NPS in general has become more aware of the potential for nearby water development to impact park resources, more attention must be paid to local water development proposals. At the same time, the branch had several positions vacant. Both the need and the opportunity to restructure came to the forefront in 1997. In meeting this challenge, we maintained our "teams" approach but have dedicated more staff resources to carry out information gathering and monitoring and enforcement activities. Our intent is that these changes will not be visible to the parks and regions (our "customers") while our success in protection actions will be enhanced because we are better prepared and we will have better information.

As reported in last year's overview, the Water Rights Branch (WRB) and the Office of the Solicitor have implemented an agreement whereby the SOL provides a position and WRB provides funding for an attorney dedicated to work with WRB on NPS water rights issues. Many park staff will agree that our "NPS water rights attorney" has aided protection efforts considerably. In a following article, Peter Fahmy gives us the benefit of his experience in joining natural resources science with water law to bring the best case possible for protecting resources.

As I mentioned above, monitoring of water developments near parks and participating in appropriate administrative or court processes to ensure protection of park water rights and water-related resources is a steadily increasing endeavor. The two keys to a successful action are timely responses and having information sufficient to delineate potential impacts. Timely response is largely a result of park staff being aware of water development activities near their parks. In some cases, WRB dedicates a significant amount of personnel resources to assist parks in reviewing water rights application notices. Impact delineation is often very technical in nature so WRB maintains a staff of professionals in surface and ground water hydrology to assist parks in these highly specialized fields.

Sometimes, amid the flurry of water rights quantification and enforcement activity, there comes an opportunity to actually fix a water resource problem. WRB seized such an

opportunity at Chickasaw NRA in 1997. During the early days of this park's existence, private and public wells poked holes in an artesian ground water system near important fresh and mineral water springs. Over the decades since, some of these important springs have ceased flowing while the old drill holes have gradually corroded and collapsed. WRB and park staff have planned a strategy to gain some control over these old wells with the hope of protecting the remaining springs and possibly reviving the former springs. One of the old and uncontrolled wells is the Vendome well, a park well that is valued by generations of park visitors and local citizens as an historic fountain of mineral water. Vendome is also one of the larger artesian wells in the area and very close to the impacted park springs. It was obvious that, if we expected the local citizens to help, NPS would have to begin by putting its own house in order. In 1997, the park and WRB worked together to design and fund a replacement well for Vendome. In a following article, Paul Christensen explains this effort in more detail.

Remember that park management and staff are more aware than WRB staff of issues in and surrounding their park and the potential for impact to water-related resources or water rights. We are thankful for the availability and professionalism of park management and staff and appreciate their critical role in the success of the NPS water rights protection program. We continue to encourage field managers to call upon WRB whenever water rights issues are, or could be, affected by management decisions or proposals by park neighbors.

Vendome Well and Springs at Chickasaw National Recreation Area

By Paul K. Christensen, Hydrologist

Chickasaw National Recreation Area (CHIC) is located in south central Oklahoma. The Platt District of CHIC includes the Sulphur Springs Reservation, which was created in 1902 from lands of the Chickasaw and Choctaw Indian nations. The reservation was established "...for the proper utilization and control of ... springs and creeks," which occur in the District. Later the reservation was enlarged, and in 1906 became Platt National Park. In 1976, the park was included in CHIC. (See Wikle and others, 1998, for additional detail.)

The Platt District is historically significant because of its fresh- and mineral-water springs which are a focal point of visitor activity and a principal natural resource at CHIC. Prior to the settlement of the area by non-Native Americans, the abundance of water attracted peoples from several Native American tribes. These groups valued the spring water for its reputed medicinal purposes and viewed the springs as sacred places. Later, other Americans came to appreciate and enjoy the waters of the District.

The discharge of the springs ranges widely; some springs emit only a few gallons per minute (gpm), while others emit more than 1,000 gpm. The water issuing from the springs is derived from a carbonate-rock aquifer that extends miles beyond CHIC. Throughout this century, artesian flowing wells have been completed in the carbonate-rock aquifer to take advantage of the abundant inexpensive source of ground water. These wells are located several hundred feet to several miles away from the springs. The city of Sulphur, adjacent to the Platt District, is one entity that withdraws water from the aquifer to meet its water-supply needs. In addition, the city provides CHIC with drinking water for the District.

Theoretically, withdrawals from the carbonate-rock aquifer, if large and of a sufficiently long duration, could cause widespread declines in the hydraulic head of the aquifer and thus diminishment or elimination of spring discharge. In fact, the discharge from some springs in the District has ceased or diminished; and, in particular, two springs highly valued for their reputed "mineral" value "dried up" in the 1970's. Thus, management is concerned about the effects ground-water withdrawals, including those of the NPS, might have on spring discharge.

One artesian flowing well, Vendome, is located in the Platt District. The well was constructed in 1922 and has flowed freely since its construction, becoming a popular tourist attraction. Before the National Park Service (NPS) acquired the well in the 1970's, Vendome well provided water for facilities, such as a swimming pool, which have since been removed. Many of CHIC's visitors stop at the well to observe the fountain of gushing water, drink the water, and collect the water in containers for later use. The slightly mineralized water issuing from the well has a sulfurous taste and smell, which some find offensive. In addition, the well sits in an historic

stone fountain, and water issuing from the well flows through an historic stone-lined channel into a wooded park where visitors jog or take leisurely strolls (see Figure 1.)

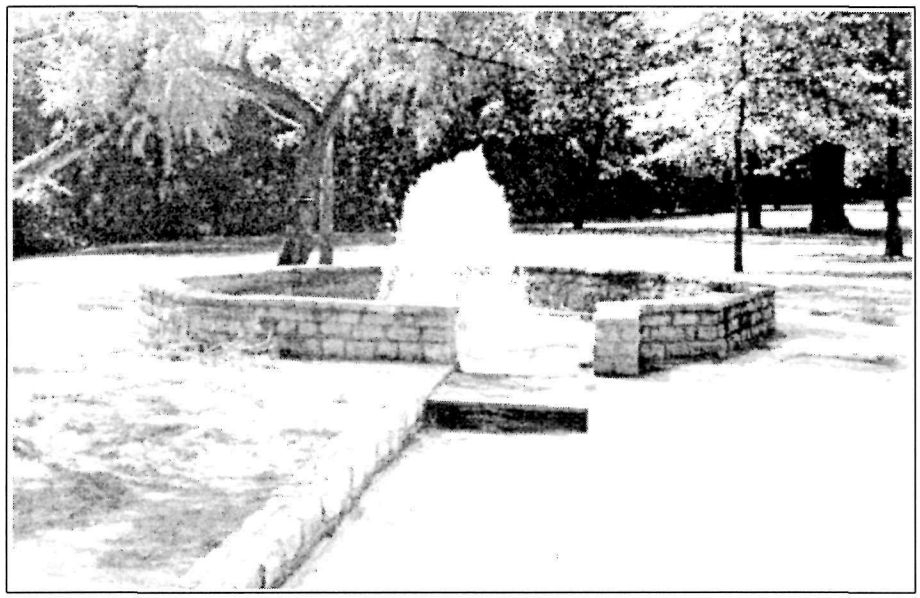


Figure 1. Photograph of Vendome well showing historic stone fountain and stone-lined channel (from Wikle and others, 1998).

Vendome well reportedly was drilled to a depth of about 370 feet, is completed in the carbonate-rock aquifer, and produces water from about 325 feet below land surface. Initially, water issued from the well flowed at about 2,500 gpm. Over time, however, well discharge has waned to about 600 gpm. This decline in well production, some surmise, is evidence that the hydraulic head of the aquifer has declined. In addition, the large discharge rate from the well over such a long period of time may have contributed to the decline in spring discharge.

The hydrogeology of the Vendome well area is complicated, characterized by several geologic structures (including faults), and solution channels in the underlying carbonate-rock aquifer. The solution channels are the main conduits of water in carbonate rock and are formed by the dissolution of carbonate minerals along joints and fractures in the rock. An overlying rock unit confines the carbonate-rock aquifer, causing the artesian flowing conditions. Unfortunately this rock unit also conceals the geologic structure in the carbonate-rock aquifer, making it nearly impossible to decipher the features associated with the solution channels. Thus, obtaining sufficient hydrogeologic information to determine which wells are causing spring-flow decline would require substantial resources. Even then, there would be no guarantee that the information collected would allow for the identification of discharging wells (possibly including Vendome well) that affect spring discharge.

A feasible and perhaps much less costly means of restoring hydraulic head and spring discharge, as well as maintaining the viability of Vendome well as a historic feature, is to reduce the well

withdrawals from the carbonate-rock aquifer. Hypothetically, plugging unused flowing wells, controlling the discharge from flowing wells, and reducing wastage would decrease discharge from the aquifer, thus raising the hydraulic head and perhaps restoring spring discharge. Obviously, NPS must first control the discharge from Vendome well before asking its neighbors to plug their unused flowing wells and limit the discharge from other wells.

As a first step, NPS investigated the possibility of placing control valves on the well. In 1978, the U.S. Geological Survey conducted borehole geophysical tests on Vendome well. The results of the down-hole logging indicated that the well casing was damaged. In 1980, a contractor inspected the well casing using a down-hole camera. The contractor lowered the camera to a depth of about 325 feet where the hole was blocked by debris. The video log also indicated substantial damage to the well casing which, in part, is encrusted and corroded from land surface to the bottom of casing (about 300 feet). In fact, gaps in the casing occur at several intervals. In 1995, after examining this information, engineers of NPS's Geologic Resources Division determined that the well casing could not be repaired, and the discharge could not be controlled using the existing well casing. NPS management then decided to (1) construct a new well nearby, (2) plug and abandon the existing well, and (3) construct control valves and underground plumbing from the new well to the stone fountain.

In mid 1997, CHIC and WRD staff prepared a solicitation with the assistance of U.S. Bureau of Reclamation engineers to do the work described above. The contract was awarded in August 1997, and construction began in October 1997. The new well was constructed about 30 feet away from Vendome well (see Figure 2.) The well was drilled to a depth of 400 feet but a mere 40 gpm of water flowed out of the well. Further, the water was not as mineralized as Vendome well water. The absence of a discharge rate similar to that of Vendome well, only 30 feet away and within in the same depth interval, is characteristic of carbonate-rock aquifers and their "wandering" solution-channels.

Drilling continued, and several fractured zones and solution cavities were encountered. Discharge increased as the drilling bit passed through each fractured zone and solution cavity and continued to as depth of about 750 feet. At that depth, steel pieces of the drilling bit broke off in the hole. The new well produced about 1,000 gpm and the water issuing from the well smelled and tasted like the water flowing from Vendome well, a requisite for a successful venture. After the valve on the new well was opened fully, the Vendome well fountain height decreased, indicating that the deeper solution channels encountered in the new well are connected to the shallower ones in Vendome well.

At the time, obligated funding was insufficient to complete the project, and work ceased. Later, CHIC management requested and received additional funds to complete the work. Construction is scheduled to begin again in spring 1998.

To begin the reversal of the process of declining spring and well discharge, NPS determined that discharge from Vendome well must be controlled. However, CHIC management wishes to reduce the rate of free flow from Vendome well and simultaneously satisfy the historically

important role of the tourist attraction, fountain, and channel. While this action by itself will not likely restore spring flow completely, it would be the first step in that direction. After NPS has gained control over the discharge from the well, NPS may then proceed to ask its neighbors to do the same for their wells. Provided most neighbors with flowing and pumping wells cooperate, there is a strong probability that the hydraulic head of the aquifer will rise and spring discharge in suit.

Reference Cited

Wikle, T., Nicholl, M., Brown, T., Nord, J., Parker, R., and Weeks, D., 1998, Draft water resources management plan, Chickasaw National Recreation Area, Oklahoma: National Park Service, Water Resources Division, Fort Collins, Colorado, 125 p.

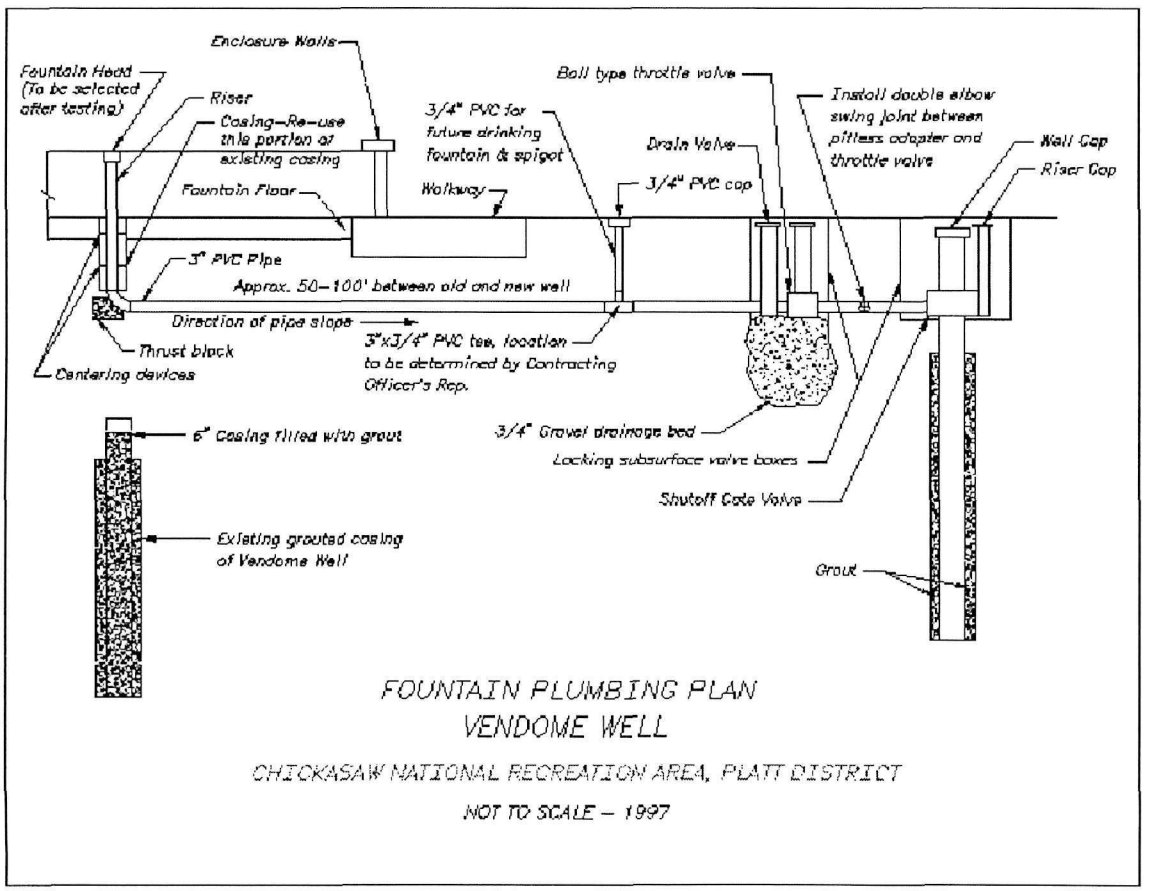
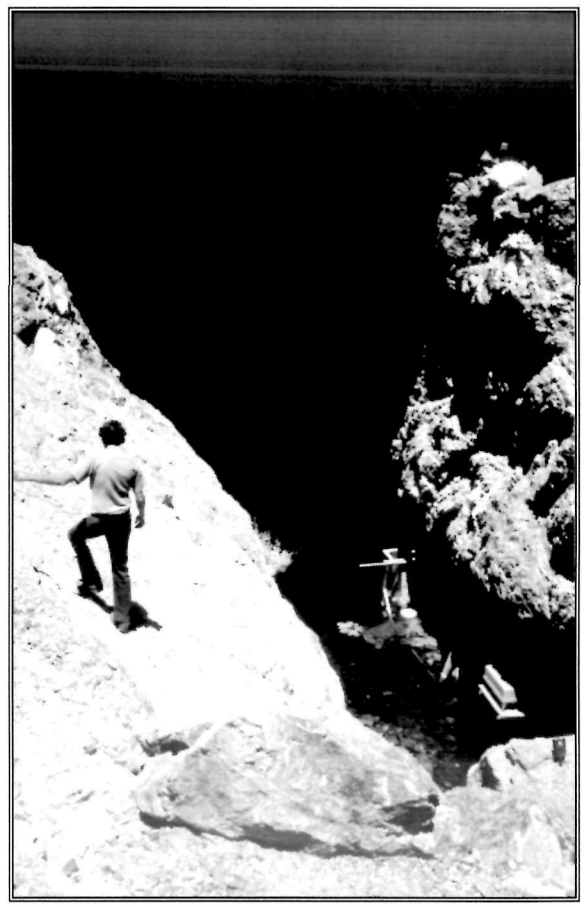


Figure 2. Plumbing design prepared by the U.S. Bureau of Reclamation

Cappaert: A Blessing and a Curse

By Peter A. Fahmy, Water Rights Attorney, Office of the Solicitor

In 1976, the United States Supreme Court decided the landmark case of *Cappaert v. United States*.[1] The Court held that because the federal reserved water rights doctrine is based on the need for water to further the purposes of the federal reservation, the United States can protect such water from subsequent diversion, whether the diversion is of surface or ground water. By establishing this right to sue ground water diverters in order to safeguard federally reserved waters, *Cappaert* was a wonderful blessing for the water resources of the National Park System. However, in another sense, *Cappaert* is somewhat of a curse for NPS because its statutory mandate to preserve park resources unimpaired for future generations obliges NPS to act to prevent ground water diverters from adversely affecting federally-reserved waters within the National Park System. This duty is quite simply Herculean.



The enormous burden imposed by *Cappaert* stems from the success the NPS had in enjoining the ground water withdrawals, which had reduced the pool level in Devils Hole. This success fostered a belief among some members of the public that NPS can readily act to reduce or prevent ground water withdrawals that will adversely affect park water resources. However, the facts in *Cappaert* were extremely favorable to NPS. First of all, the wells were all very close to Devils Hole. In fact, the farthest well was no more than two-and-one-half miles away. Secondly, the rate and volume of withdrawal was extremely large relative to the discharge rates and volumes of springs in the vicinity of Devils Hole. The average annual volume of withdrawals was approximately 5,500 acre-feet, almost one-third of the measured discharge of the springs in the vicinity of Devils Hole. Finally, the effect of the ground water withdrawals on the pool level in Devils Hole was manifested quickly, usually within a matter of a few weeks. Thus, the ground water withdrawals in *Cappaert* constituted a single

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[1]. 426 US 128 (1976).

hydrologically significant stress on the ground water flow that supports the pool level in Devils Hole.

Unfortunately, the facts in most matters involving possible adverse effects from ground water withdrawals on park water rights are not as straightforward as those involved in *Cappaert*. Typically, a threat to park water resources from ground water withdrawals involves a large number of diversions of small quantities of water scattered throughout a vast regional aquifer. For example, NPS units in Arizona, California, and Nevada have water rights and water-dependent resources that rely on extensive regional aquifers.[2] Given that the NPS would initially have the burden of proof in a court action to enjoin ground water withdrawals, proving that such widespread and remote diversions are causing injury to park water rights and water-related resources represents a formidable challenge to NPS's natural resource management professionals.

Thus, the challenge presented by *Cappaert* to NPS is to devise legal and technical strategies to address the tough post-*Cappaert* cases without bankrupting the public fisc. However, regardless of the strategies chosen, it is imperative that NPS make other federal agencies, state regulators, and ground water users aware of the dependence of NPS water rights on ground water sources. Often other users of ground water are unaware of the far-reaching effects of their diversions. When confronted with competent evidence of these effects on park resources and the prospect of protracted and complex litigation, they are sometimes willing to reduce and limit their diversions. Thus, through education and negotiation it may be possible to reduce the technical and financial burdens inherent in extending the protection of *Cappaert* to the most remote sources of NPS waters.

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[2]. In Arizona, units such as Grand Canyon National Park and Wupatki National Monument have natural resources and visitor services that depend on ground water from the Coconino Aquifer, whereas Death Valley National Park and Lake Mead National Recreation Area are similarly dependent on the ground water of the Carbonate Rock Aquifer.

Water Operations Branch Highlights

By William L. Jackson, Ph.D, Branch Chief

1997 was another extremely productive year for the Water Operations Branch (WOB) as we continued our programs of technical support to parks in the areas of hydrology and water quality. In addition, we continued to oversee Servicewide water quality inventory and monitoring activities and to promote expansion of the Service's water quality assessment capabilities.

