

ANNUAL REPORT 1993
WATER RESOURCES DIVISION

National Park Service
Fort Collins, CO 80525

Natural Resources Report NPS/NRWRD/NRR-94/03

June 1994



United States Department of the Interior
National Park Service
Washington, D.C.



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A Word from the Acting Associate Director, Natural Resources

BY DENNIS B. FENN

This Annual Report provides a summary of significant accomplishments of the Water Resources Division of the National Park Service (NPS) in 1993. This Washington Office is located in Fort Collins, Colorado, with additional program offices in Washington, D.C. and Denver, Colorado. The Division provides servicewide leadership for the preservation, protection, and management of water and water-related resources of units of the National Park System. The Division carries out a broad-based water resources program involving a variety of activities, including planning and evaluation, water rights, water quality, floodplain management, watershed and wetlands protection, information management, and training. In addition to national program responsibilities, the Division provides day-to-day support to parks, regions, the Washington Office, and other NPS organizational units in addressing the myriad of water resources issues and concerns facing NPS.

I appreciate the excellent cooperation and support provided by park and regional staffs throughout the Service during the past year. These efforts have provided an environment for the high level of success achieved by our Natural Resources Program.



Comments from the Division Chief

BY DAN B. KIMBALL

As in previous years, 1993 was a very productive year for the Water Resources Division (WRD) and was characterized by a number of significant accomplishments that are reflected in this Annual Report. From a program, budget, and personnel standpoint, 1993 was also a year of change. More specifically, on October 1, 1993, the Division's Applied Research Branch (and associated project and support monies and seven FTE's) was transferred to the new National Biological Survey. However, I should note that in 1993, the Division was very successful in bringing in external funds to support ongoing efforts in the areas of inventory and monitoring and hazardous waste and contaminants assessment. I should also note that while personnel costs have continued to rise, water resources management project funding and technical assistance have been maintained at 1992 levels, principally through careful management of the Division's administrative overhead. Some examples of significant accomplishments of the Division in 1993 include the following:

- ◆ Active participation in a Department of the Interior working group with respect to reauthorization of the Clean Water Act.
- ◆ Involvement in resolving regulatory issues surrounding water pollution from inactive and abandoned mines on federal lands.
- ◆ Successful conclusion of a Reserved Water Rights Compact in the State of Montana, initiation of a settlement agreement with the Las Vegas Valley Water District concerning applications to appropriate water near the mouth of the Virgin River, and the advancement of negotiations in Utah for Zion National Park and in Colorado for Black Canyon of the Gunnison National Monument.
- ◆ Significant progress, with support from the NPS Inventory and Monitoring Program, in developing a servicewide water quality database and a programmatic plan for a servicewide water quality baseline inventory.

- ◆ Development of a formal Memorandum of Understanding with the U.S. Geological Survey (USGS) to coordinate the long-term water quality needs of units of the National Park System with the USGS National Water Quality Assessment Program.
- ◆ Issuance of a Special Directive revising NPS's Floodplain Management Guidelines.
- ◆ Involvement in significant water resources issues facing NPS including proposed construction of a flood control tunnel in Hot Springs National Park, the Glen Canyon Dam Environmental Impact Statement, the proposed New World Mine near Yellowstone National Park, and restoration of the Elwha River in Olympic National Park
- ◆ Expansion of the Division's contaminants encyclopedia to provide information on aquatic concern levels for commonly spilled hazardous substances and involvement in preliminary assessments of hazardous waste sites.
- ◆ Development of a model Water Resources Management Plan Scoping Report for small parks.
- ◆ Implementation of an enhanced training program covering wetlands delineation, classification, mapping, and compliance.
- ◆ Participation in implementation of various aspects of the Natural Resources Strategic Plan and the Vail Agenda.



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

Consistent with the tradition of the WRD, we are dedicated to customer service and to providing professional and technical support of the highest quality. I am extremely proud of the hard work and commitment to these goals demonstrated on a daily basis by the staff and management of the WRD. In addition, we will continue to search for more innovative, efficient, and cost effective ways to provide support and services to parks and regions in protecting and managing water resources of the National Park System.

Washington Program Coordination Office Highlights

**BY BILL WALKER
PROGRAM COORDINATOR**

This year has been one of major political change in Washington and continuing personnel changes in the Water Resources Division's (WRD's) program coordination staff in the Washington Office. The inauguration of President Clinton and Vice President Gore has ushered in a new era of cooperation between Congress and the White House on issues related to the environment, energy, natural resources, and land management.