WOB's core program remains one of park assistance in the areas of ground water protection, stream management and restoration, floodplain assessment and compliance, aquatic contaminants analysis, and water quality protection. In total, approximately 80 parks were the subjects of Branch assistance activities. A complete listing of our assistance activities is provided later on in this report. Good examples of park assistance include:

- Continued support to Ozark National Scenic Riverways in analyzing and interpreting aquifer characteristics, which influence the vulnerability of park springs and streams to contamination by proposed exploration and mining of lead on adjacent National Forest lands.

- Continued support to Lake Mead National Recreation Area in analyzing issues associated with the occurrence of endocrine-disrupting chemicals in Las Vegas Wash Bay, and in helping to define future study needs (see the article which follows by Roy Irwin).

- Analysis of issues at Biscayne National Park including the proposed transfer of Homestead Air Force Base to Dade county, past and future contamination of Military Canal (including contaminated sediments), and ammonia contamination from a nearby county landfill.

- Analysis of the hydrologic and geomorphic characteristics of the January 1, 1997, flood at Yosemite National Park, including interpreting flood conditions for flood recovery activities and long-term valley planning (see the article which follows by Gary Smillie and others).

- Continued support to Padre Island National Seashore in developing and negotiating clean-up standards for a contaminated oil/gas production site at Yarborough Pass, and technical assistance (contaminants, ground water) in support of a project to develop programmatic oil and gas management plans and Environmental Impact Statements for Padre Island National Seashore, Big Thicket National Preserve, and Lake Meredith National Recreation Area.

- Participation on an interagency committee to evaluate and recommend hydrologic/risk criteria which when met would permit scheduling of management floods from Glen Canyon Dam through Grand Canyon National Park as part of the Glen Canyon Dam Adaptive Management Program and the Colorado River Annual Operating Plan.

- Preparation of a hydrologic analysis and review of management alternatives as part of an interagency team evaluating issues associated with the natural instability and historic dredging of Pilgrim Creek in the vicinity of Jackson Lake Dam in Grand Teton National Park.

The Branch's water quality database project, implemented in cooperation with the servicewide Inventory and Monitoring Program, has now produced "Water Quality Data Inventory and Analysis" reports and complete digital water quality databases for over 115 parks. This project assists parks in uploading park data into the EPA's national water quality database (STORET), and analyzes all data pertinent to park waters for such things as normal limits of variation, trends, exceedances of EPA criteria, and completeness of park data sets compared to NPS Level-I standards.

WOB continued to oversee the NPS water quality monitoring partnership with the U.S. Geological Survey's National Water Quality Assessment (NAWQA) program. Twelve parks were involved in that program, which consists of a combination of synoptic inventory studies, intensive water quality investigations, and long-term fixed-station monitoring. The investigation into synthetic hormones in Lake Mead, which is discussed in a following article by Roy Irwin, is an example of an intensive study implemented as part of this partnership. Considerable effort was expended in FY97 in developing a programmatic basis for expansion of the NPS-USGS partnership into a full-scale servicewide water quality assessment program. At this writing, a plan for expansion of this partnership is included in the President's proposed FY99 Clean Water Action Plan.

Finally, WOB helped oversee design and review and provide funding for roughly 25 park-based hydrology and water quality projects.

Our programs continue to depend upon park resource managers to recognize issues and technical assistance needs and to associate their needs with our staff capabilities. By being as responsive as possible to park needs, our hope is to foster strong long-term working relationships with parks dealing with the protection and management of park water resources.

Yosemite Valley Flood, January 1-3, 1997

By Gary Smillie, Bill Jackson, and Mike Martin

A New Year's Day flood in Yosemite National Park was the largest in over an 80-year period of record on the Merced River, and may have approximated a 100-year return-period flood. The flood resulted when a series of tropical storms dropped over ten inches of rain from December 29, 1996 to January 3, 1997 (measured at the 4000 foot level). The snowline rose progressively during the storm series to a level of 11,000 feet, contributing snowmelt to the rainfall runoff. Water backed up in the central part of Yosemite Valley and inundated park offices, roads, concessionaire lodging units, and other developments. In steeper reaches of the river, the force of the flowing water ripped up roads, sewer lines, and campgrounds. The park was essentially closed for over three months while the basic infrastructure required to accommodate visitors was repaired or cleaned-up.

As part of the National Park Service's initial response to the flood, a large multi-agency incident team was formed to assist the park in evaluating the consequences of the flood on infrastructure and resources and in formulating plans to respond to the flood. The NPS Water Resources Division formally participated on the incident team. We were charged with analyzing the hydrologic, hydraulic, and geomorphic attributes of the flood, and in describing the implications for park planning and the repair of park infrastructure affected by the flood. Approximately five man-weeks were spent in the park working with the incident team and park staff during the month following the flood. A detailed report was prepared and submitted to the park in February, 1997 (Jackson, et.al., 1997).

To facilitate the flood assessment, five geomorphic reaches were defined along the Merced River between El Portal and the upper reaches of Yosemite Valley (see Figure 3.) The flood had distinctly different characteristics in each geomorphic reach and influenced resources and impacted infrastructure differently in each of these reaches. From El Portal to the Cascade Diversion Dam at the lower end of the park, the river grade is steep and the river flowed with great force. Resource adjustments were largely confined to the reworking and redeposition of large side- and mid-channel bar deposits. Severe damage to the road and sewer pipeline occurred in this reach.

From the diversion dam upstream to El Capitan Moraine, the river is less steep and only moderately confined. Resource adjustments included some bank scour (in the vicinity of Bridalveil Moraine) and the cutting of flood channels across meander bends. There were minor impacts to roads and bridges in this reach.

In the central chamber of Yosemite Valley, between El Capitan Moraine and roughly the Housekeeping Camp area, water was impounded by the moraine and was deep and very slow moving. There was minimal resource adjustment in this reach, but a large number of park developments were submerged in deep, low-velocity water. Many units of Yosemite Lodge, some of which were located as low as the 10-year floodplain, were severely impacted by as much as 10 feet of water.

In the upper reaches of the valley, between Housekeeping Camp and a point upstream from the confluence of Tenaya Creek, floodwaters flowed over the floodplain and across river meander necks. Infrastructure in this reach, including campgrounds and tent housing units were heavily impacted. There was considerable scour, and sediment and organic debris deposition of floodplains and meander bends in this reach. In the steep, upper reaches of the Merced River and Tenaya Creek, the river was confined and flowed with great force. There was bank erosion in this reach and many shoreline trees were uprooted and deposited in the channel. Some road and footbridge damage occurred in this reach.

Floods, of course, are natural events in river environments and typically result in beneficial "ecological disturbance" to channel and riparian resources. However, the significance of the Yosemite flood as a natural ecosystem event was tempered somewhat by the impacts to human developments in the floodplain. Also, some natural resource damage occurred when flood flows interacted with infrastructure, or when floodplains had been made vulnerable to erosion by heavy visitor use. The Upper Pines Campground, which was severely damaged by the flood, is a good example of where natural river processes were adversely affected by park development. The campground occupies a natural point bar located on the inside of a large river meander at the east end of the Valley. Excessive erosion of the point bar occurred during the January flood in part because excess flood water was forced across the point bar by a road and undersized bridge, and in part because heavy trampling by visitors had eliminated most ground-protecting vegetation cover.

While much of the park's damaged infrastructure has been repaired, the Yosemite flood highlighted the problems associated with human occupation and development of floodplains. Park planners recognize this fact, and restoration of the Merced River and its floodplain is a cornerstone of the draft Yosemite Valley Implementation Plan (VIP). The plan's preferred alternative has a strong orientation towards restoration of the Merced River and its riparian zone, and is consistent with effective floodplain management. For example, the plan emphasizes removing flood-prone activities (including lodging and campground units) out of the floodplain, establishing a river corridor buffer, and restoring natural floodplain conditions and processes.

Interestingly, the January flood assisted the valley planning process in several significant ways. First, the flood permitted a far more accurate delineation of flood-prone areas than existed previously. Secondly, observations by park staff during the flood and the post-flood analysis conducted by WRD provided a better understanding of the hydraulic characteristics of the flood (depths, velocities) at specific points of interest, and a more precise understanding of the causes of infrastructure and resource response to the flood. Finally, flood recovery funds approved by Congress will permit the park to take action on many of the proposals in the VIP.

Because of the park's decisive response to the flood and its dedication to improved floodplain management, future floods should provide for natural ecosystem adjustment and rejuvenation with far less impact to park facilities and infrastructure.

Literature Cited

Jackson, W.L., G.M. Smillie, and M.W. Martin, 1997. Analysis of the Hydrologic, Hydraulic and Geomorphic Attributes of the Yosemite Valley Flood: January 1-3, 1997. Technical Report NPS/NRWRD/NRTR-97/129. Water Resources Division, Fort Collins, CO 43 p.

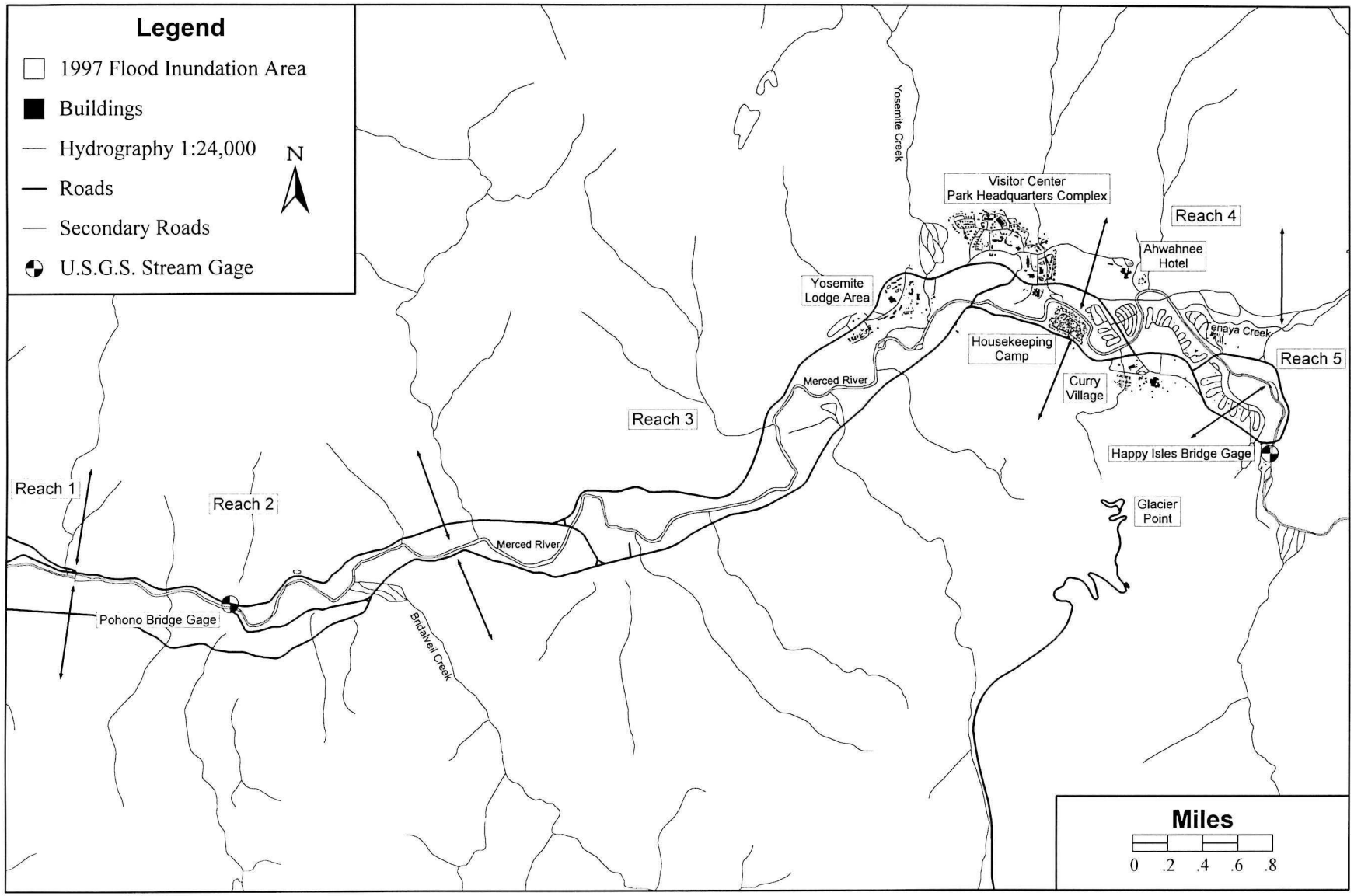


Figure 3. MAP DELINEATING FIVE GEOMORPHIC REACHES ALONG THE MERCED RIVER

Identification of Chemicals Feminizing Fish in Lake Mead National Recreation Area

By Roy Irwin, Hydrologist

In 1995, the National Park Service initiated a cooperative investigation with the U.S. Geological Survey's (USGS) National Water Quality Assessment (NAWQA) Program to assess the occurrence, distribution, and bioavailability of endocrine-system disrupters in Lake Mead near Las Vegas, Nevada. The bay receives urban runoff and all of the treated sewage from the City of Las Vegas. USGS researchers Hugh Bevans and Steve Goodbred, working with John Miesner of the US Fish and Wildlife Service, determined that there were unusually high levels of vitellogenin in male carp. They also found several potentially endocrine-active chemicals in water, sediment, and fish tissue samples.

The vitellogenin response in male carp was the highest that had been seen in USGS studies of various areas of the United States. Vitellogenin is a protein involved in egg production that is normally not found in males. Its presence suggested that something had feminized these male fish and made scientists wonder if this might be an early sign of potentially more serious environmental consequences. While several possible chemical culprits had been identified, the strength of the vitellogenin response made researchers wonder whether or not other contaminants might be responsible.

The findings in Lake Mead were timely, since during 1997 there was a strongly increasing national interest among environmental toxicologists in the environmental effects of endocrine disrupting chemicals. There was increasing awareness that certain chemicals can mimic or block the activity of natural hormones. Such compounds may be causing significant impacts on fish, wildlife, and humans. Estrogen and many other hormones control many very important biological functions. When things go wrong in the endocrine system, a cascade of events can lead to cancer or to various developmental or reproductive problems. Not only are hormones such as estrogen sometimes directly involved, but the breakdown products of compounds such as estrogen can also play a role in the production of cancers and in other types of damage (such as free radical or oxidative damage) to organs.

In response to the signs of endocrine disruption on Lake Mead fish, Bill Burke and Kent Turner of the Resource Management staff at Lake Mead National Recreation Area, requested assistance from the Water Resources Division in Fort Collins. Help was needed in: 1) Determining the chemical(s) responsible for the endocrine disruption seen in the carp, and 2) Determining the significance of the problem (if any) to fish, wildlife, and humans.

WRD staff began assistance to Lake Mead National Recreation Area by identifying experts in the very specialized and relatively new field of aquatic endocrine effects. WRD staff assisted Lake Mead staff in networking with the experts from around the world. Several of the top U.S. researchers were brought in to serve on a Park Superintendent's Technical Advisory Group. This group was convened to help the Superintendent better define and understand the issues and to recommend strategies for addressing the issues. Included in these sessions were technical experts from Michigan, Florida, California, Missouri, and Colorado. Nevada representatives of local, state, and federal agencies joined them in a series of meetings in 1997. The discussions centered on identifying the best strategies for addressing the problem.

The technical experts emphasized that the endocrine effects seen so far are preliminary signs of potential problems rather than conclusive proof of significant effects on populations of fish, wildlife, or humans. Although some potential suspect compounds had been identified, many of these same compounds were present in similar concentrations in areas not showing the strong vitellogenin response. The experts recommended that future studies should include consideration of ethinyl estradiol, the main ingredient in birth control pills. This compound can cause vitellogenin response in fish at very low levels, is not produced by animals, and is resistant to breakdown (Tim Gross, Reproductive Physiologist/ Endocrinologist, University of Florida, Personal Communication).

At the conclusion of the technical meetings, a general consensus on the kinds of things that needed to be done was reached, and Shane Snyder of Michigan State University Institute of Environmental Toxicology began a study to identify the chemical compounds responsible for the carp endocrine disruption. Logistics support for the study was provided by the National Park Service and the USGS, while significant funding for the work was provided by the Southern Nevada Water Authority, the regional agency supplying most of the drinking water for the Las Vegas area. Several members of the Superintendent's Technical Advisory Group supplied technical advice and other forms of collaboration.

Water was sampled from Las Vegas Bay, and from Las Vegas Wash, an effluent-dominated creek that empties into the Las Vegas Bay region of Lake Mead. The researchers used a variety of analytical techniques to isolate endocrine disruption compounds from the many suspect chemicals the fish came in contact with. Polar fractions were separated from non-polar fractions, and a variety of other chemical fractionation techniques were used. The investigators also used an innovative method that involves solid-phase extraction and in vitro cellular bioassays to detect endocrine-modulating compounds in complex aqueous mixtures.

The study results suggested that high levels of natural and synthetic hormones in wastewater effluent were the most likely culprits in the endocrine disruption effects being seen in the fish. Human female reproductive hormones, including estradiol (natural estrogen) and ethinyl estradiol (the birth control pill synthetic hormone), rather than industrial chemicals or pesticides, were identified as the probable cause of endocrine disruption in the fish. Of the contaminants identified, only the steroids of the estrogen and ethinyl estradiol class gave evidence of estrogenic activity in the bioassays. Thus, estrogen (estradiol) and ethinyl estradiol are the most likely culprits in causing the male carp to show signs of endocrine disruption.

The results were similar to findings published in 1996 by British investigators. Those investigators concluded that hormones originating from women's urine as the cause of vitellogenesis in caged fish exposed to sewage effluent. In this country, many investigators found it of interest that in both the Lake Mead and the British studies, hormones appeared to be the causative agent rather than some other chemical suspects, which had included pesticides and industrial chemicals such as nonylphenol, PCBs, BHC, and DDE.

Preliminary studies showed the presence of endocrine disruptive chemicals at active concentrations in Las Vegas Wash and Las Vegas Bay, but not in the City of Las Vegas drinking water intake a few miles down the lake. Confirmatory studies will need to be done over time to document variability over time.

The results of the Michigan State study were presented in November 1997, at the Society of Environmental Toxicology and Chemistry meeting in San Francisco. In cooperation with Tim Gross and Hugh Bevans of the USGS, these same investigators are planning additional immunoassay work to

determine the proportion of potential effects from natural estrogens (estradiol and estrone) versus ethinyl estradiol (the synthetic birth control pill compound). Some caging studies are planned to shed further light on effects of Las Vegas Wash contaminants on fish. At previous meetings, there had been a fairly broad consensus that the endangered razorback suckers (fish) were a priority resource, so additional studies aimed at determining effects on these fish may also be initiated.

A key question is what could or should be done, if anything, to reduce the amount of hormonally active contaminants in Las Vegas Wash. Initial indications are that ethinyl estradiol (the birth control pill active ingredient) is much more resistant to breakdown in the environment and in current wastewater treatment systems than are natural estrogens. Discussions will be held with the operators of the Las Vegas wastewater treatment plants to determine if remedies are available to remove estradiol and ethinyl estradiol from treated discharges. More work may need to be done on the treatability, transport, and general fate of ethinyl estradiol, 17b estradiol (natural estrogen), estrone, and the sulfate and glucuronide conjugates of each of the above-listed compounds. The tendency of estradiols, organochlorines, and phenols to become conjugated to water-soluble glucuronides and sulfates may be important. When conjugated, these contaminants become more water-soluble and can move around in surface water. After being transported to other media (sediments, fish guts, human guts) the combined compounds can be de-conjugated by bacteria. This would serve to transform the chemicals back into the more hazardous, more endocrine-active, and less soluble (less mobile), parent compounds.

When appropriate, we will once again re-convene an advisory group of technical experts to advise the Park Superintendent on what else (if anything) might need to be done. The goal is to fully address the significance of the endocrine disruption indicators seen in Lake Mead fish. As Las Vegas grows, and as the flow from Las Vegas Wash into Lake Mead grows, endocrine disruption and other impacts to water quality and park resources may also grow and will need to be monitored closely.

Tracking Microbial Sources Using Genetic Analysis of Ribosome Patterns

By Barry A. Long, Hydrologist

For the first time, the National Park Service is utilizing genetic analysis tools to identify the sources of bacterial contamination in park waters and sediments. The Water Resources Division (WRD) is involved in this work by providing funding and assistance to Grand Teton National Park and Glen Canyon National Recreation Area for two projects which apply microbial source tracking techniques to answer management questions related to impacts of recreation and other land uses on water resources. The fundamental questions being addressed in these studies are whether bacterial contamination is a human health concern in park waters, and if so, what are the sources and pathways of this contamination? In addition, where are the areas of highest concern and are there correlations between bacterial contamination and land uses?