In the Senate, a comprehensive bill (S1114) for reauthorization of the Clean Water Act (CWA) was introduced by Senator Baucus. In response to reauthorization efforts, the Department of the Interior established a policy group that has identified high priority issues of special importance to Interior agencies. These issues include strengthened wetlands protection through the Section 404 regulatory program; mandated consultation by the Environmental Protection Agency (EPA) and the states with the Department on development, review, and implementation of water quality standards; development of a risk-based approach to address water pollution caused by inactive and abandoned mines; mandated adoption of an antidegradation policy as part of each state's water quality standards; and a statutorily designed process for designating park waters and other nationally important waters as "outstanding national resource waters." WRD is an active participant in this policy group and will continue to work closely with the Department on CWA issues relevant to National Park Service management activities. Although no action was taken by Congress in 1993, reauthorization of the CWA will be Congress's top environmental priority in 1994.

WRD staff in this office and in Colorado are actively involved in resolving the regulatory issues surrounding water pollution from inactive and abandoned mines (AML) on federal lands. Current law requires that all such mines receive point-source water discharge permits (NPDES permits). Due to the overwhelming

number of AML sites on federal lands, federal agencies are not in compliance with this requirement. The Department is working with EPA on devising a watershed, risk-based approach to alleviating water pollution from AML sites. NPS, through the work of WRD, is a key player in the Department on this issue.

Additionally, this year the House passed the Old Faithful Protection Act of 1993, which would afford statutory protection to the geysers, hot springs, and ground water of Yellowstone National Park. The Senate will take up this park protective legislation in 1994.

Personnel changes that began in the Washington Program Coordination Office in 1992, when Sharon Kliwinski joined the WRD, continued in late November when I became the Division's Program Coordinator. Pam Matthes, who did such a terrific job as my predecessor in this position, left during the year to become Chief of the Branch of Damage Assessment and Response for the Fish and Wildlife Service. My background in aquatic ecology, resources management, and employee development complements nicely the strengths that Sharon brought to the office last year. We should make a good team as we continue to monitor legislative issues such as the CWA and the Old Faithful Protection Act, represent the Service on intra- and interagency water resources working groups, and work on various new and ongoing ecosystem management initiatives such as those in South Florida and the Chesapeake Bay.



Planning and Evaluation Branch Highlights

**BY MARK FLORA
BRANCH CHIEF**



This year has been a period of change and transition for the Planning and Evaluation Branch (PEB). During the year, Dan Kimball, our former Branch Chief, was promoted to Chief, Water Resources Division (WRD) and Barbara West, PEB's Environmental Protection Specialist, began a detail in Washington with the Office of the Assistant Secretary, Fish, Wildlife and Parks. The loss of Dan's and Barbara's contributions to the PEB have been greatly felt, and this is compounded by a current inability to replace them due to a hiring freeze. These losses notwithstanding, PEB has been successful during 1993 in providing substantial technical support to parks, regional offices, and the Washington Office on issues related primarily to water resources planning, wetlands management, and regulatory review.

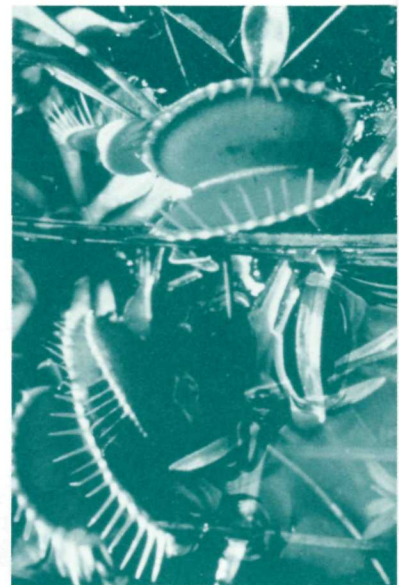
During the year, PEB has provided NPS units with both funding assistance and technical support for the development of eight Water Resources Management Plans (Acadia National Park, Big Bend National Park, Congaree Swamp National Monument, Big Cypress National Preserve, Big South Fork National River and Recreation Area, Big Horn Canyon National Recreation Area, Colonial National Historical Park, and Great Basin National Park). In addition, WRD staff have begun or completed three water resources "scoping" efforts in Morristown National Historical Park, Jewel Cave National Monument, and Katmai National Park and Preserve. PEB provided training in the development of water-related planning documents for ten additional NPS units (Valley Forge National Historical Park, Hopewell Furnace National Historic Site, Delaware Water Gap National Recreation Area, Upper Delaware Scenic and Recreational River, Richmond National Battlefield Park, Petersburg National Battlefield, Yellowstone National Park, Grant-Kohrs Ranch National Historic Site, Dinosaur National Monument, and Curecanti National Recreation Area).