Microbial source tracking is a relatively new technique used for sleuthing the origin of bacterial organisms, such as fecal coliform and *Escherichia coli (E. coli)*, which are present in streams, lakes, and ponds. Fecal coliform and *E. coli* reside in the intestines of warm-blooded animals, including humans, and are excreted in waste materials. The presence of high numbers of these bacteria in water samples may indicate that unsanitary conditions exist which may pose human health concerns. Confusion has existed for many years regarding whether animals or people are responsible for much of the bacterial contamination found in natural waters. Ratios between species or groups of bacteria have been applied with little success to determine the sources of bacterial contamination. Many scientists today are experimenting with management applications of genetic fingerprinting research. Genetic fingerprinting has been found to be very effective in matching bacteria strains from a contaminated site in a water body to its source.

Recently, studies have been implemented in parks, which include aspects of genetic testing of bacteria in water samples to determine microbial sources. A study in Grand Teton National Park, titled *The Influence of Human Use on the Water Quality in the Backcountry of Grand Teton National Park*, was begun in 1996. A study in Glen Canyon National Recreation Area, titled *Beach Sediment Bacterial Contamination and Microbial Source Tracking*, was begun in 1997. Dr. Mansour Samadpour from the University of Washington developed the microbial source tracking technique being used in the park studies (Samadpour and Chechowitz, 1995). Park investigators use a specialized procedure to prepare the samples for genetic analysis. Water samples are filtered and incubated for analysis of fecal coliform using the membrane filter (MF) procedure as described in Standards Methods (APHA, 1992). Positive fecal coliform colonies are selected and *E. coli* isolates are obtained. The isolates are then transported to the University of Washington for microbial source analysis. Genetic fingerprinting using ribosomal RNA typing is performed on each *E. coli* isolate. These

patterns or DNA types, referred to as ribotypes, are then used to match specific strains of E. *coli* from water samples with ribotypes from potential sources. Typically, ribotypes from potential sources are extracted from samples of fecal material. Dr. Samadpour maintains a ribotype database from source samples collected around the country.

The preliminary results from these two studies have been very interesting, and somewhat surprising. Even though Grand Teton National Park is a high mountain ecosystem and Glen Canyon National Recreation Area is a lower plateau/canyon ecosystem, both parks expected the studies to identify bacteria contamination of human origin in waters near heavily used recreation sites. In general, few fecal coliforms from any origin were measured in streams in Grand Teton National Park. Data from the first year of this study ranged from no detection of fecal coliforms in Avalanche and Garnet Canyons to 10 colonies per 100 milliliters in Cascade Canyon. Low coliform counts may be attributed to flushing by high streamflows. While the isolated colonies matched the ribotypes of avian, deer, canine, and elk sources, only one clone from three matched the isolates of a human source. Second-year sampling is focused on Garnet Canyon and Cascade Canyon.

In the Glen Canyon National Recreation Area study, higher fecal coliform counts were measured at beach sites in Lake Powell. Data from the first year of this study suggested that higher fecal coliform levels are present in beach sediment than in the water column and that most of the fecal coliform counts in the water samples were less than 100 colonies per 100 milliliters. However, some sites did display periods of high fecal coliform counts. A total of 67 plates were processed from the water and sediment samples and sent to the University of Washington for genetic analysis. From these samples, 248 *E. coli* isolates were ribotyped. Of the isolates, which have been identified so far, 13 out of 14 were identified as human from human impacted sites, 7 out of 10 were identified as bovine from mixed-use sites, and 16 out of 23 were identified as bovine from cattle impacted sites. Also, isolated colonies matched the ribotypes of avian, deer, canine, elk, and feline sources. Unfortunately, a majority of the isolates could not be identified because there were no matches with Dr. Smadpour's ribotype database. In fact, none of the 39 isolates from control sites in Lake Powell were identified. Second-year sampling is focused on collecting source samples from the local area to include in the ribotype database. It is possible that many of the unknown isolates may be from resident wildlife, such as rodents.

It is obvious that these two studies represent just the tip of the iceberg on this subject. Microbial source tracking studies in parks and other resource lands receiving intensive use hold great promise in providing answers to basic questions that have perplexed managers for years. Not only will this science aid us in determining potential sources of impacts to our water resources, but also hopefully it may shed some light on evaluating current and desired conditions of our resources. If we decide to preserve a certain condition, then this is what it might cost, or this is what we must give up, to maintain that condition.

APHA. 1992. Standard methods for the evaluation of water and wastewater, 18th ed. American Public Health Association. Washington, D.C.

Samadpour, M., and Naomi Chechowitz. 1995. Little Soos Creek microbial source tracking, a survey. Department of Environmental Health, University of Washington. Seattle, Washington.

Support Provided to Regions, Parks, and Other National Park Service Organizational Units

ALASKA REGION

ALASKA CLUSTER

Planning and Evaluation Branch

Katmai National Park and Preserve

* Provided technical review and comment on a National Wetland Inventory project statement.

Wrangell-St. Elias National Park and Preserve

* Assisted with preparation of a combined floodplain and wetland Statement of Findings for a temporary flood protection effort at Copper-Tanada Lakes alluvial fan.

* Assisted with preparation of a combined floodplain and wetland Statement of Findings for construction of a berm to protect private property and historic structures alongChathenda Creek.

Water Operations Branch

Denali National Park and Preserve

* Provided analysis of PAH data from the Pennzoil Dust palliative product PenzSuppressD.

Gates of the Arctic National Park and Preserve

* Assessed potential impacts from development at Anaktuvuk Pass.

Katmai National Park and Preserve

* Provided advice and documentation to establish permanent stream morphology monitoring stations.

Klondike Gold Rush National Historical Park

* Coordinated site visit to conduct feasibility study by erosion control experts.

Lake Clark National Park and Preserve

* Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six Environmental Protection Agency databases.

Wrangell - St. Elias National Park and Preserve

* Reviewed proposal for the monitoring of contaminants and invertebrates downstream of Nabesna Mine.

* Facilitated use of Area Hydrologist.

Water Rights Branch

Sitka National Historical Park

* Evaluated issues related to NPS assertion of rights to protect the Indian River.

Wrangell-St. Elias National Park and Preserve

* Provided technical advice on an application for permit to divert park water.

Multi-park

* Conducted water rights training session for park and SO staff.

* Assisted the SO with preparation of the Interagency report to the Secretary on Department of the Interior water rights programs in Alaska.

INTERMOUNTAIN REGION

COLORADO PLATEAU CLUSTER

Planning and Evaluation Branch

Arches National Park

* Assisted in the completion and publication of the Canyonlands National Park, Arches National Park, and Natural Bridges National Monument Water Resources Scoping Report (WRD Technical Report NPS/NRWRS/NRTR-97/94)

* Provided continued support for a WRD funded project to prepare a Water Resources Management Plan, including assistance in the preparation of a study plan and scope of work, identification of qualified contractors, and participation in issues scoping sessions.

Canyonlands National Park

* Assisted in the completion and publication of the Canyonlands National Park, Arches National Park, and Natural Bridges National Monument Water Resources Scoping Report (WRD Technical Report NPS/NRWRS/NRTR-97/94)

* Provided continued support for a WRD funded project to prepare a Water Resources Management Plan, including assistance in the preparation of a study plan and scope of work, identification of qualified contractors, and participation in issues scoping sessions.

* Reviewed and approved the detailed study plan for the project "Characterize and Identify Water Quality and Biotic Components in Isolated Springs along the Colorado River Drainage System."

Dinosaur National Monument

* Made observations of hydrologic conditions during unusually high dam releases and assisted with data gathering.

* Assisted in evaluating research results describing the effects of the Flaming Gorge Dam on fluvial geomorphologic and riparian vegetation processes along the Green River. Assisted the park in drafting a letter to the Bureau of Reclamation requesting support for additional research on these issues.

El Malpais National Monument

* Provided technical review and comment on an Agua Fria Creek restoration project statement.

* Provided review and comment on draft Resource Management Plan.

Glen Canyon National Recreation Area

* Provided an evaluation and recommendation concerning the need to update the current Glen Canyon National Recreation Area Water Resources Management Plan .

* Assisted park staff in developing an interagency workplan to address native and sportfish management activities for FY97.

* Reviewed and approved the detailed study plan for the project "Characterize and Identify Water Quality and Biotic Components in Isolated Springs along the Colorado River Drainage System."

* Approved IAR and transferred second year funds for 96/97 WRD funded project titled "Wetland Inventory and Classification Using Multi-spectral Videography."

Grand Canyon National Park

* Assisted with the development of water-related project proposals for the FY98 Natural Resources Funding Call.

* Reviewed and approved the detailed study plan for the project "Characterize and Identify Water Quality and Biotic Components in Isolated Springs along the Colorado River Drainage System."

Hubbell Trading Post National Historic Site

* Provided onsite technical assistance regarding the feasibility of improving channel and floodplain conditions along the Pueblo Colorado Wash, and provided a follow-up letter of support for funding.

Natural Bridges National Monument

* Assisted in the completion and publication of the Canyonlands National Park, Arches National Park, and Natural Bridges National Monument Water Resources Scoping Report (WRD Technical Report NPS/NRWRS/NRTR-97/94)

Petrified Forest National Park

* Reviewed and approved the detailed study plan for the 'Puerco River Riparian Restoration Project."

Water Operations Branch

Arches National Park

* Provided technical assistance in response to requests for data interpretation related to park drinking water.

Aztec Ruins National Monument

* Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six Environmental Protection Agency databases.

Bryce Canyon National Park

* Provided advice on determining source area water protection zones for water supply wells.

Canyonlands National Park

* Assessed impacts of the Atlas uranium mill tailings pile on adjacent park resources. Convened an interagency working group to develop a list of remaining research needs for the tailings pile. A consensus report was developed and sent to the Department of the Interior.

* Provided technical assistance guidance related to the concern that pH in the Green River may be increasing, resulting in potential interactions between higher pH levels and selenium.

Capital Reef National Park

* Delineated wellhead protection area for a water supply well.

Chaco Culture National Historical Park

* Uploaded water quality data from the 1979 Dome Petroleum Well Spill to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

* Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six Environmental Protection Agency databases.

* Performed project coordination for erosion control study being performed by Bureau of Reclamation.

Dinosaur National Monument

* Continued assistance with evaluation of monitoring data relating to a riparian area restoration project in Hog Canyon.

* Attended meeting of riparian and sediment research accomplishments of the Yampa and Green Rivers.

* Provided sediment sampling equipment for research on the Green River through Lodore Canyon.

* Prepared bidding documents, supervised construction, and tested new water supply well at Gates of Lodore.

* Conducted two major sediment sampling trips to the Green River during high flows from Flaming Gorge Dam which required critical timing, equipment, and coordination.

* Maintained stage recording equipment and data collection on the Green River at Gates ofLodore and provided data files to graduate researcher from University of California at Berkeley.

* Conducted sediment load measurements on Green River in response to Flaming Gorge Dam spill.

El Malpais National Monument

* Reviewed RMP project statement proposing stream restoration for AquaFria Creek.

Fossil Butte National Monument

* Provided continued assistance for proposal to remove stock dams utilizing the National Guard.

* Reviewed and revised watershed restoration plan and associated RMP project statement.

* Monitored precipitation with WRD automatic equipment at a remote site in a study watershed and compared data with park's main weather station.

* Wrote up an assessment of stock water options for outside of park that provided alternatives to reduce impacts within the park.

* Prepared a base map in support of the Chicken Creek Restoration Project.

Glen Canyon National Recreation Area

* Drafted an argument on the need to protect natureal resources from potential future impacts from the Atlas Uranium mill tailings pile.

Grand Canyon National Park

* Reviewed and commented on a proposal to develop a ground water supply for a new development south of Tusayan (Canyon Forest Village).

* Provided a summary of information on the Lower Colorado River Basin near the laboratory research site of the EPA Las Vegas National Exposure Research Laboratory.

* Participated on a work group to review and recommend hydrologic/riskcriteria which, if met, would permit scheduling management floods form Glen Canyon Dam as part of the Glen Canyon Dam Adaptive Management Program.

* Served on the project review board for monitoring and research projects to be funded by the Grand Canyon Monitoring and Research Center.

Hubbell Trading Post National Historical Site

* Provided review and comment on a reparian restoration partnership.

* Uploaded water quality data from the National Geochemical Data Base: National Uranium Resource Evaluation Program to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

* Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six Environmental Protection Agency databases.

Petrified Forest National Park

* Assisted in setting up a ground water monitoring program.

Pipe Spring National Monument

* Managed WRD funded project for geohydrologic study by USGS on decline of springflow which was co-funded by the state of Arizona.

* Authored a natural resource technical report entitled "Monitoring and Analysis of Spring Flows in Pipe Spring National Monument, Mojave County, Arizona."

Timpanogos Cave National Monument

* Performed a stream channel survey and subsequent low flow modeling for evaluation of potential bypass flows.

Walnut Canyon National Monument

* Performed a paleoflood reconnaissance to locate the presence of high water indicators.

Wupatki National Monument

* Provided advice and consultation regarding conversion of an evaporation pond to aleachfield.

* Performed an assessment of a prehistoric ballcourt that collects water periodically.

* Performed a flood reconnaissance of multiple archeology site located along the Little Colorado River.

Zion National Park

* Conducted a field review in support of the GMP process of Virgin River channel restoration alternatives.

* Completed hydraulic analysis to evaluate the effects of levee removal on North Fork of the Virgin River floodflows.

* Assisted in the development of ideas related to the proposed restoration of the North Fork Virgin River near Zion Lodge.

* Provided hydraulic information to DSC designers during the planning/design process for a new bus maintenance facility in Sammy's Canyon.

* Uploaded a variety of water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Water Rights Branch

Bryce Canyon National Park

* Conducted field reconnaissance with State of Utah to review water rights issues for settlement negotiations.

Canyonlands National Park

* Assisted with scoping meeting for Water Resources Management Plan.

Capitol Reef National Park

* Conducted adjudication related studies.

Cedar Breaks National Monument

* Conducted field reconnaissance with State of Utah to review water rights issues for settlement negotiations.

Dinosaur National Monument

* Assisted SOL and the park with the issue of water diversion by the Mantle Ranch.

Golden Spike National Historic Site

* Prepared draft water rights settlement agreement.

Grand Canyon National Park

* Continued South Rim spring monitoring program.

* Conducted technical reviews of proposed settlement issues for Department of Justice (DoJ) for the Little Colorado River Adjudication.

* Briefed park management on status of water rights negotiations in the Little Colorado River Adjudication.

* Provided contract administration of USGS studies to prepare conceptual model and water budget for the regional ground-water flow system and bibliography for the Little Colorado River adjudication area, participated in settlement discussions with Parties involved in the Little Colorado River adjudication, and continued to facilitate meetings of the Little Colorado River Technical Study Group.

Hovenweep National Monument

* Assisted DoJ in completing the final Findings of Fact, Conclusion of Law and Decree for water rights in the Water Division 7 Adjudication.

* Conducted field reconnaissance with State of Utah to review water rights issues for settlement negotiations.

Hubbell Trading Post National Historical Site

* Briefed park management on status of water rights negotiations in the Little Colorado River Adjudication.

* Provided contract administration of USGS studies to prepare conceptual model and water budget for the regional ground-water flow system and bibliography for the Little Colorado River adjudication area, participated in settlement discussions with Parties involved in the Little Colorado River adjudication, and continued to facilitate meetings of the Little Colorado River Technical Study Group.

Mesa Verde National Park

* Assisted DoJ in completing the final Findings of Fact, Conclusions of Law and Decree for water rights in the Water Division 7 Adjudication.

* Provided assistance on fees charged by the Mancos Water Conservancy District for storage and use of water in Jackson Gulch Reservoir.

Natural Bridges National Monument

* Conducted field reconnaissance with State of Utah to review water rights issues for settlement negotiations.

Petrified Forest National Park

* Briefed park management on status of water rights negotiations in the Little Colorado River Adjudication.

* Provided contract administration of USGS studies to prepare a conceptual model and water budget for the regional ground-water flow system and bibliography for the Little Colorado River adjudication area, participated in settlement discussions with Parties involved in the Little Colorado River adjudication, and continued to facilitate meetings of the Little Colorado River Technical Study Group.

Pipe Spring National Monument

* Assisted with request for information concerning the water use agreement between the National Park Service, local cattlemen, and the Kaibab Indian Tribe.

Sunset Crater Volcano National Monument

* Briefed park management on status of water rights negotiations in the Little Colorado River Adjudication.

* Provided contract administration of USGS studies to prepare conceptual model and water budget for the regional ground-water flow system and bibliography for the Little Colorado River adjudication area, participated in settlement discussions with Parties involved in the Little Colorado River adjudication, and continued to facilitate meetings of the Little Colorado River Technical Study Group.

Timpanagos Cave National Monument

* Assisted in negotiations with the Utah State Engineer's Office to resolve reserved water right claims for the park.

Walnut Canyon National Monument

* Continued crest-stage gaging program with the city of Flagstaff to determine the frequency and magnitude of high flows in the park.

* Continued negotiations with the City of Flagstaff, Arizona to resolve reserved water right claims for the park.

* Briefed park management on status of water rights negotiations in the Little Colorado River adjudication.

* Provided contract administration of USGS studies to prepare a conceptual model and water budget for the regional ground-water flow system and bibliography for the Little Colorado River adjudication area, participated in settlement discussions with Parties involved in the Little Colorado adjudication, and continued to facilitate meetings of the Little Colorado River Technical Study Group.

Wupatki National Monument

* Briefed park management on status of water rights negotiations in the Little Colorado River Adjudication.

* Provided contract administration of USGS studies to prepare a conceptual model and water budget for the regional ground-water flow system and bibliography for the Little Colorado River adjudication area, participated in settlement discussions with Parties involved in the Little Colorado River adjudication, and continued to facilitate meetings of the Little Colorado River Technical Study Group.

Zion National Park

* Protested seven Utah water rights applications.

* Assisted park and SOL prepare a draft Implementation Plan for the Zion Water Rights Settlement Agreement.

ROCKY MOUNTAIN CLUSTER

Planning and Evaluation Branch

Curecanti National Recreation Area

* Provided technical review and comment on a Gunnison River riparian restoration project statement.

Fossil Butte National Monument

* Compiled necessary information and obtained Corps of Engineers 404 permit for restoration work at Chicken Creek. Provided review and comment on the restoration document and EA.

Grand Teton National Park

* Utilized the Hydrological Affiliates Program to initiate the development of a Water Resources Scoping Report for Grand Teton National Park

* Participated in a design meeting for reclamation of the Snake River Gravel Pit (John D. Rockefeller, Jr. Memorial Parkway). A subsequent trip report documented the effects of the various alternatives on the hydrology of the site and the prospects for successful reclamation.

* Collected vegetation, ground surface elevation, and hydrologic data along eight transects in "reference area" wetland communities near the Snake River Gravel Pit (John D. Rockefeller, Jr. Memorial Parkway). The reference sites will be used as models for restoration of the disturbed (mined) area.

Great Sand Dunes National Monument

* Assisted in the completion and publication of a Water Resources Management Plan.

* Provided technical review and comment on a project statement addressing disappearance of wetlands within the dunes.

Yellowstone National Park

* Provided review and comment on various drafts of the proposedCooke City Area Mineral Withdrawal EIS.

* Reviewed Alternatives Analysis for Historic Mine Disturbances report for the proposed New World Mine.

* Assisted park staff in a Society of Wetland Scientist's field trip to "Wetlands of the Greater Yellowstone Ecosystem."

* Provided assistance with NPS wetland/floodplain compliance and Clean Water Act permit information for various park projects.

* Provided mitigation banking materials to the park in preparation for a park wetland mitigation bank.

Water Operations Branch

Bent's Old Fort National Historical Site

* Surveyed irrigation drainage ditch through park, discussed water resources impacts with park staff, and made recommendations for repairs and maintenance.

Black Canyon of the Gunnison National Monument

* Uploaded a variety of water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Curecanti National Recreation Area

* Uploaded park-collected (1987-1997) and a variety of other water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Devils Tower National Monument

* Provided assistance in design, location, and contracting of monitor well construction.

* Performed a detailed riparian assessment with Dr. Cooper, CSU, and completed alluvial groundwater analysis on FY96 water level data.

* Issued a Baseline Water Quality Data Inventory and Data Analysis Report documenting water quality data retrievals from six Environmetal Protection Agency databases.

Florissant Fossil Beds National Monument

* Installed monitor wells to assess ground water conditions in vicinity of dams andimpoundments.

* Completed a detailed survey in support of a research project evaluating the removal of several stockpond dams.

Glacier National Park

* Provided review and comment on Total Maximum Daily Load Development process for Flathead Lake.

* Provided advice on how to handle exposure of bighorn sheep to spilled antifreeze.

* Provided advice regarding proposed use of a flood warning system at Divide Creek.

Grant-Kohrs Range National Historic Site

* Provided a review of a proposal to utilize a park pasture as a wastewater irrigation treatment facility.

Grand Teton National Park

* Performed baseline hydrogeology for restoration of Snake River gravel pit.

* Evaluated an existing ground water monitoring program in the vicinity of sewage lagoons, conduct wellhead protection planning, and complete evaluation of trophic status of lakes.

* Performed a detailed topographic survey to support a DSC/WRD wetlands restoration project.

* Participated in a work group coordinated by the Bureau of Reclamation studying the options for management of risk to Jackson Dam from Pilgrim Creek.

* Participated in a work group to develop information on the sediment dynamics associated with several boat landing facilities on the Snake River.

* Provided advice regarding flooding potential and geomorphic stability at Moose Headquarters.

* Performed field reconnaissance of flood hazard at a proposed housing area near the southwest entrance.

Great Sand Dunes National Monument

* Revised digital cartographic maps of water resources for inclusion in Water Resource Scoping Report.

* Uploaded a variety of water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Little Bighorn Battlefield National Monument

* Uploaded water quality data from the National Geochemical Data Base: National Uranium Resource Evaluation Program to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

* Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six Environmental Protection Agency databases.

Rocky Mountain National Park

* Provided advice on how to handle exposure of bighorn sheep to spilled antifreeze.

* Coordinated WRD funded restoration of Hidden Valley Creek project.

* Attended an All-Scientist meeting of multi-discipline projects including hydrology and wetlands in the park.

Yellowstone National Park

* Provided advice regarding proposed relocation of a segment of the Grand Loop Road out of Gibbon Canyon. A recommendation was made to restore natural fluvial function within the canyon.

* Represented the park at a State of Wyoming Department of Environmental Quality Meeting for the development of Total Maximum Daily Loads.

* Provided analysis of possible hydrogeologic impacts from the New World Mine nearCooke City. Reviewed the EIS for Cooke City mineral withdrawal.

Water Rights Branch

Bent's Old Fort National Historic Site

* Reviewed and recommended acceptance of a replacement water plan for well No. 4.

Big Hole National Battlefield

* Assisted DoJ, SOL, Montana Water Court, and the park with proceedings for a Preliminary Decree for the Montana Statewide Water Rights Adjudication.

Bighorn Canyon National Recreation Area

* Assisted with Resource Management Plan.

* Assisted DoJ, SOL, Montana Water Court, and the park with proceedings for a Preliminary Decree for the Montana Statewide Water Rights Adjudication.

Black Canyon of the Gunnison National Monument

* Assisted park and Region with negotiations for a contract with the Bureau of Reclamation forflow deliveries.

* Conducted studies to quantify reserved water right.

* Coordinated interim flow releases according to preliminary Aspinall Flow Delivery Contract.

* Reviewed water rights aspect of proposed legislation redesignating the monument as a national park.

Glacier National Park

* Evaluated non-NPS water-right applications to implement the Montana Water Rights Compact.

* Notified State of Montana regarding change in NPS water use at campground.

* Assisted park in matter regarding NPS temporary use of water.

* Assisted DoJ, SOL, Montana Water Court, and the park with proceedings for a preliminary decree for the Montana Water Rights Adjudication.

Grant-Kohrs Ranch National Historic Site

* Monitored progress of Montana adjudication for Basin 76G.

Great Sand Dunes National Monument

* Assisted DoJ, SOL, FWS, and park staff in developing technical strategy to prepare to respond to Stockman's proposed water development.

Little Bighorn Battlefield National Monument

* Assisted DoJ, SOL, Montana Water Court, and the park with proceedings for a Preliminary Decree for the Montana Statewide Water Rights Adjudication.

Rocky Mountain National Park

* Reviewed hydrologic data and revised draft completion report.

* Reviewed progress of a study to evaluate the effects of Grand Ditch on hydrology of Colorado River and associated wetlands.

Wind Cave National Park

* Submitted location notices for water developments found within the park.

Yellowstone National Park

* Reviewed the NEPA documents for a mineral withdrawal in the New World Mine area.

* Evaluated non-NPS water right applications to implement the Montana Water Rights Compact.

* Attended Soda Butte Creek Conference.

* Continued support for investigations by the USGS and Montana Bureau of Mines to describe the hydrogeologic system of the Soda Butte Creek drainage upstream from the park boundary. Reviewed and directed work.

* Assisted DoJ, SOL, Montana Water Court, and the park with proceedings for a preliminary decree for the Montana Water Rights Adjudication.

* Assisted the park in evaluating its earth resources program needs.

* Collected streamflow data for Soda Butte Creek in support of the Water Rights Compact.

Multi-Park

* Reviewed monthly Colorado Water Court resumes.

SOUTHWEST CLUSTER

Planning and Evaluation Branch

Big Bend National Park

* Provided assistance with NPS wetland/floodplain compliance and Clean Water Act permit information.

Big Thicket National Preserve

* Participated in a workshop to discuss issues pertaining to river corridor management in the Upper Neches River Corridor Unit and Jack Gore Baygall Unit.

* Reviewed the Big Thicket Water Corridor Units Management Assessment prepared by Dr. Paul Harcombe (Rice University) and Ms. Glenda Callaway (Ekistics Corp.) providing the park with recommendations pertaining to the need for the future development of a Water Resources Management Plan.

Chickasaw National Recreation Area

* Provided continued technical support and assistance in the initiation and development of a Water Resources Management Plan.

Chiricahua National Monument

* Provided an overview of water resources-related issues and developed two RMP project statements relating to changes in hydrology caused by fire suppression and surface and groundwater monitoring needs.

Fort Bowie National Historic Site

* Provided park management with an overview of water resources-related issues and developed an RMP project statement relating to the need for developing a restoration plan for Apache Spring.

Guadalupe Mountains National Park

* Utilized the Fisheries Affiliates Program to provide technical assistance in the development of alternatives pertaining to the reintroduction of Rio Grande Cutthroat trout toMcKittrick Creek.

* Provided assistance with NPS wetland compliance and Clean Water Act permit information for the Smith Canyon/Manzanita Spring erosion/sedimentation problems.

Lake Meredith National Recreation Area

* Visited oil and gas facilities in the park to observe possible wetland, ground water, and surface water impacts. Assistance was provided as part of an on-going support for the park's oil & gas management plan/EIS.

* Visited a wetland site along the park's boundary, below Sanford Dam, where a Clean Water Act 404 violation had occurred. Provided guidance to the park for actions necessary to oppose the permit.

Montezuma Castle National Park

* Provided assistance with NPS wetland/floodplain compliance and Clean Water Act permit information for trail work along Beaver Creek.

Organ Pipe Cactus National Monument

* Provided assistance with NPS wetland compliance and Clean Water Act permit information for road work through the park.

Palo Alto Battlefield National Historic Site

* Provided technical review and comments on a water resources planning project statement.

Pecos National Historical Park

* Reviewed and approved the detailed study plan for the project "Develop Feasibility Study and Restoration Design for Glorieta Creek Floodplain/Reservoirs."

* Provided technical assistance regarding restoration of the channel and floodplain ofGlorieta Creek, including mapping existing wetlands, developing design criteria for floodplain and wetland restoration, reviewing design alternatives and the Environmental Assessment, and advising on compliance with Section 404 of the federal Clean Water Act.

Salinas Pueblo Missions National Monument

* Assisted in the technical review and publication of the Salinas Pueblo Missions National Monument Water Resources Management Plan.

Saguaro National Park

* Assisted in the completion and publication of the Saguaro National Park Water Resources Scoping Report (WRD Technical Report NPS/NRWRD/NRTR-97/95).

Water Operations Branch

Amistad National Recreation Area

* Provided well logs and construction information for submittal to state agency.

Bandelier National Monument

* Developed stormwater permitting strategy for Elk Meadows development.

* Reviewed and provided comments on a study plan for proposal on the ecological, hydrological, and geochemical effects of the Dome fire on the Capulin Watershed.

* Issued a Baseline Water Quality Data Inventory and Analysis Report documenting water quality data retrievals from six Environmental Protection Agency databases.

Big Bend National Park

* Reviewed dust control options and provided summary ofPenzSuppressD and calcium chloride information.

Casa Grande Ruins National Monument

* Assessed impacts of water table declines.

Carlsbad Caverns National Park

* Facilitated completion of a project conducted by the Colorado School of Mines assessing the impact to cavern water quality from surface infiltration.

* Assisted park staff in developing a monitoring program for backcountry springs and seeps.

* Assisted park staff in calibrating new flume at Rattlesnake Springs.

* Investigated the hydrogeology of Rattlesnake Springs.

Chickasaw National Recreation Area

* Uploaded park-collected (1987-1994) and a variety of other water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Chiracahua National Monument

* Provided interpretation on the applicability of the stormwater permitting requirements to a highway construction project.

* Provided advice regarding installation of a flood warning system.

* Performed a reconnaissance and provided advice regarding the potential watershed effects of a 250-acre wildfire.

* Uploaded water quality data for springs from the WRD archives to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Fort Bowie National Historical Site

* Provided recommendations for stabilization of an ephemeral channel threatening an historic trail.

* Uploaded water quality data for Apache Spring from WRD archives to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Fort Union National Monument

* Advised on environmentally friendly ways to remove asphalt spilled on concrete sidewalks.

Gila Cliff Dwellings National Monument

* Uploaded water quality data from the National Geochemical Data Base: National Uranium Resource Evaluation Program to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Guadalupe Mountain National Park

* Provided assistance with the identification of impacts to water quality by prescribed fire.

* Assessed problems with the water supply well at Pine Springs.

* Provided floodplain information regarding the visitor center/administration building.

* Inventoried and assessed potential of unused water supply wells on acquired lands.

* Inventoried and compiled historical data for springs in the park.

* Provided information on proper techniques for plugging and abandoning unused wells.

* Uploaded Texas Tech University and park-collected (1987-1997) data and a variety of other water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Lake Meredith National Recreation Area

* Toured oil and gas industry facilities and scouted potential sample sites for soil, sediment, water, and tissue to define contamination from said facilities.

* Prepared proposals to study oil and gas contamination in soil, sediment, and freshwater mussel tissue.

* Participated in oil and gas management plan/EIS formulation and assisted park in assessing the likely effect of adjacent wetlands dredging.

Organ Pipe Cactus National Monument

* Provided advice regarding water quality monitoring equipment forQuitobaquito Spring.

* Uploaded a variety of water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Pecos National Historical Park

* Completed a detailed survey to support a stream restoration project.

* Provided project coordination and consultation related to the floodplain/wetland restoration project underway, including the use of an Area Hydrologist.

Petroglyph National Monument

* Reviewed Albuquerque stormwater (AMAFCA) documents and recommended options for development of the Ladera watershed.

* Reviewed proposed stormwater drainage plan.

Saguaro National Park

* Evaluated the impact of declining water tables on park resources.

* Uploaded water quality data from WRD archives and the National Geochemical Data Base: National Uranium Resource Evaluation Program to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Salinas Pueblo Missions National Monument

* Reviewed and commented on a multi-area water resources scoping report produced by a contractor.

White Sands National Monument

* Reviewed ground water quality study plan and coordinated visit to assess erosion on an archeological site and development of an interagency ground water monitoring strategy.

* Compiled trip report on erosion of an archeological site, revised ground water management plan, and provided interagency coordination.

* Uploaded a variety of water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Water Rights Branch

Big Bend National Park

* Analyzed flows of tributaries to the Lower Rio Grande.

Chickasaw National Recreation Area

* Prepared statement of work to replace Vendome Well, acquired engineering assistance of the Bureau of Reclamation, and provided technical oversight in construction of replacement well for Vendome well.

* Participated in scoping meeting regarding Water Resources Management Plan and presented information on Oklahoma water rights.

Coronado National Memorial

* Monitored progress of San Pedro River adjudication.

Fort Bowie National Historic Site

* Monitored progress of Upper Gila River adjudication.

* Continued negotiation for withdrawal of protests for water right filings for Apache and Mine Tunnel Springs.

Montezuma Castle National Monument

* Monitored progress of Verde River adjudication.

Pecos National Historical Park

* Assisted SOL and park in determining the water rights status of impoundments on Glorieta Creek.

Saguaro National Park

* Monitored progress of San Pedro and Santa Cruz River adjudications.

* Reviewed water rights acquired through land exchanges.

Salines Pueblo Missions National Monument

* Provided review comments for draft Water Resources Management Plan.

San Antonio Missions National Historical Park

* Assisted SOL with plans to re-establish the San Juan Ditch Corporation.

Tonto National Monument

* Monitored progress of Salt River adjudication.

Tuzigoot National Monument

* Monitored progress of Verde River adjudication.

MIDWEST REGION

GREAT LAKES CLUSTER

Planning and Evaluation Branch

Provided technical review of a study plan for an NRPP-funded study of basic limnological characteristics of selected lakes at Indiana Dunes National Lakeshore, Sleeping Bear Dunes National Lakeshore, Pictured Rocks National Lakeshore, Isle Royale National Park, Apostle Islands National Lakeshore, and Voyagers National Park.

Isle Royale National Park

* Provided technical advice regarding the disposition of fingerling and yearling coaster brook trout.

Pictured Rocks National Lakeshore

* Provided project review and technical assistance on a project to evaluate and restore walleye spawning habitat in Beaver Lake.

Saint Croix National Scenic Riverway

* Assisted in the completion and publication of the St. Croix National Scenic Riverways Water Resources Management Plan.

* Assisted park in the development of a draft Fisheries Management Plan.

* Participated in a multi-agency Risk Assessment Workshop to prioritize resource management issues facing the riverway.

* Prepared a draft description of requirements for compliance with Section 10 of the Rivers and Harbors Act for insertion into the Water Resources Management Plan.

Sleeping Bear Dunes National Lakeshore

* Facilitated a "scoping" session to identify and delineate water resource management issues facing the park, a first step in the development of a Water Resources Scoping Report.

* Provided project oversight and review for a study assessing the impacts of bacterial contamination at swimming beaches.

* Assisted Denver Service Center in troubleshooting a malfunctioning wetland-based wastewater treatment system.

Water Operations Branch

Apostle Islands National Lakeshore

* Provided review and recommendations on possible causes of failure of wetland wastewater treatment pond.

* Reviewed and provided comments on proposed changes to the Water Quality Standards of the Wisconsin Administrative Code.

Indiana Dunes National Lakeshore

* Provided a summary of the new EPA 1600 metals methods as well as updated suggestions for recommended labs, QA/QC methods, and detection limits.

* Reviewed and approved final report on a WRD funded study of restoration of Great Marsh.

Mississippi National River & Recreation Area

* Provided comments on an NPDES stormwater permit for a proposed metal shredding facility adjacent to the river.

Saint Croix National Scenic Riverway

* Provided consultation on channel bed and habitat detection and mapping technologies.

Sleeping Bear Dunes National Lakeshore

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

GREAT PLAINS CLUSTER

Planning and Evaluation Branch

Buffalo National River

* Provided assistance to the park in preparation of an opposition letter to the Corps of Engineers in response to a 404 public notice for construction of a dam and water supply reservoir on Bear Creek that could have impacts to the free-flowing nature of the Buffalo River and impact other park resources.

* Approved final report for FY 94/95 WRD funded project for "Inventory and Characterization of Riparian Zone (Wetlands)."

Knife River Indian Villages National Historical Site

* Provided assistance in review of a 404 public notice and subsequent park response letter to the Corps of Engineers for a proposed jetty project.

Ozark National Scenic Riverways

* Reviewed and approved the study plan for a FY 97/98 WRD funded project for "Riparian Zone Wetland Characterization and Succession."

* Provided review comments on the draft Water Resources Management Plan.

Tall Grass Prairie National Preserve

* Participated in a Resource Management Workshop in order to assist park and regional staff in the identification of water resources-related issues.

Theodore Roosevelt National Park

* Provided project oversight and technical review in the development of a Water Resources Scoping Report.

Water Operations Branch

Agate Fossil Beds National Monument

* Uploaded a variety of water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Arkansas Post National Monument

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

Buffalo National River

* Provided recommendations for the development of water quality standards for the park.

* Delineated karst hydrogeology of the Crooked Creek watershed.

* Uploaded water quality data collected in 1989 at four stations used to assess the effects of cattle pasture runoff on water chemistry to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Homestead National Monument of America

* Provided details and explanations about previous WRD floodplain mapping assistance.

Hot Springs National Park

* Uploaded a variety of water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Knife River Indian Village National Historic Site

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

Niobrara National Scenic Riverway

* Provided technical definitions to a query about inventorying waterfall features.

Ozark National Scenic Riverways

* Visited park with an Area Hydrologist to develop advice for park staff concerning the proposed construction of several new highway bridges that will span park rivers.

* Reviewed and commented on USGS annual report of monitoring activities in contributing watersheds.

* Assisted in evaluating potential impacts of proposed lead mining in the watershed of the park. Reviewed and commented on draft EA for exploratory drilling.

Pea Ridge National Military Park

* Uploaded water quality data from the National Geochemical Data Base: National Uranium Resource Evaluation Program to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Tall Grass Prairie National Preserve

* Evaluated park riparian systems using the Bureau of Land Management's process for assessing proper functiong condition.

Theodore Roosevelt National Park

* Provided information on lab methods appropriate for use in responding to an oil-industry spill of salt water.

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

Wilson's Creek National Battlefield

* Performed a STORET Invent Summary at the request of the park to identify water quality data currently in STORET.

Wind Cave National Park

* Provided information on the advisability of using portable instruments vs. lab analyses in monitoring oil contamination washing into the cave from parking lots.

NATIONAL CAPITAL REGION

Planning and Evaluation Branch

* Provided assistance to the NPS Chesapeake Bay Taskforce in defining watershed management issues of interest to the Taskforce and in developing a plan for improving watershed practices on NPS managed lands within the Chesapeake Bay watershed.

NATIONAL CAPITAL CLUSTER

Planning and Evaluation Branch

Rock Creek Park

* Provided technical assistance regarding the restoration and enhancement of vernal pond habitats.

Water Operations Branch

Chesapeake and Ohio Canal National Historical Park

* Reviewed USGS proposals for flood-related projects.

* Assisted DSC in developing recommendations for future work related to providing flood protection to cultural resources.

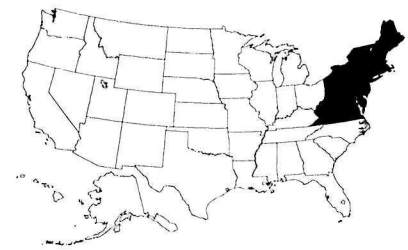
Harpers Ferry National Historical Park

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

Manassas National Battlefield

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

NORTHEAST REGION



Water Operations Branch

* Reviewed and provided comments on the State of Pennsylvania's Antidegradation Policy.

ALLEGHENY CLUSTER

Planning and Evaluation Branch

Allegheny Portage Railroad National Historical Site

* Reviewed and commented on a draft "Schematic Design/Environmental Assessment for Staple Bend Tunnel Unit."

Fort Necessity National Battlefield

* Assisted with preparation and review of a wetland Statement of Findings for construction of a new visitor center.

New River Gorge National River/Gauley River National Recreation Area/Bluestone Scenic Riverway

* Assisted park and USGS in developing a study plan for the NERI/GARI/BLUE Water Resources Management Plan.

* Participated in an issue identification and scoping workshop in support of the development of a Water Resources Management Plan.

Water Operations Branch

Allegheny Portage Railroad National Historical Site

* Provided a review of an aquatic invertebrate monitoring report and suggested proper uses for various approaches.

* Uploaded water quality data collected by Penn State University to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Fort Necessity National Battlefield

* Uploaded water quality data from the National Geochemical Data Base: National Uranium Resource Evaluation Program to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Friendship Hill National Historic Site

* Uploaded a variety of water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

New River Gorge National River

* Provided information on the impacts of road de-icing chemicals on water quality.

CHESAPEAKE CLUSTER

Planning and Evaluation Branch

Provided assistance to the NPS Chesapeake Bay Taskforce in defining watershed management issues of interest to the Taskforce and in developing a plan for improving watershed practices on NPS-managed lands within the Chesapeake Bay watershed.

Delaware Water Gap National Recreation Area

* Reviewed and approved the study plan for a FY 97/98 WRD funded project to "Evaluate and Implement Wetland Restoration Methods."

Fredericksberg & Spotsylvania County Battlefields Memorial NHP

* Reviewed and commented on a draft wetland Statement of Findings for "Removal of Two Riparian Stream Buffers, Bloody Angle Historic Scene Restoration, Spotsylvania Battlefield."

George Washington Birthplace National Monument

* Provided technical review and revision of the draft Water Resources Management Plan.

Shenandoah National Park

* Assisted in the development of an interagency workplan to monitor trout populations within the park.

* Provided assistance with NPS wetland/floodplain compliance and Clean Water Act permit information for the Hog Camp Branch restoration project.

* Provided assistance with NPS wetland/floodplain compliance and Clean Water Act permit information for the Hemlock Run restoration project.

Water Operations Branch

Booker T. Washington National Monument

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

Colonial National Historical Park

* Provided recommendations on urban stream restoration projects.

* Reviewed PAH data from hazardous waste site 12 and recommended future chemical analyses strategies.

* Responded to requests to analyze reports and data generated by Navy contractors as well as draft responses.

* Reviewed and commented on the final draft Scope of Work for the Shoreline Management Plan being prepared by the Virginia Institute of Marine Science.

Delaware Water Gap National Recreation Area

* Provided assistance in calculating discharge in an ungaged stream.

* Developed a proposal for inventory and description of hydrogeology and ground water resources.

* Field inspected numerous proposed stream erosion and dam deactivation projects.

* Responded to query about recommended reading for layman on stream restoration projects.

* Oversaw contracted project designed to line a water quality/watershed model (Soil and Water Assessment Technique - SWAT) with GIS to enable the park and Delaware River Basin Commission to assess the impacts of rapid land development around the park on water quality.

George Washington Birthplace National Monument

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

Gettysburg National Military Park

* Provided information on the tendency of arsenic to be found in the environment of civil war battlefields. Provided information on lab methods and detection limits appropriate for analyses of arsenic.

Petersburg National Battlefield

* Collected technical information on water bars and trail maintenance for park staff.

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

Richmond National Battlefield

* Provided continued technical assistance relating to landfill and water contaminants monitoring issues.

Shenandoah National Park

* Advised on the availability of ground water for additional development at Lewis Mountain, Camp Hoover, and Dickey Ridge.

* Completed a detailed channel survey with subsequent modeling and check dam design for the purpose of restoring an incised stream.

* Reviewed and commented on the Atmospheric and Streamwater Components of the Integrated Data Assessment Project of the Shenandoah Watershed Acidification Study.

Valley Forge National Historical Park

* Reviewed a report on concentrations of various chemicals in the sediments of Schuykill River and provided information on the chemicals.

NEW ENGLAND/ADIRONDACK CLUSTER

Planning and Evaluation Branch

Acadia National Park

* Advised Denver Service Center regarding wetlands compliance requirements for pipeline removal.

Cape Cod National Seashore

* Assisted in the technical review and development of the draft Water Resources Management Plan.

Roosevelt-Vanderbilt National Historic Sites

* Co-authored and provided technical review in the completion of the Water Resources Management Plan.

Water Operations Branch

Acadia National Park

* Provided interpretation of the applicability of stormwater permits to housing development.

* Provided review and comment on Environmental Assessment for housing development.

* Participated in park-sponsored water quality workshop.

* Provided analysis of chlorine contaminated discharge into park streams.

* Provided guidance on handling potential soil contamination issues related to lead from buried pipes.

* Provided comments on an international report on mercury to a group studying sources in Mexico, Canada, and the United States.

* Informed park of risks to aquatic life from a long-term release of chlorinated drinking water into a stream and recommended a sampling plan to define contamination.

* Provided consultation to DSC staff involved in design/compliance associated with several projects.

Adams National Historical Site

* Reviewed proposed urban storm water drainage project hydrologic modeling by highway department.

Cape Cod National Seashore

* Assessed ecological impacts of ground water withdrawals on aquatic resources.

* Advised on eutrophication trends in the past 500 years in kettle pond sediments.

Gateway National Recreation Area

* Uploaded park-collected water quality data (1977-1996) from the Jamaica Bay, Staten Island, Sandy Hook, and Atlantic Units to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Marsh-Billings National Historical Park

* Uploaded water quality data for four stations from a 1994 Water Resources Assessment to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Saratoga National Historical Park

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

Saugus Iron Works National Historical Site

* Assessed site and reviewed ground water quality and soils data.

* Interpreted soil, sediment, surface water, and ground water quality data for several compounds. Commented on potential environmental effects of dredging the marsh-river adjacent to the park.

* Provided data interpretation information related to arsenic concentrations in a slag pile, PCBs in soils, and PAHs in sediments.

Weir Farm National Historic Site

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

Water Rights Branch

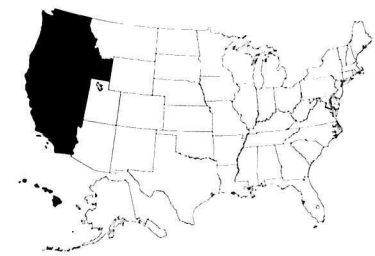
Cape Cod National Seashore

* Monitored progress of ongoing work and initiated studies to address effects of groundwater withdrawals on aquatic resources.

* Provided guidance to park management on sale and lease of park water and water rights.

* Reviewed methods for possible exchange of NPS rights to Provincetown.

PACIFIC WEST REGION



COLUMBIA CASCADES CLUSTER

Planning and Evaluation Branch

Crater Lake National Park

* Provided a technical review of the bull trout restoration project.

Lake Roosevelt National Recreation Area

* Assisted in the completion and publication of the Lake Roosevelt NRA Water Resources Scoping Report (WRD Technical Report NPS/NRWRS/NRTR-97/107).

Mount Rainier National Park

* Approved IAR and released funds for 96/97 WRD funded project titled "Inventory and Mapping of Park Wetlands."

Oregon Caves National Monument

* Utilized the Hydrologic Affiliates Program to assist the GMP planning team in the completion of a hydrogeologic assessment regarding the potential impacts from adjacent lands onkarst hydrology.

* Reviewed and commented on the "hydrological" and "geological" sections of the draft General Management Plan.

San Juan Island National Historical Park

* Provided technical review and comment on a project statement (wetland mapping and characterization) prior to submission for funding.

Water Operations Branch

Big Hole National Battlefield

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

John Day Fossil Beds National Monument

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

Hagerman Fossil Beds National Monument

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

Nez Perce National Historical Park

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

North Cascades National Park Complex

* Reviewed and provided comments on site assessments prepared for leaking underground storage tanks at Hozomeen.

* Discussed potential contaminants projects and provided information summaries on foam, surfactants, and dust suppressants.

* Reviewed flow modeling progress and final results for Company Creek bank stabilization project.

* Performed flow modeling of alternatives for Company Creek bank stabilization project.

Olympic National Park

* Provided information on hazards of contaminants leaching out from treated wood in docks, hazards of motor oil, and potential hazards of campground smoke to resident park staff.

* Inspected conditions at the mouth of the Quillayute River and represented park concerns at an Army Corps of Engineers meeting held to discuss potential actions intended to maintain the boat basin at the river's mouth.

* Provided guidance on obtaining an exemption from the NPDES permitting requirements for a wastewater discharge.

Oregon Caves National Monument

* Evaluated alternative potable water supplies.

* Reviewed draft General Management Plan.

Whitman Mission National Historic Site

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

Water Rights Branch

City of Rocks National Reserve

* Assisted DoJ and SOL as requested in ongoing Snake River Basin adjudication.

Crater Lake National Park

* Conducted Klamath adjudication-related studies.

* Coordinated with SOL and DoJ, as well as technical specialists from other agencies, to ensure consistent claims for Federal water rights.

* Submitted water right claims for Klamath adjudication.

* Assisted in developing strategies for protecting the park's authorization to use water, specifically as it relates to water right priority.

* Participated in Klamath Alternative Dispute Resolution process to secure greater understanding and acceptance of the park's water right claims.

Craters of the Moon National Monument

* Assisted the DoJ in supporting NPS claims in the Snake River Basin adjudication.

Lake Roosevelt National Recreation Area

* Assisted park in the completion of the water resources management scoping report.

San Juan Island National Historical Park

* Continued implementation of action plan to protect water rights and water resources.

PACIFIC/GREAT BASIN CLUSTER

Planning and Evaluation Branch

* Provided technical review of the study plan for an NRPP-funded project to preserve and restorecoho salmon and steelhead habitat at Golden Gate National Recreation Area, Point Reyes National Seashore, and Muir Woods National Monument.

* Presented information on NPS wetland and floodplain compliance, the Corps of Engineers Sections 404/401/10 permit programs, the USFWS's National Wetland Inventory program, and wetland functions at a course titled "Resource Stewardship Through Quality Environmental Planning."

Channel Islands National Park

* Provided technical review and comment on a Santa Rosa Island stream channel restoration project statement prior to submission for funding.

Death Valley National Park

* Assisted with wetland compliance for the Texas Springs rehabilitation project (provided written assessment of requirements for compliance with Section 404 of the Clean Water Act and with NPS wetland guidelines.)

Golden Gate National Recreation Area

* Provided technical review and comment on a water resources project statement ("Water Quality at Muir Beach Stables") prior to submission for funding.

* Advised park staff regarding an Environmental Assessment and wetlands compliance for draining artificial ponds.

* Advised park staff regarding wetlands compliance issues associated with drainage along the Camino del Canyon Road.

Great Basin National Park

* Reviewed and approved the first-year report for the project "Mapping and Assessment of High-Use Riparian and Wetland Areas at Great Basin National Park." Arranged for a University of Nevada (Reno) team to assess the "functional condition" of stream and riparian zones throughout the park, and approved second year funding.

Redwood National Park

* Provided review and comment on the final Davison Ranch wetland delineation report.

* Provided review and comment on the draft Redwood Creek Estuary management plan.

Santa Monica Mountains National Recreation Area

* Assisted in the technical publication of the Water Resources Management Plan.

* Provided review and comment on the draft EA for decreasing flood hazard of the Rocky Oaks Dam.

Sequoia and Kings Canyon National Park

* Reviewed and commented on the Project Agreement for the GMP/EIS.

Yosemite National Park

* Assisted park in the initiation of a Water Resources Management Plan.

* Facilitated discussions between the USGS and the park pertaining to further enhancing cooperative activities.

Water Operations Branch

Channel Islands National Park

* Continued to provide support to ongoing evaluation and negotiations on grazing activities on Santa Rosa Island.

* Provided review and comments on Santa Rosa Island Grazing EIS.

* Reviewed Santa Rosa Island riparian monitoring project.

Death Valley National Park

* Provided regulatory guidance for the disposal of sewage sludge from an abandoned sewage treatment plant.

* Evaluated local hydrogeology and potential impacts on spring resources at locations that may be vulnerable to impacts from ground water withdrawals outside the park.

* Reviewed, commented on, and approved a study plan to study aquatic invertebrate fauna and water quantity and quality issues in the Travertine and Nevares Springs complex.

* Provided a summary of information on glyphosphate.

* Conducted a detailed survey and performed subsequent modeling to assess flood risk and design mitigation measures for the historic Scotty's Castle Bridge.

* Completed a detailed survey and established permanent monitoring stations along Furnace Creek.

Golden Gate National Recreation Area

* Reviewed and provided comments on San Francisco's Recycled and Groundwater Master Plan.

* Reviewed and provided comments on water quality assessment of concessionaires stables.

* Reviewed and provided comments on the park's water quality database.

Joshua Tree National Park

* Coordinated proposed completion of WRD funded investigation of historical water and chemistry study.

Lake Mead National Recreation Area

* Provided review and comments on Clark County 208 plan.

* Represented NPS at a meeting with the Nevada Department of Environmental Protection on proposals to change water quality standards at the park.

* Assisted in convening a group of technical experts to help find out why male carp were being feminized. Finalized the results and helped guide an expert who identified the chemicals (estrogen and ethinyl estradiol) responsible for the endocrine disruption.

* Summarized known ecotoxicology literature on perchlorates.

Point Reyes National Seashore

* Participated on a three-park (PORE, GOGA, MUWO) Coho Restoration Project technical advisory board.

Redwood National Park

* Provided review comments for draft Redwood Creek Estuary Plan.

Santa Monica Mountains National Recreation Area

* Reviewed monitoring impacts to evaluate possible ground water impacts of subway tunnel construction beneath Runyon Canyon.

* Reviewed EA on impacts of Calabases landfill.

* Provided on-site consultation in the modification of an emergency spillway for a small reservoir.

Sequoia and Kings Canyon National Park

* Inspected park infrastructure damaged by flooding in January, 1997. Provided advice on how best to make repairs to roads and other infrastructure given the geomorphic setting.

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

Yosemite National Park

* Provided advice and technical assistance to park staff regarding the proposed removal of Cascade Diversion Dam. Techniques for the management of sediment stored behind the dam and implications to downstream water quality were discussed.

* Conducted a hydrologic and geomorphic assessment of the January 1-3, 1997, flood in Yosemite Valley and provided interpretations for flood recovery and Valley Implementation Planning.

* Organized and conducted cross section surveys of Cascade Dam sediment deposition and downstream environments. Established baseline monitoring for dam removal and highway relocation.

* Provided extensive support in the evaluation of the effects of a 100-year flood on park infrastructure.

* Reviewed and commented on contractor proposal of removing sediment from Cascade Dam.

* Integrated digital GIS datasets and prepared maps and graphics in support of a WRD issued flood report.

* Provided advice and contacts on attributing the park's 1:24,000 DLGhydrography data relative to RF3 and the National Hydrography Dataset.

Water Rights Branch

Death Valley National Park

* Continued development of project and study plans to protect water rights.

* Coordinated investigations with other entities at the sixth annual Devil's Hole workshop in Las Vegas, NV.

* Monitored Devil's Hole pool level and discharge of Nevares, Texas, and Travertine springs.

* Negotiated with Rayrock Mines, Inc. concerning its water right application upgradient from the park and reviewed proposed monitoring plan.

* Protested four Nevada Water Right applications.

* Recommended to the park that three applications not be protested.

* Compiled and reviewed monitoring data on Department of Energy and Barrick Bullfrog water permits.

* With USGS and park staff, analyzed potential causes for the apparent gradual decline of the pool level in Devil's Hole.

* Prepared water rights section for report on potential lands for Timbisha Indian Tribe and reviewed the entire report.

* Recommended to the park that two protests to applications in Oasis Valley be withdrawn.

* Initiated multi-year USGS study of evapotranspiration at Death Valley salt pan.

* Assisted DoJ with preparation of memorandum of understanding among federal agencies that manage lands in southern Nevada.

* Provided review comments for Environmental Assessment of ground water monitoring well in Amargosa River alluvium near Saratoga Springs.

* Negotiated agreement with Department of Energy, Yucca Mountain Project, regarding revised long-term monitoring plan for Death Valley region.

* Developed priorities with the USGS and consultants for technical investigations in the Death Valley ground-water system.

* Reviewed USGS proposal to update Death Valley regional ground-water flow model and prepared task order.

* Reviewed draft report concerning suitability of lands for Timbisha Tribe.

Golden Gate National Recreation Area

* Assisted in negotiations with Muir Beach Community Services District concerning the District's Redwood Creek application.

Great Basin National Park

* Completed analysis of seepage runs conducted by USGS on Baker, Lehman, and Snake Creeks.

* Funded operation of gaging stations on Lehman and Baker Creeks.

* Protested one water right application and recommended to park that five applications not be protested.

Joshua Tree National Monument

* Reviewed environmental impact documents for proposed Eagle Mountain landfill project located adjacent to park and evaluated impact to water-related resources and rights.

Lake Mead National Recreation Area

* Submitted annual report to Moapa Valley Water District regarding Rogers Spring as required by monitoring plan.

* Provided additional funding and oversight for the investigation by Desert Research Institute of the origin and flowpaths of water issuing from selected springs.

* Provided funding to monitor discharge of Rogers Spring.

* Protested nine water right applications, recommended that ten applications not be protested, and withdrew protests to two applications.

Point Reyes National Seashore

* Coordinated state water-use compliance inspections and reporting requirements.

* Provided water rights assistance for the Giacomini land exchange.

* Provided water rights assistance on Pasternak's request to drill a horizontal well in Devil's Gulch.

* Exchanged opportunities to file petitions with the State Water Resources Control Board to change water rights to instream beneficial uses.

Yosemite National Park

* Prepared water rights assessments for Wawona water supply.

Multi-Park

* Reviewed water right applications for Nevada and California.

* Submitted Reports of Licensee and Progress Reports for California parks.

PACIFIC ISLAND CLUSTER

Planning and Evaluation Branch

Kalaupapa National Historical Park

* Provided technical assistance regarding coral reef management and coral reef fish sampling and monitoring protocols.

Kaloko-Honokohau National Historical Park

* Reviewed a feasibility study for the rehabilitation of native Hawaiian fishponds.

National Park of American Samoa

* Conducted an issues identification and scoping workshop to identify water resources-related issues which will be addressed in a Water Resources Scoping Report.

War in the Pacific National Historical Park

* Assisted in the development of a project statement to provide a high priority assessment of the park's coastal marine resources.

Water Operations Branch

American Memorial Park

* Provided STORET Invent Summary in support of water resources scoping effort at the park.

Kaloko-Honokohau National Historical Park

* Reviewed a final report on water quality in anchialine ponds.

National Park of Samoa

* Provided STORET Invent Summary in support of water resources scoping effort at the park.

War in the Pacific National Historical Park

* Provided STORET Invent Summary in support of water resources scoping effort at the park.

Water Rights Branch

Kalaupapa National Historic Park

* Completed the field data collection for the Waikolu Stream Study and received final aquatic biologic reports from contractor.

* Contracted with Colorado State University for assistance with Waikolu Stream Study.

Kaloko-Honokohau National Historical Park

* Continued a groundwater modeling study with USGS to determine effects of proposed groundwater withdrawals.

* Reviewed and provided comments to park on proposed groundwater withdrawal.

SOUTHEAST REGION

APPALACHIAN CLUSTER

Planning and Evaluation Branch

Big South Fork National River and National Recreation Area

* Provided continued project support for a WRD funded project to develop a Water Resources Management Plan.

* Provided technical review of several aquatic biomonitoring proposals solicited by the park.

Cumberland Gap National Historical Park

* Provided assistance to DSC in obtaining a wetland delineation contractor, reviewed the final delineation report, recommended minimization and mitigation alternatives, and reviewed draft Wetlands Statement of Findings.

Obed Wild and Scenic River

* Provided continued assistance for a region-funded project for a Water Resources Management Plan, including providing an overview of the WRMP process to TVA contractors and a review of portions of the draft plan.

Water Operations Branch

Big South Fork National River & National Recreation Area

* Continued to provide support for characterization andremediation of acid mine drainage.

* Uploaded additional water quality data collected by SS Papadopulos and Associates at more than 70 stations along the Big South Fork, as part of an initial investigation into acid mine drainage impacts on the river, to STORET.

Carl Sandburg Home National Historic Site

* Uploaded park-collected (1988-1993) water quality data from 13 stations monitored as part of the park's Inventory and Monitoring Program and other water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Chickamauga and Chattanooga National Military Park

* Provided information on methods for monitoring cave habitats for Benzene, Toluene,Ethylbenzene, Xylenes (BTEX), and other oil compounds.

Cumberland Gap National Historical Park

* Uploaded a variety of park-collected and other water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Fort Donelson National Battlefield

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

Kings Mountain National Military Park

* Provided review and comments on Water Quality Interim Report #3.

* Uploaded water quality data for seven stations from ongoing park water quality monitoring program (1994-1996) to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Obed Wild and Scenic River

* Provided interpretation of the state's antidegradation policy.

Ninety Six National Historic Site

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

Water Rights Branch

Obed Wild and Scenic River/Big South Fork National River and Recreation Area

* Reviewed proposal to develop surface water upstream of BISO and analyzed hydrologic effects ofHuntville Utility District project.

* Briefed park on water rights issues for both park units.

* Provided water rights language for draft Water Resources Management Plan.

Chattahooche River National Recreational Area

* Recommended study methods for quantifyinginstream flows for recreation uses.

ATLANTIC COAST CLUSTER

Planning and Evaluation Branch

Chattahoochee River National Recreation Area

* Provided technical assistance in the development of an RMP project statement identifying the need for the development of a Water Resources Management Plan.

* Participated in a scoping workshop in order to identify the NPS role in the DOI Tri-State Compact Study for the allocation of Chattahoochee River waters.

Congaree Swamp National Monument

* Reviewed the Investigator's Annual Report for the project "Wetland Database-Guided Field Verification of Vegetative Communities in COSW" and approved second-year funding.

Fort Caroline National Memorial

* Provided onsite technical assistance regarding alternatives for mitigating extraordinarily high water levels in Spanish Pond.

Moores Creek National Battlefield

* Provided on site technical assistance (well installation, topographic survey, groundtruthing for "existing conditions" vegetation map, and related data collection) related to restoration of a drained savannah wetland.

Timucuan Ecological and Historic Preserve

* Provided technical assistance for and concurred with an Executive Order 11990 "Wetlands Statement of Findings" for the Cedar Point Development Concept Plan.

* Provided an issues overview and analysis of water-related management issues at a meeting of the Timucuan Alliance convened to discuss water resources issues affecting the Preserve.

Water Operations Branch

Andersonville National Historic Site

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

Cape Hatteras National Seashore

* Investigated potential for impacts to water quality in the shallow ground water system from septic field leachate.

Chattahoochee River National Recreation Area

* Developed a scope-of-work for a recreation instream flow study.

Congaree Swamp National Monument

* Uploaded a variety of water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Cumberland Island National Seashore

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

Fort Caroline National Memorial

* Provided assistance relating to the proposed artificial draining of Spanish Pond. Urban encroachment has led to the consideration of partial pond drainage to reduce flooding of nearby houses. Assistance was given in identifying and evaluating other alternatives to this action.

Horseshoe Bend National Military Park

* Uploaded a variety of water quality data to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Kennesaw Mountain National Battlefield Park

* Uploaded water quality data for four stations from ongoing park water quality monitoring program (1994-1997) to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Moores Creek National Battlefield

* Completed alluvial aquifer analysis from water level data collected by park staff to evaluate a wetland restoration project.

* Uploaded park-collected Hydrolab water quality data for Moores Creek at the Boardwalk Crossing to STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

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

Timucuan Ecological & Historic Preserve

* Visited the park and University of Florida laboratories as part of project management for a study on the comparative evaluation of physical and biological parameters.

Water Rights Branch

Cape Hatteras National Seashore

* Coordinated (through East Carolina University and the Virginia Institute of Marine Science) studies to monitor/assess potential impacts of water withdrawals on island vegetation.

* Continued North Carolina State University investigation to describe spatial and temporal variations of water table.

* Completed North Carolina State University investigation to determine hydraulic characteristics of surficial aquifer and reviewed associated report.

GULF COAST CLUSTER

Planning and Evaluation Branch

Big Cypress National Preserve

* Provided technical assistance to review and comment on the Miccosukee Tribe's proposal to adopt new water quality standards for the tribe's reservation immediately east of the park.

* Reviewed and commented on the qualified applicants for hydrologist position at the preserve.

* Prepared article on the park's hydrology program.

* Reviewed and commented on draft report summarizing the 1997 Big Cypress Basin Issues Characterization Workshop.

* Provided technical review of the park's annual water quality report.

Everglades National Park

* Reviewed and concurred with a supplemental wetlands Statement of Findings for additional Miccosukee Indian Tribe housing.

* Provided a written assessment of wetland compliance needs (e.g., Section 404 of the Clean Water Act and NPS wetland guidelines) for Taylor Slough restoration project.

Gulf Islands National Seashore

* Assisted park in resolving a dispute with the U.S. Army Corps of Engineers regarding a Clean Water Act Section 404 permit for a housing development along the park boundary. Reviewed and commented on a proposed set of mandatory permit conditions that will require monitoring of wetland recovery and protect park wetlands from degradation.

* Reviewed draft EIS for the Gulf of Mexico Outer Continental Shelf Oil and Gas Lease Sales for the Central Planning Area.

* Provided assistance to the park in evaluating various Corps of Engineers public notices that might have impacted the park.

Jean Lafitte National Historical Park & Preserve

* Participated in an interagency wetlands workshop to prioritize wetlands mitigation sites in the Barataria Unit of the park. Impacted sites were visited and evaluated. Discussed preparation of a wetland mitigation plan.

* Provided assistance with NPS wetland/floodplain compliance and Clean Water Act permit information for the Wood Duck restoration project.

* Visited the National Wetlands Research Center (USGS-BRD) to discuss park projects with researchers.

Natchez Trace Parkway

* Assisted DSC with review and evaluation of the wetland resource identification and delineation survey report for the Section 3X Southern Terminus EIS. Provided assistance with NPS wetlands compliance.

* Assisted DSC with review of the wetland resource identification and delineation survey report for the Palmetto Road (3D26) EA. Provided assistance with NPS wetlands compliance.

Padre Island National Seashore

* Participated in an interdisciplinary team meeting aimed at establishing a framework for completion of three oil & gas management plans/EISs over the next five years.

* Traveled with park staff to nearby Aransas National Wildlife Refuge to view 3-D seismic activities and their effects on coastal ecosystems. Discussions were held with the US Fish and Wildlife Service regarding operator conditions, environmental assessments, and the use of third-party monitors.

Water Operations Branch

Big Cypress National Preserve

* Provided review, comments, and recommendations on proposed water quality standards by theMiccosukkee Indian Tribe.

Big Thicket National Preserve

* Continued to provide assistance on the evaluation of contamination of environmental media from oil and gas operations.

* Provided information on oil brines, brines in general, produced water, and monitoring method protocols.

* Advised on potential environmental impacts from a small release at an oil drilling site and recommended a sampling plan to define contamination.

* Interpreted water quality data taken from a stream after a small release of crude oil into it from a ruptured pipeline.

Big Thicket National Preserve/Lake Meredith National Recreation Area/Padre Island National Seashore

* Provided guidance and recommendations on the development of an Oil and Gas Management Plan.

Biscayne National Park

* Drafted a letter to provide detailed comments on EPA's plans to study sediments in Military Canal, a conduit currently polluting waters.

* Provided an outline for rationales on the need for a buffer strip to protect park waters from pollution originating at the Air Force base at Homestead, and assisted in the development of water quality standards for Biscayne Bay.

Everglades National Park

* Met with staff and discussed a number of contaminants issues, including potential changes in contaminants dynamics that may result from increased water flows to the Everglades, pesticides of concern, mercury, and sources of contaminant information.

Gulf Islands National Seashore

* Reviewed and provided comments on Tiger Point sewage treatment plant upgrade.

* Assessed potential for hydrologic impacts from treated sewage percolation ponds adjacent to park.

* Investigated possible impacts of the park's septic leach fields on Santa Rosa Island.

Jean Lafitte National Historical Park & Preserve

* Provided information summaries on conductivity issues and field and lab protocols for contaminants monitoring.

* Participated in a wetlands workshop to prioritize potential wetlands mitigation sites in the park and informed park of contaminants issues associated with the sites.

Kings Mountain National Monument

* Reviewed and provided comments on tiger point sewage treatment plant upgrade.

Natchez Trace Parkway and National Scenic Trail

* Reviewed EIS and mining permit application and evaluated possible impacts for proposed surfacecoal mine and power plant adjacent to parkway. Negotiated with mining company for additional groundwater and surface water monitoring at the parkway.

Padre Islands National Seashore

* Developed sampling plan to support NPS CERCLA claims.

* Reviewed and provided comments on the results of the South Sprint facility groundwaterremediation project.

* Provided review of report on Baseline/Soil/Groundwater Sampling for Oil and Gas Operations.

* Provided recommended QA/QC methods related lab and field protocols for collection of petroleum contaminated samples.

* Developed Section 9B demand letter for clean-up requirement at Yarborough Pass site.

* Developed summary of contaminant issues at Yarborough Pass for the Department of Justice in support of the government's defense in Austral v. NPS.

Virgin Islands National Park

* Coordinated WRD funded road erosion and sediment study and project refinancing and restructuring.

Water Rights Branch

Natchez Trace Parkway and National Scenic Trail

* Assisted the park with water rights information concerning a proposed lignite mine.

SERVICEWIDE

Planning and Evaluation Branch

* Provided support to the Department of the Interior's US-Mexico Field Coordinating Committee - Shared Water Resources Issues Team in providing information on water-related issues affecting NPS units in the border region.

* Served as member of a Technical Proposal Evaluation Committee for the Bureau of Land Management to evaluate contract proposals for a high profile Supplemental EIS in the California Desert.

* Provided comments on NPS-2, the NPS Planning Guideline.

* Coordinated Servicewide review and completed final draft versions of "Director's Order #77.1: Wetlands Protection" and "Procedural Manual #77.1: Wetlands Protection."

* Provided the General Accounting Office with data and information regarding NPS wetlands-related activities and the WRD Wetlands Program for the period 1990-1997. Information provided included project funding levels, program staffing, wetland definitions, inventory activities, and estimates of wetland acreage in parks.

* Reviewed and proposed NPS comments on the proposed "State Water Sovereignty Protection Act" (House Resolution 128).

* Applied for and received a grant from the National Park Foundation for reprinting the brochure "Wetlands in the National Parks."

* Provided comments to the US Fish and Wildlife Service on a proposed riparian definition and inventory/mapping procedures for the western United States.

* Coordinated the NPS response to a US Fish and Wildlife Service proposal to limit use of refuges as wetland mitigation sites for Section 404 permits on private land.

* Served as NPS representative to the Federal Geographic Data Committee's Wetlands Subcommittee.

* Presented lectures on NPS wetlands protection and floodplain management procedures for the "Natural Resources Fundamentals Course" at the Albright Training Center.

* Provided information on wetland education programs and software to planners for the Illinois and Michigan Canal National Heritage Corridor.

* Participated in a workshop to discuss revising the Resource Management Planning process.

* Provided review of Final Rule 36CFR Parts 1&3 regulating access of boats and individuals to NPS waters infested with injurious non-native aquatic plants and animals.

* Sponsored the development of a "Resource Handbook for Native Mussel Conservation."

* Represented NPS on the National Recreational Fisheries Coordination Council in the development of a 5-year interagency agenda to conserve and restore the nation's aquatic systems in order to provide for a viable and healthy recreational fishery.

* Represented NPS on the National Fishing Week Steering Committee and provided coordination of National Fishing Week activities servicewide.

* Worked with the American Sportfishing Association in seeking funding for NPS fisheries-related restoration projects.

* Represented NPS at a meeting with the National Marine Fisheries Service to review the proposed rules for implementing the essential fish habitat provisions of the reauthorized Magnuson-Stevens Fishery Conservation Act.

* Presented a paper at the annual meeting of the Society of Wetland Scientists titled "Protecting Wetlands in the National Parks: New procedures for balancing public use and wetland preservation mandates."

Water Operations Branch

* Coordinated all aspects of the joint WRD - Servicewide Inventory and Monitoring Program's effort to produce Baseline Water Quality Data Inventory and Analysis Reports for all I&M parks.

* Presented "Fundamentals of the Clean Water Act" to the Natural Resource Fundamentals course at Albright Training Center.

* Continued to provide guidance on the development of a water quality Government Performance Results Act goal.

* Participated on the Western Governor's Association Multi-Agency Task Force on the remediation of water quality impacts from abandoned minelands.

* Reviewed and provided comments on proposed EPA amendments to NPDES regulations.

* Provided review and comments on EPA's strawman and penultimate abandoned minelands policy paper.

* Presented a case study of regulatory aspects of permitting grazing of domestic livestock at CHIS to the BLM's Watershed Workshop.

* The Contaminants Encyclopedia is completed and will be able to help NPS and other scientists be more productive by being able to quickly access key information on 118 high priority contaminants, including oil contaminants, metals, solvents, and cyanide.

* Participated on the steering committee and coordinated NPS review of the Federal Interagency Stream Restoration Handbook.

* Represented NPS on the Colorado River Adaptive Management Work Group and coordinated NPS review of alternative surplus and shortage criteria.

* Participated on the Servicewide Inventory and Monitoring Program steering committee.

* Participated in the Disturbed Lands Restoration Advisory Group steering committee.

* Maintained "WetNet", a mailing list of NPS aquatic professionals network.

* Established a groundwater monitoring network in the Little Colorado adjudication.

* Provided water resource management comments on NPS draft Wilderness guidelines.

* Attended an interagency field trip on wildfires, hydrology, and dam safety in the Front Range of Colorado.

* Assisted in high water mark identification and mapping in disastrous flood of '97 in Fort Collins.

* Presented poster session on natural river sandbar dynamics compared to regulated river at American Geophysical Union Annual Meeting.

* Assisted in the facilitation of Area Hydrologists in WRD activities.

* Provide technical review of Floodplain Statement of Findings for projects at ZION, TIMU, CARE, YOSE, WRST (2), REDW, and general floodplain compliance advice.

* Made presentation to participants of Hydrologist meeting of the Lawn Lake flood in ROMO.

* Provided review comments for U.S. Fish and Wildlife Service's draft Riparian Guideline.

* Maintained and updated a geo-referenced park boundary digital database for use in GIS-based water resources analyses and queries.

* Updated the National Park Units in National Water Quality Assessment (NAWQA) basins GIS database and provided a variety of cartographic and slide products to document which parks lie within which NAWQA basins.

Water Rights Branch

* Updated water rights information contained in National Park Service's dockets.

* Presented talk on "Water Rights and the National Park Service" at the Fundamentals for National Resources Management training course.

* Participated in quarterly meetings with other federal agencies to coordinate water rights issues.

* Assisted SOL with establishing an attorney position dedicated to assisting the National Park Service with water rights issues.

* Computerized Service-wide water rights records.

* Reviewed the report of the Western Water Policy Review Advisory Committee.

1997
PUBLICATIONS

Planning and Evaluation Branch

Berghoff, Kevin and D.L. Vana-Miller. 1997. *Canyonlands National Park, Arches National Park, and Natural Bridges National Monument Water Resources Scoping Report*. National Park Service Water Resources Division Technical Report 97/94. National Park Service, Fort Collins, CO. 37 pp.

Bruckler, R.A. and F.M. Panek. 1996. *Sharks in the National Park System: status, conservation, and management options*. Water Resources Division Technical Report 96/92. National Park Service, Fort Collins, CO. 29 pp.

Chatman, Mark, D.L. Sharrow and Andrew Valdez, 1997. *Water Resources Management Plan -- Great Sand Dunes National Monument, Colorado*. National Park Service, Great Sand Dunes National Monument, Mosca, CO 197 pp.

Furbish, C.E., D.L. Vana-Miller, Suzanne Lewis, and Craig Sheldon. 1996. *Water Resources Management Plan -- Timucuan Ecological and Historic Preserve (FL)*. National Park Service, Timucuan Ecological and Historic Preserve, Jacksonville, FL. 152 pp.

Hayes, D. J., C. Farris, and D.L. Vana-Miller. 1997. *Water Resources Management Plan - Vanderbilt Mansion National Historic Site, Eleanor Roosevelt National Historic Site, and Home of Franklin D. Roosevelt National Historic Site, NY*. National Park Service, Roosevelt-Vanderbilt National Historic Sites, Hyde Park, NY. 87 pp.

Holmberg, K.M., Jim Perry, R.S. Ferrin, and D.L. Sharrow. 1997. *Water Resources Management Plan - St. Croix National Scenic Riverway (Minnesota and Wisconsin)*. National Park Service, St. Croix National Scenic Riverway, St. Croix Falls, WI 155 pp. + app.

Inglis, Richard, Curt Deuser, and Joel Wagner. 1996. *The effects of tamarisk removal on diurnal groundwater fluctuations*. National Park Service Water Resources Division Technical Report NPS/NRWRD/NRTR-96/93. 30 pp. + app.

Papoulias, Diana, Dennis Woodward, Mark Flora, and D. R. Buckler. 1997. *Water resources in the mexican highlands*. US Department of the Interior, U.S. - Mexico Border Field Coordinating Committee, Washington, DC. 8 pp.

Panek, F.M. 1997. *Recreational Fishery Resources Conservation Plan: Agency Implementation Plan*. Office of the Director, National Park Service, Washington, DC. 7 pp.

Panek, F.M. 1997. *Recreational Fishery Resources Conservation Plan: 1996 Annual Accomplishment Report*. National Park Service Water Resources Division Technical Report NPS/NRWRD/NRTR-97/111. National Park Service, Fort Collins, CO. 19 pp.

Panek, F.M. 1997. *Fisheries Management Program Fact Sheet*. National Park Service, Water Resources Division, Fort Collins, CO. 2 pp.

Panek, F. M. 1997. *Threats, risks, and promises: challenges for trout management in the twenty-first century*. Fisheries 22:6 24-26.

Rosenlieb, G., J. I. Wagner, and W. Jackson. 1996. *Assessing the condition of riparian-wetland areas*. Park Science. National Park Service, Washington, D.C. Vol 16:4 22-24.

Taylor, T. J. and L. D. Krueger, eds. 1997. *Mitigation Guidelines for Nebraska's Eastern Saline Lakes*. Prepared for the eastern Saline Wetlands Interagency Study Project. U.S. Environmental Protection Agency, Region VII, and the U.S. Army Corps of Engineers, Omaha District. 46 pp.

Vana-Miller, D. L. and D. P. Weeks. 1997. *Water resources planning program fact sheet*. National Park Service, Water Resources Division, Fort Collins, CO. 2pp.

Wagner, J. I. 1997. *Water resources division wetlands program fact sheet*. National Park Service, Water Resources Division, Fort Collins, CO. 2 pp.

Wagner, J. I. and L. D. Krueger. 1997. *Protecting wetlands in U.S. national parks: new procedures for balancing public use and wetland preservation mandates (abstract)*. Presented at the 18th Annual Meeting of the Society of Wetland Scientists, Bozeman, MT, June 1-6, 1997.

Water Operations Branch

Jackson, W.L., G.M. Smillie, and M.W. Martin. 1997. *Analysis of the hydrologic, hydraulic, and geomorphic attributes of the Yosemite Valley Flood: January 1-3, 1997*. NPS/NRWRD/NRTR-97/129. National Park Service, Water Resources Division, Fort Collins, CO. 43 pp.

Marzolf, R.G., W. Jackson, and T. Randle. 1998. *Flood releases from dams as managment tools: Interactions between management and science*. American Geophysical Union Special Monograph (in-press).

Cluer, B.L., 1997. *Eddy bar responses to the sediment dynamics of pool-riffle environments*. Ph.D. Dissertation, Colorado State University, Fort Collins, CO.

National Park Service. 1996. *Baseline water quality data inventory and analysis: Big Cypress National Preserve*. NPS/NRWRD/NRTR-96/88. Fort Collins, CO

National Park Service. 1996. *Baseline water quality data inventory and analysis: Blue Ridge Parkway*. NPS/NRWRD/NRTR-96/79. Fort Collins, CO

National Park Service. 1996. *Baseline water quality data inventory and analysis: Canaveral National Seashore*. NPS/NRWRD/NRTR-96/85. Fort Collins, CO

National Park Service. 1996. *Baseline water quality data inventory and analysis: Chesapeake and Ohio Canal National Historical Park*. NPS/NRWRD/NRTR-96/87. Fort Collins, CO

National Park Service. 1996. *Baseline water quality data inventory and analysis: Everglades National Park.* NPS/NRWRD/NRTR-96/83. Fort Collins, CO

National Park Service. 1996. *Baseline water quality data inventory and analysis: George Washington Memorial Parkway.* NPS/NRWRD/NRTR-96/80. Fort Collins, CO

National Park Service. 1996. *Baseline water quality data inventory and analysis: Grand Canyon National Park.* NPS/NRWRD/NRTR-96/84. Fort Collins, CO

National Park Service. 1996. *Baseline water quality data inventory and analysis: Kalaupapa National Historical Park.* NPS/NRWRD/NRTR-96/81. Fort Collins, CO

National Park Service. 1996. *Baseline water quality data inventory and analysis: Minute Man National Historical Park.* NPS/NRWRD/NRTR-96/86. Fort Collins, CO

National Park Service. 1996. *Baseline water quality data inventory and analysis: Santa Monica Mountains National Recreation Area.* NPS/NRWRD/NRTR-96/78. Fort Collins, CO

National Park Service. 1996. *Baseline water quality data inventory and analysis: Sunset Crater Volcano National Monument.* NPS/NRWRD/NRTR-96/90. Fort Collins, CO

National Park Service. 1996. *Baseline water quality data inventory and analysis: Wolf Trap Farm Park for the Performing Arts.* NPS/NRWRD/NRTR-96/89. Fort Collins, CO

National Park Service. 1996. *Baseline water quality data inventory and analysis: Wupatki National Monument.* NPS/NRWRD/NRTR-96/82. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Andersonville National Historic Site.* NPS/NRWRD/NRTR-97/130. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Arkansas Post National Monument.* NPS/NRWRD/NRTR-97/138. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Aztec Ruins National Monument.* NPS/NRWRD/NRTR-97/123. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Bandelier National Monument.* NPS/NRWRD/NRTR-97/103. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Big Hole National Battlefield.* NPS/NRWRD/NRTR-97/115. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Booker T. Washington National Monument.* NPS/NRWRD/NRTR-97/116. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Buffalo National River.* NPS/NRWRD/NRTR-97/117. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Chaco Culture National Historical Park.* NPS/NRWRD/NRTR-97/135. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Chickasaw National Recreation Area.* NPS/NRWRD/NRTR-97/146. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Chiricahua National Monument.* NPS/NRWRD/NRTR-97/122. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Cumberland Island National Seashore.* NPS/NRWRD/NRTR-97/104. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Devils Tower National Monument.* NPS/NRWRD/NRTR-97/118. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Fort Bowie National Historic Site.* NPS/NRWRD/NRTR-97/134. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Fort Donelson National Battlefield.* NPS/NRWRD/NRTR-97/145. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Fort Necessity National Battlefield.* NPS/NRWRD/NRTR-97/131. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Gateway National Recreation Area.* NPS/NRWRD/NRTR-97/113. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: George Washington Birthplace National Monument.* NPS/NRWRD/NRTR-97/97. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Guadalupe Mountains National Park.* NPS/NRWRD/NRTR-97/133. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Hagerman Fossil Beds National Monument.* NPS/NRWRD/NRTR-97/105. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Harpers Ferry National Historical Park.* NPS/NRWRD/NRTR-97/98. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Horseshoe Bend National Military Park.* NPS/NRWRD/NRTR-97/142. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Hubbell Trading Post National Historic Site.* NPS/NRWRD/NRTR-97/144. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: John Day Fossil Beds National Monument.* NPS/NRWRD/NRTR-97/112. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Kennesaw Mountain National Battlefield Park.* NPS/NRWRD/NRTR-97/119. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Kings Mountain National Military Park.* NPS/NRWRD/NRTR-97/136. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Knife River Indian Village National Historic Site.* NPS/NRWRD/NRTR-97/127. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Lake Clark National Park and Preserve.* NPS/NRWRD/NRTR-97/102. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Little Bighorn Battlefield National Monument.* NPS/NRWRD/NRTR-97/124. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Manassas National Battlefield.* NPS/NRWRD/NRTR-97/99. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Marsh-Billings National Historical Park.* NPS/NRWRD/NRTR-97/143. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Moores Creek National Battlefield.* NPS/NRWRD/NRTR-97/120. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Nez Perce National Historical Park.* NPS/NRWRD/NRTR-97/114. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Ninety Six National Historic Site.* NPS/NRWRD/NRTR-97/141. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Organ Pipe Cactus National Monument.* NPS/NRWRD/NRTR-97/132. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Pea Ridge National Military Park.* NPS/NRWRD/NRTR-97/137. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Petersburg National Battlefield.* NPS/NRWRD/NRTR-97/101. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Saguaro National Park.* NPS/NRWRD/NRTR-97/140. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Saratoga National Historical Park.* NPS/NRWRD/NRTR-97/96. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Sequoia-Kings Canyon National Park.* NPS/NRWRD/NRTR-97/121. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Sleeping Bear National Lakeshore.* NPS/NRWRD/NRTR-97/106. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Theodore Roosevelt National Park.* NPS/NRWRD/NRTR-97/100. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Weir Farm National Historic Site.* NPS/NRWRD/NRTR-97/126. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: White Sands National Monument.* NPS/NRWRD/NRTR-97/139. Fort Collins, CO

National Park Service. 1997. *Baseline water quality data inventory and analysis: Whitman Mission National Historic Site.* NPS/NRWRD/NRTR-97/109. Fort Collins, CO

Water Rights Branch

Auble, G.T., J.M. Friedman, and L.Hammack. 1997. *Removal of riparian trees by sediment mobilization and extended inundation.* Presented at Society of Wetland Scientists, 18th Annual Meeting, Bozeman, Montana, June 1-6, 1997.

Evans, David G., 1997, and C.A. Burkett. 1997. *Determining the aquifer characteristics of the Buxton Woods Aquifer, lower Hatteras Island, North Carolina.* Final Report. North Carolina State University. Prepared for the National Park Service, Water Resources Division, Fort Collins, CO under National Park Service Cooperative Sub-Agreement CA-5000-4-9017/2. 48 pp and appendices.

Hansen, W.R. and D.J. McGlothlin. 1997. *Federal reserved water rights at Zion National Park.* In: **Draft** -Water in the West: The Challenge for the Next Century. Draft. Report of the Western Water Policy Review Advisory Commission. October 1997.

Hughes, Jeffrey C. 1997. *Aquatic organism/physical habitat study for studies in Zion National Park: completion report for PHABSIM data collected.* Final report (unpublished). National Park Service, Water Resources Division, Fort Collins, CO. 8 pp and appendices and photographs.

Pohlmann, K.F. and D.J. Campagna, J.B. Chapman, and S. Earma. 1997. *Investigation of the origin of springs in the Lake Mead National Recreation Area.* Draft Report. University and Community College System of Nevada, Desert Research Institute. Prepared for the National Park Service, Water Resources Division, Fort Collins, CO under National Park Service Cooperative Sub-Agreement CA-8019-2-9003. 48 pp and appendices.

Rheinhardt, R.D. and M.M. Brinson. 1997. *Impact of water withdrawals on the vegetation of dune and swale communities of Cape Hatteras National Seashore, North Carolina.* Final Report. East Carolina University. Prepared for the National Park Service, Water Resources Division, Fort Collins, CO under National Park Service Cooperative Sub-Agreement CA -5000-4-9019/2. 129 pp.

Shelby, B. D. Whittaker and W.R. Hansen. 1997. *Streamflow effects on hiking in Zion National Park.* Rivers: Studies in the Science, Environmental Policy, and Law of Instream Flow. (in press). 14 pp.

Stevens, N.F. and W.R. Hansen. 1997. *Investigations of controlled Kolob Reservoir releases during September 8-17, 1993 at Zion National Park, Utah.* Natural Resources Technical Report NPS/WRDNRTR-97108. National Park Service, Water Resources Division, Fort Collins, CO. 14 pp.

CONTRIBUTOR

Planning and Evaluation Branch

Hamilton, B. S. and L. Turrini-Smith. 1997. Big South Fork National River and Recreation Area Water Resources Management Plan. National Park Service, Big South Fork National River and Recreation Area, Oneida, TN 152 pp.

Karish, John, Tom Blount, and Bob Krumenaker (Eds.) 1997. Resource Assessment of the June 27 and 28, 1995 Floods and Debris Flows in Shenandoah National Park. Natural Resources Report NPS/SHEN/NRR-97/001. Center for Resources, Shenandoah National Park, Luray, VA. 120 pp.

Kunkle, Sam and Loretta Moseley. 1997. Salinas Pueblo Missions National Monument Water Resources Management Plan. National Park Service, Salinas Missions Pueblo National Monument, Mountainair, NM 75 pp.

Levy, Louis and John Korkosz. 1997. Santa Monica Mountains National Recreation Area Water Resources Management Plan. National Park Service, Santa Monica Mountains National Recreation Area, Agoura Hills, CA.

Mott, D. M. 1997. Saguaro National Park Water Resources Scoping Report. National Park Service Water Resources Division Technical Report 97/95. National Park Service, Fort Collins, CO. 36 pp.

Olyphant, G.A. , Eric Feuerstein, and Denver Harper. 1997. Hydrologic Monitoring Associated with Pilot Restoration of Part of the Great Marsh, Indiana Dunes National Lakeshore. Final Project Report, Requistion Number DI-1 0033. Indiana Dunes National Lakeshore, Porter, IN. 14 pp.

Portnoy, J.W. Effects of Diking, Drainage and Seawater Restoration on Salt Marsh Biogeochemical Cycling. Technical Report NPS/NESO-RNR/NRTR/96-04. National Park Service, New England System Support Office, Boston, MA. 113 pp.

Portnoy, J.W. and A.E. Giblin. 1997. Effects of Historic Tidal Restrictions on Salt Marsh Sediment Chemistry. Biogeochemistry 36:275-303

Portnoy, J. W. and I. Valiela. 1997. Short-Term Effects of Salinity Reduction and Drainage on Salt-Marsh Biogeochemical Cycling and Spartina (Cordgrass) Production. Estuaries 20:3 p. 569-578.

Riedel, J.L. 1997. Lake Roosevelt National Recreation Area Water Resources Scoping Report. National Park Service Water Resources Division Technical Report 97/107. National Park Service, Fort Collins, CO. 80 pp.

Roman, C. T. , R. W. Garvine, and J. W. Portnoy. Hydrologic Modeling as a Predictive Basis for 1997. Ecological Restoration of Salt Marshes. Environmental Management 19:4 559-566.

Sagers, C. L. and Jonathan Lyon. 1997. Inventory and Characterization of the Riparian Zone (Wetlands) at Buffalo National River. Final Project Report, Project Number CA7150-4-0001, SA

Financial Status of the Water Resources Division

By Dan B. Kimball
Division Chief

and Debi Cox
Program Analyst

FY98 base funding for the Water Resources Division (WRD) was $4,718,000. The figure below illustrates the distribution of total WRD funds among technical assistance, project, and administrative support costs. Technical assistance, which is predominately day-to-day operational support to the parks includes staff salaries, travel, and associated expenses. Administrative support includes program management costs, administrative support, equipment, and supplies and materials Divisionwide. The projects category includes funds supporting WRD-sponsored projects in the areas of general water resources, water quality, wetlands protection, and water rights. Tables 1, 2, 3, and 4 list WRD-sponsored projects for FY98.

Distribution of WRD FY98 Funding

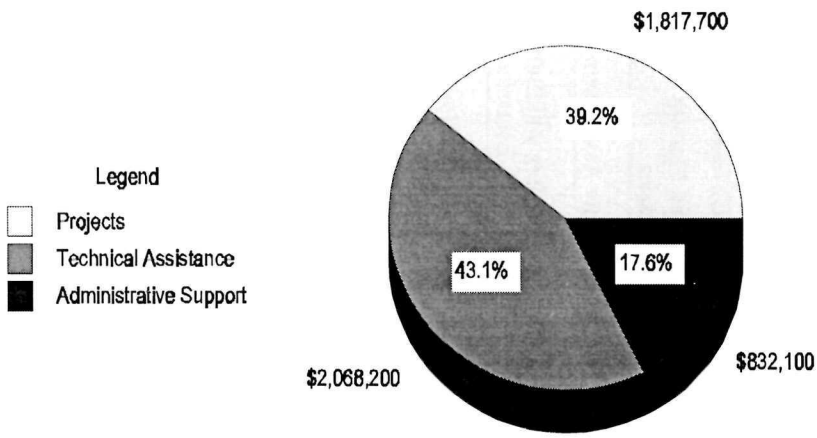


TABLE 1 - FY98 WATERSHED PROTECTION PROGRAM FUNDING WATER QUALITY ACTIVITY NEW AND CONTINUING PROJECTS					
PARK	**REGION**	**NEW PROJECT TITLE**	**WRD PROJECT COORDINATOR**	**FUNDING $(000s)**	
				FY98	**FY99**
SACN	Midwest	Inventory and Monitor Sediment and Nutrient Discharges from Tributaries	Long	25.00	25.00
LACL	Alaska	Water Quality Assessment of Lake Clark	Long	10.00	40.00
ACAD	Northeast	Nutrient-Loading and Eutrophication Monitoring of the Northeast Creek Estuarine Wetland	Rosenlieb	33.00	17.00
BAND	Intermountain	Assess Ecological, Hydrological, & Geochemical Effects of the Dome Fire in Capulin Watershed	Irwin	24.60	17.30
ROCR	National Capital	Dumbarton Oaks Park Stream Stability Project	Martin, M.	20.00	30.00
PORE	Pacific West	Determine Impacts of Grazing, Agriculture, and Recreation on Key Water Resources	Long	24.50	21.50
		SUBTOTAL NEW WATER QUALITY		137.10	150.8

TABLE 1 (Continued)

PARK	REGION	CONTINUING PROJECT TITLE	WRD PROJECT COORDINATOR	FUNDING $(000s) FY98	FY99
MACA	Southeast	Establish Water Quality Monitoring Program	Rosenlieb	25.00	00.00
GLCA	Intermountain	Protect Lake Powell Water Quality: Implement Strategic Plan with the Utah Department of Environmental Quality and the Risk Assessment Process	Long/Rosenlieb	25.00	00.00
CACO	Northeast	Eutrophication Trends in the Past 500 Years in Cape Cod Kettle Pond Sediments	Martin, L.	23.20	00.00
SLBE	Midwest	Water Quality Monitoring/Lake Management	Vana-Miller	45.00	00.00
PRWI	National Capital	Post-Reclamation Water Quality of Cabin Branch Pyrite Mine	Rosenlieb	22.50	00.00
		SUBTOTAL CONTINUING WATER QUALITY		140.7	00.00
		TOTAL WATER QUALITY - NEW AND CONTINUING PROJECTS		277.80	150.80

TABLE 2 - FY98 WATERSHED PROTECTION PROGRAM FUNDING WETLANDS ACTIVITY NEW AND CONTINUING PROJECTS					
PARK	**REGION**	**NEW PROJECT TITLE**	**WRD PROJECT COORDINATOR**	**FUNDING $(000s)**	
				FY98	**FY99**
PECO	Intermountain	Restore Glorieta Creek Reservoirs to Native Floodplain	Wagner	50.00	00.00
FIIS	Northeast	Monitoring Estuarine Wetland Habitats	Krueger	15.70	34.30
CARE	Intermountain	Oxbow Wetland Ecology	Wagner	24.00	21.00
DENA	Alaska	Wetlands Mapping of Transportation Corridors	Krueger	25.00	25.00
SAJN	Pacific West	Inventory and Characterize Wetland Resources	Wagner	10.55	00.00
BIBE	Intermountain	Restore Endangered Big Bend Mosquitofish Habitat	Krueger	23.00	27.00
JELA	Southeast	Monitor Tallow Invasion in Forested Wetlands	Krueger	39.50	9.80
		SUBTOTAL WETLANDS NEW ACTIVITY		187.75	117.10

TABLE 2 (Continued)

PARK	REGION	CONTINUING PROJECT TITLE	WRD PROJECT COORDINATOR	FUNDING $(000s) FY98	FY99
PEFO	Intermountain	Puerco River Riparian Restoration Project	Wagner	20.00	00.00
DEWA	Northeast	Evaluate and Implement Wetland Restoration Methods	Krueger	20.00	00.00
GLCA/CA NY/GRCA	Intermountain	Characterize and Identify Water Quality and Biotic Components in Isolated Springs along the Colorado River Drainage System, Utah and Arizona	Wagner/Rosenlieb	25.00	00.00
OZAR	Midwest	Riparian Zone Wetland Characterization of Succession	Krueger	7.50	00.00
		SUBTOTAL CONTINUING WETLANDS PROJECTS		72.5	00.00
		TOTAL WETLANDS ACTIVITY NEW AND CONTINUING PROJECTS		260.25	117.10

TABLE 3 - FY98 "OTHER" WATER-RELATED ISSUES NEW AND CONTINUING PROJECTS					
PARK	REGION	NEW PROJECT TITLE	WRD PROJECT COORDINATOR	FUNDING $(000s) FY98	FY99
CHIS	Pacific West	Initiate Restoration of Riparian Communities on Santa Rosa Island	Rosenlieb	22.90	26.10
REDW	Pacific West	Evaluation of Watershed Response to Land Use Changes	Smillie	25.00	25.00
BUFF	Midwest	Develop Water Resources Management Plan	Weeks	24.50	25.50
WAPA	Pacific West	Portection of the Coral Reef/Reef Flats Habitats in the Asan Beach and Agat Units	Flora/Vana-Miller	35.00	15.00
CHAT	Southeast	Water Resources Management Plan	Vana-Miller	31.50	18.50
DEVA	Pacific West	Evaluate Threats to Five Endemic Invertebrates from Up-Gradient Ground Water Withdrawals	Irwin	25.00	25.00
GRSA	Intermountain	Determine Cause of Disappearnace of Interdunal Ponds	Martin, L.	15.20	14.20
DEWA	Northeast	Manage Water Resources - Protect Stream Courses (Pool Colony)	Smillie	25.00	25.00
		SUBTOTAL NEW "OTHER"		204.10	174.30

TABLE 3 (Continued)

PARK	REGION	CONTINUING PROJECT TITLE	WRD PROJECT COORDINATOR	FUNDING $(000s) FY98	FY99
SAGU	Intermountain	Inventory Water Sources and Riparian Areas	Benham/Martin, L.	19.10	00.00
VIIS	Southeast	Assess Soil Erosion/Sediment Input to Marine Environment	Inglis	14.00	00.00
CANY	Intermountain	Develop Water Resources Management Plan	Weeks	30.00	00.00
ROCR	National Capital	Enhance/Create Vernal Pool Habitats in Rock Creek Park	Irwin	7.50	00.00
SACR	Midwest	Development of Aquatic Habitat Assessment and Classification	Irwin	11.00	00.00
DENA	Alaska	Restoration of a Watershed Disturbed by Mining	Martin, M.	28.00	00.00
		SUBTOTAL CONTINUING "OTHERS"		109.6	0.00
		TOTAL "OTHER" NEW AND CONTINUING PROJECTS		**313.70**	174.30

Table 4 - Summary of Water Rights Projects Supported by WRD Funds (Planned for Fiscal Year 1998)

PARK	REGION	PROJECT TITLE (s)	WRD PROJECT COORDINATOR	FUNDING $(000)
ALL	ALL	Solicitor Position	Pettee	83.0
ALL	ALL	Water-Rights Docket Scanning	Albright	98.0
ALL	ALL	Expert Witness Training	McGlothlin	30.0
CHCU	IMR	Preparation for Negotiation/Litigation, San Juan River Adjudication	Wondzell	21.9
LAME	PWR	Rogers Spring	McGlothlin	5.5
BLCA	IMR	Preparation for Negotiation/Litigation, Adjudication	Wondzell	26.0
CACO	NER	Effects of Ground-Water Withdrawals	Wondzell	20.0
CARE	IMR	Preparation for Negotiation/Litigation, Fremont River Adjudication	Cluer	23.5
DEVA	PWR	Evapotranspiration Study and Ground-Water Modeling	Perfect	55.0
AZ Parks	PWR	Preparation for Negotiation/Litigation, Little Colorado River Adjudication	Hansen	110.4
GRCA	PWR	South Rim Spring Flow Monitoring	Hansen	33.0
GRSA	IMR	Preparation to File and Support Objections	Christensen	35.0
KALA	PWR	Hydrologic Investigation	Hughes	57.5
OBRI	SER	Stream Gaging	McGlothlin	9.0
UT Parks	IMR	Preparation for Negotiation/Litigation, various Utah Adjudications	Hansen	33.5
YELL	IMR	Stream Gaging and Ground Water Model	Christensen	39.0
ZION	IMR	Implementation of water-rights settlement	Hansen	43.3
		TOTAL WATER RIGHTS PROGRAM		723.6

The National Park Service's water rights protection efforts are generally dictated by court schedules, Department of Justice case strategies, water development proposals by private entities, and State administrative actions and schedules. This table lists the allocation of funds necessary to meet these anticipated demands for FY98. If unforeseen hearing or adjudication needs arise, adjustments to project funding may be necessary.

July 1998

(F)-Fort Collins, CO
(D)-Denver, CO
(W)-Washington, D.C.

WATER RESOURCES DIVISION
Chief, Dan Kimball (F)
Secretary, Patty Hennessy (F)

WASO PROGRAM COORDINATION OFFICE
Program Coordinator, Bill Walker (W)
Env. Prot. Spec., Sharon Kliwinski (W)

ADMINISTRATIVE SUPPORT
Mathematician, Dave Ryn (F)
Program Analyst, Debi Cox (F)
Term OA Clerk, Carol Liester (F)

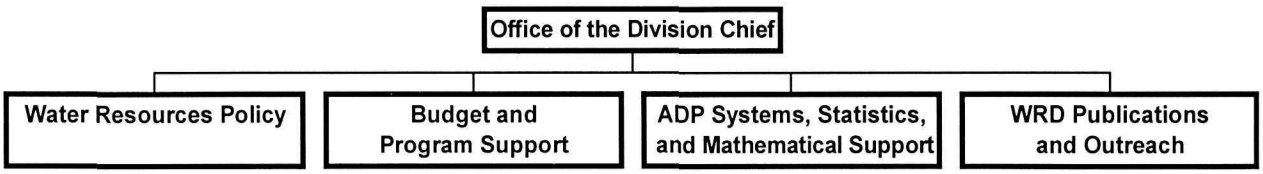
PLANNING AND EVALUATION BRANCH Chief, Mark Flora (D)
Hydrologist, Joel Wagner (D)
Hydrologist, Don Weeks (D)
Fisheries Biologist, Jim Tilmant (F)
Hydrologist, David Vana-Miller (D)
Natural Resource Specialist, Leslie Krueger (D)
Secretary, Lael Wagner (D)

WATER RIGHTS BRANCH Chief, Chuck Pettee (F)
Hydrologist, Jeff Albright (F)
Hydrologist, Bill Hansen (F)
Hydrologist, Dan McGlothlin (F)
Hydrologist, Paul Christensen (F)
Hydrologist, Brian Cluer (F)
Hydrologist, Jeff Hughes (F)
Hydrologist, Eric Moser (F)
Hydrologist, Diana Perfect (F)
Hydrologist, Chris Gable (F)
Hydrologist, Henrique Barreto (F)
Hydrologist, Jim Harte (F)
Hydrologist, Vacant (F)

WATER OPERATIONS BRANCH Chief, Bill Jackson (F)
Hydrologist, Gary Rosenlieb (F)
Hydrologist, Larry Martin (F)
Hydrologist, Gary Smillie (F)
Hydrologist, Barry Long (F)
Contaminant Specialist, Roy Irwin (F)
Computer Program Analyst, Dean Tucker (F)
Hydrologist, Rick Inglis (F)
Hydrologist, Matt Hagemann (F)
Hydrologist, Mike Martin (F)

Office of the Division Chief

Organization and Staff



Dan Kimball: Division Chief, MS in Water Resources Administration. Specialty areas include water and natural resources management planning and evaluation of complex regulatory issues.

Bill Walker: Water Resources Program Coordinator, PhD in Aquatic Ecology. Specialty areas include natural resources management and aquatic ecosystem management.

Sharon Kliwinski: Water Resources Washington Liasion, BS in Environmental and Pollution Sciences. Specialty area includes environmental legislation and regulations; natural resource policy issues; and mining laws, policies, and programs.

Dave Ryn: Mathematician, MS in Mathematics. Specialty areas include computer and statistical technology.

Debi Cox: Program Analyst, BA in Anthropology.

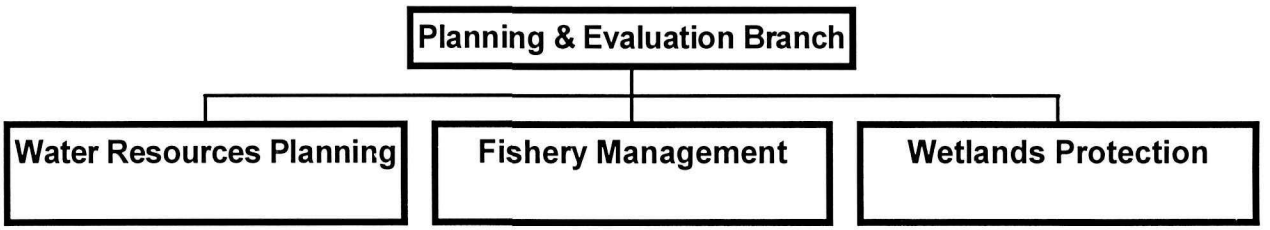
Patty Hennessy: Secretary, BBA in Management.

Chuck Cross: LAN Assistant, MBA in Management.

Carol Liester: Office Automation Clerk.

Planning and Evaluation Branch

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

Leslie Krueger: Natural Resource Specialist, BS in Water Resources. Specialty areas include wetlands science, management, and regulatory issues.

Jim Tilmant: Fishery Management Program Team Leader, MS in Wildlife and Fisheries. Specialty areas include aquatic and marine resources management, fish biology, and population dynamics.

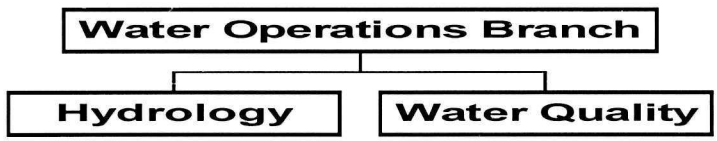
David Vana-Miller: Water Resources Planning Program Team Leader, MS in Marine Biology. Specialty areas include water resources planning, aquatic and marine resources management, and water quality.

Don Weeks: Hydrologist, MS in Geology (emphasis in hydrogeology). Specialty areas include water resources managment planning, water quantity, and water quality.

Lael Wagner: Secretary

Water Operations Branch

Organization and Staff



Bill Jackson: Branch Chief, PhD in Hydrology. Specialty areas include sedimentation processes, fluvial geomorphology, and river rehabilitation and management.

Gary Rosenlieb: Water Quality Program Leader, MS in Water Resources. Specialty areas include water quality (chemistry and micro-biology), groundwater quality, and hazardous materials management.

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

Rick Inglis: Hydrologist, BS in Watershed Science. Specialty areas include field hydrologic data collection using automated recorders, watershed management, ground water monitoring, and data analysis.

Roy Irwin: Senior Contaminants Specialist, PhD in Biology. Specialist in environmental contaminants and biological aspects of water quality (including bio-monitoring).

Barry Long: Hydrologist, BS in Watershed Sciences, MS in Forest Hydrology. Specialty areas include physical-chemical aspects of water quality.

Larry Martin: Hydrogeologist, MS in Hydrology. Specialty areas include hydrogeology, groundwater surface water interaction, well siting, drinking water source protection, and aquifer testing.

Michael Martin: Hydrologist, BS in Environmental Geology, MS in Watershed Science. Speciality areas include geochemistry, water quality, geomorphology, flood analysis, and tropical aquaculture.

Dean Tucker: Computer Programmer-Analyst, PhD in Forestry. Specialty areas include data management, computer graphics, and water resources applications in GIS.

Mike Matz: Research Associate, MS Candidate in Civil Engineering (1998). Specialty areas include water quality planning and managment; inventory and monitoring; and data analysis.

Pat Wiese: Secretary

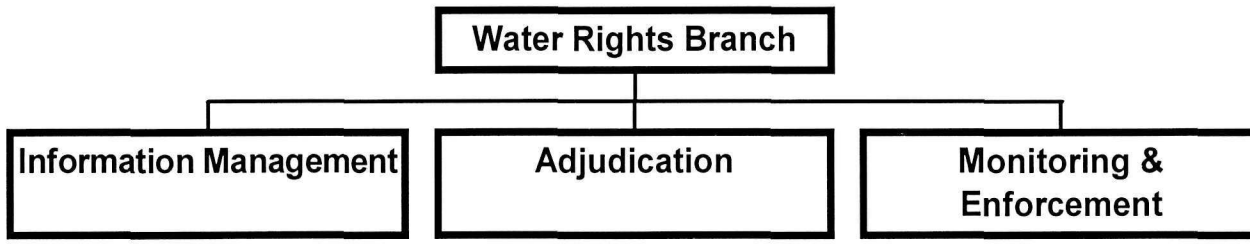
STUDENT ASSISTANTS

Mark VanMouwerik: Assistant Contaminants Specialist, MS candidate in Environmental Health, BS in Biology.

Elizabeth Eisenhauer: GIS specialist, MS candidate in Geology (1997), BS in Geology (1988).

Water Rights Branch

Organization and Staff



Chuck Pettee: Branch Chief, Supervisory Hydrologist, MS in Watershed Science. Specialty areas include water rights, surface water hydrology and hazardous materials.

Jeff Albright: Supervisory Hydrologist, Information Management Program Leader, MS in Watershed Management. Specialty areas include surface water hydrology, field methods, and instrumentation.

Bill Hansen: Supervisory Hydrologist, Adjudication Program Leader, MS in Hydrology. Specialty areas include water law, surface water hydrology, field methods, and watershed management and rehabilitation.

Dan McGlothlin: Supervisory Hydrologist, Monitoring and Enforcement Program Leader, BS in Watershed Hydrology. Specialty areas include water rights law and administration and water resources policy.

Henrique Barreto: Hydrologist, BS in Computer Science, MS in Geography. Speciaity areas include fluvial geomorphology, surface water hydrology, data analysis, and instrumentation.

Paul Christensen: Hydrologist, MS in Geology. Specialty areas include hydrogeology, ground water hydrology, and ground water modeling.

Brian Cluer: Hydrologist, PhD in Earth Resources. Specialty areas include fluvial geomorphology, surface water hydrology, hydraulics and sediment transport processes, two-dimensional flow modeling, remote sensing of fluvial processes, and monitoring changes in fluvial systems.

Chris Gable: Hydrologist, BS in Watershed Sciences. Specialty areas include surface water hydrology, water quality control, field methods, instrumentation, and data analysis.

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

Diana Perfect: Hydrologist, ME in Geologic Engineering. Specialty areas include hydrogeology, ground water hydrology, ground water modeling, dta analysis, GIS, and hydrochemistry.

Mark Wondzell: Hydrologist, MS in Agricultural Engineering. Specialty areas include surface water hydrology, riparian vegetation ecology/management, and field techniques.

Bernadette Berger: Research Associate; Colorado State University. BA in Speech Communications, MS Candidate in Computer Information Systems. Specialty areas include document imaging systems, network applications, and electronic mail systems.

Brad Gillies: Research Associate: Colorado State University. BS in Watershed Science. Specialty areas include field methods and data analysis.

Lauren Hammack: Research Associate; Colorado State University. MS in Earth Sciences (Watershed Science). Specialty areas include fluvial geomorphology, surface water hydrology, hydraulics, sediment transport, field methods, and data analysis.

Flora Romero: Secretary.

Joe Ackert: Student Hourly; Colorado State University, pursuing degree in Computer Information Systems.

Nick Mazour: Student Hourly; Colorado State University, pursuing degree in Computer Information Systems.

Don McIntosh: Student Hourly; Colorado State University, pursuing degree in Computer Information Systems.

Ted Shannon: Student Hourly; Colorado State University, pursuing degree in Civil Engineering.

AWARDS

Planning and Evaluation Branch

WRD awarded **Dave Sharrow** a STAR Award for his efforts in completing the Great Sand Dunes National Monument Water Resources Management Plan. This document will serve as a "road map" in guiding park management in actions necessary for addressing complex water-related issues within the National Monument over the next 7 - 10 years.

WRD awarded **Joel Wagner** a STAR Award recognizing his efforts in the development of the new (DRAFT) Director's Order for the Protection of Wetlands. This effort "blazed the trail" for navigating natural resource-related policies through the new procedures brought forth in response to efforts to "streamline" the existing NPS directives process.

Big Cypress National Preserve awarded **Don Weeks** a STAR Award acknowledging his accomplishments in resolving the Preserve's highly complex water resource issues and for his efforts in the development of the Preserve's first Water Resources Management Plan.

Water Operations Branch

Gary Rosenlieb was presented a STAR Award to recognize a continued high level of performance in carrying out his responsibilities as Water Quality Program team leader.

Dean Tucker was presented a STAR Award for the outstanding level of leadership he provided to the NPS Water Quality Data Inventory and Analysis Project.

Larry Martin was presented a STAR Award for his continued high level of performance in providing technical assistance to parks on ground water management issues.

Mike Martin was presented an On-the-Spot Award for his assessment of ground water seepage issues in cliff dwellings at Mesa Verde NP.

Barry Long was presented an On-the-Spot Award for his role in coordinating implementation of 12 park water quality assessment projects in partnership with the USGS National Water Quality Assessment Program.

Water Rights Branch

Jeff Albright received an "On the Spot" performance award for thorough and timely preparation of Crater Lake National Park water right claims that were filed in the Oregon's Klamath Basin Adjudication.

Bill Hansen received a Certificate of Commendation from the Department of Justice for his work on the Water Rights Settlement Agreement for Zion National Park.

Appendix 1

Referenced Units of the National Park System

Acronymn	Park Name	Region
ACAD	Acadia National Park	Northeast
AMIS	Amistad National Recreation Area	Intermountain
ARCH	Arches National Park	Intermountain
ASIS	Assateague Island National Seashore	Northeast
BAND	Bandelier National Monument	Intermountain
BEOL	Bent's Old Fort National Historical Site	Intermountain
BIBE	Big Bend National Park	Intermountain
BICA	Bighorn Canyon National Recreation Area	Intermountain
BICY	Big Cypress National Preserve	Southeast
BIHO	Big Hole National Battlefield	Pacific West
BISC	Biscayne National Park	Southeast
BISO	Big South Fork National River & Recreation Area	Southeast
BLCA	Black Canyon of the Gunnison National Monument	Intermountain
BLRI	Blue Ridge Parkway	Southeast
BRCA	Bryce Canyon National Park	Intermountain
BUFF	Buffalo National River	Intermountain
CACO	Cape Cod National Seashore	Northeast
CAGR	Casa Grande National Monument	Intermountain
CAHA	Cape Hatteras National Seashore	Southeast
CAKR	Cape Krusenstern National Monument	Alaska
CANA	Canaveral National Seashore	Southeast
CANY	Canyonlands National Park	Intermountain
CARE	Capitol Reef National Park	Intermountain
CAVE	Carlsbad Caverns National Park	Intermountain
CAVO	Capulin Volcano National Monument	Intermountain
CHAT	Chattahoochee River National Recreation Area	Southeast
CHCU	Chaco Culture National Historical Park	Intermountain
CHIC	Chickasaw National Recreation Area	Intermountain
CHIR	Chiricahua National Monument	Intermountain
CHIS	Channel Islands National Park	Pacific West
CHPI	Charles Pickney National Historical Site	Southeast
CIRO	City of Rocks National Reserve	Pacific West
COLM	Colorado National Monument	Intermountain
COLO	Colonial National Historical Park	Northeast
CORO	Coronado National Memorial	Intermountain
COSW	Congaree Swamp National Monument	Southeast
CRLA	Crater Lake National Park	Pacific West
CRMO	Craters of the Moon National Monument	Pacific West
CURE	Curecanti National Recreation Area	Intermountain
CUVA	Cuyahoga Valley National Recreation Area	Midwest
DENA	Denali National Park and Preserve	Alaska
DEVA	Death Valley National Monument	Pacific West

DEWA	Delaware Water Gap National Recreation Area	Northeast
DINO	Dinosaur National Monument	Intermountain
EBLA	Ebey's Landing National Historic Reserve	Pacific West
ELIS	Ellis Island	Northeast
ELMO	El Morro National Monument	Intermountain
EVER	Everglades National Park	Southeast
FIIS	Fire Island National Seashore	Northeast
FLFO	Florissant Fossil Beds National Monument	Intermountain
FOBO	Fort Bowie National Historical Site	Intermountain
FOBU	Fossil Butte National Monument	Intermountain
FOCL	Fort Clatsop National Memorial	Pacific West
FOLS	Fort Larned National Historical Site	Midwest
FONE	Fort Necessity National Battlefield	Northeast
FOSC	Fort Scott National Historical Site	Midwest
FRHI	Friendship Hill National Historical Site	Northeast
GATE	Gateway National Recreation Area	Northeast
GETT	Gettysburg National Military Park	Northeast
GLAC	Glacier National Park	Intermountain
GLCA	Glen Canyon National Recreation Area	Intermountain
GOGA	Golden Gate National Recreation Area	Pacific West
GOSP	Golden Spike National Historical Site	Intermountain
GRBA	Great Basin National Park	Pacific West
GRCA	Grand Canyon National Park	Intermountain
GREE	Greenbelt Park	National Capital
GRKO	Grant-Kohrs Ranch National Historical Site	Intermountain
GRPO	Grand Portage National Monument	Midwest
GRSA	Great Sand Dunes National Monument	Intermountain
GRSM	Great Smoky Mountains National Park	Southeast
GRTE	Grand Teton National Park	Intermountain
GUIS	Gulf Islands National Seashore	Southeast
GUMO	Guadalupe Mountains National Park	Intermountain
GWCA	George Washington Carver National Monument	Midwest
GWMP	George Washington Memorial Parkway	National Capital
HAFO	Hagerman Fossil Beds National Monument	Pacific West
HALE	Haleakala National Park	Pacific West
HAVO	Hawaii Volcanoes National Park	Pacific West
HEHO	Herbert Hoover National Historical Site	Midwest
HOSP	Hot Springs National Park	Midwest
HUTR	Hubbell Trading Post National Historical Site	Intermountain
INDU	Indiana Dunes National Lakeshore	Midwest
ISRO	Isle Royale National Park	Midwest
JECA	Jewel Cave National Monument	Intermountain
JELA	Jean Lafitte National Historical Park & Preserve	Southeast
JOTR	Joshua Tree National Monument	Pacific West
KAHO	Kaloko-Honokohau National Historical Park	Pacific West
KALA	Kalaupapa National Historical Park	Pacific West
KATM	Katmai National Park and Preserve	Alaska
KEMO	Kennesaw Mountain National Battlefield Park	Southeast
KNRI	Knife River Indian Village National HS	Midwest

LACH	Lake Chelan National Recreation Area	Pacific West
LACL	Lake Clark National Park and Preserve	Alaska
LAME	Lake Mead National Recreation Area	Pacific West
LARO	Lake Roosevelt National Recreation Area	Pacific West
LIBI	Little Bighorn Battlefield National Monument	Intermountain
LYJO	Lyndon B. Johnson National Historical Park	Intermountain
MACA	Mammoth Cave National Park	Southeast
MANA	Manassas National Battlefield Park	National Capital
MANZ	Manzanar National Historical Site	Pacific West
MEVE	Mesa Verde National Park	Intermountain
MIMA	Minute Man National Historical Park	Northeast
MNRR	Missouri National Recreation River	Midwest
MOCA	Montezuma Castle National Monument	Intermountain
MORA	Mount Rainier National Park	Pacific West
MORR	Morristown National Historical Park	Northeast
MRCC	Mississippi River Corridor Heritage Comm.	Midwest
NABR	Natural Bridges National Monument	Intermountain
NACE	National Capital Parks - East	National Capital
NASA	National Park of American Samoa	Pacific West
NATR	Natchez Trace Parkway	Southeast
NCFA	National Capital Field Area	National Capital
NERI	New River Gorge National River	Northeast
NIMI	Niobrara-Missouri National Riverways	Midwest
NOCA	North Cascades National Park	Pacific West
OBRI	Obed Wild and Scenic Riverways	Southeast
OLYM	Olympic National Park	Pacific West
ORPI	Organ Pipe Cactus National Monument	Intermountain
OZAR	Ozark National Scenic Riverways	Midwest
PAIS	Padre Island National Seashore	Intermountain
PECO	Pecos National Historical Park	Intermountain
PEFO	Petrified Forest National Park	Intermountain
PETR	Petroglyph National Monument	Intermountain
PIRO	Pictured Rocks National Lakeshore	Midwest
PISP	Pipe Spring National Monument	Intermountain
PORE	Point Reyes National Seashore	Pacific West
PRWI	Prince William Forest Park	National Capital
PUHE	Puukohola Heiau National Historical Site	Pacific West
PUHO	Pu'uhonau O Honaunau National Historical Park	Pacific West
REDW	Redwood National Park	Pacific West
RICH	Richmond National Battlefield Park	Northeast
ROCR	Rock Creek Park	National Capital
ROMO	Rocky Mountain National Park	Intermountain
RUCA	Russell Cave National Monument	Southeast
SAAN	San Antonio Missions National Historical Park	Intermountain
SACN	Saint Croix National Scenic Riverway	Midwest
SAGA	Saint-Gaudens National Historical Park	Northeast
SAGU	Saguaro National Monument	Intermountain
SAIR	Saugus Iron Works National Historical Site	Northeast
SAJH	San Juan Island National Historical Park	Pacific West

SAMO	Santa Monica Mountains National Recreation Area	Pacific West
SARA	Saratoga National Historical Park	Northeast
SCBL	Scotts Bluff National Monument	Midwest
SEKI	Sequoia and Kings Canyon National Park	Pacific West
SHEN	Shenandoah National Park	Northeast
STLI	Statue of Liberty National Monument	Northeast
SUCR	Sunset Crater Volcano National Monument	Intermountain
TAGR	Tall Grass Prairie Preserve	Midwest
THRO	Theodore Roosevelt National Park	Midwest
TIMU	Timucuan Ecological and Historic Preserve	Southeast
TONT	Tonto National Monument	Intermountain
TUZI	Tuzigoot National Monument	Intermountain
UPDE	Upper Delaware Scenic and Recreation River	Northeast
VAFO	Valley Forge National Historical Park	Northeast
VIIS	Virgin Islands National Park	Southeast
VOYA	Voyageurs National Park	Midwest
WACA	Walnut Canyon National Monument	Intermountain
WASH	Washita National Battlefied	Intermountain
WEIR	Weir Farm National Historical Site	Northeast
WRST	Wrangell-St. Elias National Park and Preserve	Alaska
WUPA	Wupatki National Monument	Intermountain
YELL	Yellowstone National Park	Intermountain
YOSE	Yosemite National Park	Pacific West
ZION	Zion National Park	Intermountain

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Chief Editor Dan Kimball

Editorial Assistant Patty Hennessy

As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The Department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

April 1998