It was also a very active year for the Division's Wetlands Program. PEB provided oversight for 12 ongoing wetlands projects during the year and coordinated the proposal development and funding process for 9 new projects scheduled to begin in 1994. Ongoing projects include "Characterization and Monitoring of Southern Appalachian Bogs" at Blue Ridge Parkway, "Colorado River Headwaters Wetlands Restoration" at Rocky Mountain National Park, "Big Lagoon Restoration" at Golden Gate National Recreation Area, and "Assessment of Grazing Impacts on Wetlands" at Assateague Island National Seashore.

It was also an active year for providing wetlands-related technical assistance to parks. At Grand Teton National Park, PEB staff served on an interagency technical team to resolve a Clean Water Act Section 404 enforcement action against the NPS regarding the Snake River Borrow Site. At Rocky Mountain National Park, PEB provided regulatory and technical support regarding impacts of a livery operation on wetlands and streams along Glacier Creek. At Dinosaur National Monument, PEB co-authored and helped implement a final restoration plan for a riparian and wetland complex in Hog Canyon. Additional technical assistance was provided to Olympic National Park, Carlsbad Caverns National Park, Padre Island National Seashore, Rock Creek Park, Jean Lafitte National Historical Park and Preserve, Minute Man National Historical Park, Manassas National Battlefield Park, and several other NPS units.

Wetlands training was strongly emphasized in 1993, with full wetlands compliance and delineation training courses taught at Grand Teton and Olympic national parks. Shorter training sessions were also provided for Rocky Mountain Region, the Resource Management Trainee Program, and as part of several other NPS courses.

PEB (with the assistance of the Division's other branches) also reviewed more than 290 proposed rules and regulations, environmental compliance documents (Environmental Impact Statements/Environmental Assessments) and planning documents (General Management Plans, Developed Concept Plans, Resource Management Plans, etc.) during the year. Written comments pertaining to water-related issues were prepared for over 30 percent of the documents that were reviewed.



Water Resource Planning and Management at Colonial National Historical Park

**BY MARK D. FLORA
BRANCH CHIEF, PLANNING AND
EVALUATION BRANCH**

**AND CHARLES D. RAFKIND
NATURAL RESOURCE MANAGEMENT
SPECIALIST
COLONIAL NHP**

Colonial National Historical Park (COLO) was established in 1930 to preserve the historic resources of Jamestown Island, the site of the first permanent English settlement in North America, and the Yorktown Battlefield, scene of the culminating battle of the American Revolution. Even though the park was established for its historic resources, exceptional natural resources are located throughout the area. COLO lies within the coastal plain of Virginia on the peninsula between the York and James rivers. Within its boundaries, the park contains extensive water-related natural resources including more than 33 miles of shoreline along the York and James rivers, 24 miles of perennial streams, numerous ponds, and extensive freshwater and tidal wetland habitats that cover approximately 27 percent of the park's surface area. Other important natural features include significant stands of pine and mixed hardwood forests, open fields, sinkholes, coastal bluffs, and ravines, which provide habitat for a variety of species, including the second highest number of rare, threatened, and endangered species occurring within NPS sites in Virginia. COLO is also located within the Chesapeake Bay estuary, where an active federal, state, and local initiative to improve overall water quality and the aquatic resources has been ongoing for over 10 years. The park is surrounded by several land-use types, including two large naval bases, a Coast Guard facility, residential subdivisions, commercial and industrial development, parks



and historic sites, as well as the cities of Newport News and Williamsburg, and the village of Yorktown. The potential impacts on water-related resources brought about by increasing developmental pressures have been a concern of park management for several years.

In 1991, personnel from COLO and WRD conducted a scoping effort in order to identify and assess water resources-related issues and management concerns facing the park. Primary issues of concern identified at the time included:

- ◆ a lack of basic water resources information including limited surface water quality data, an incomplete understanding of ground water hydrology and potential threats, inadequate wetland and floodplain delineations, and the lack of an adequate basic inventory for aquatic flora and fauna;
- ◆ a need to assess impacts from in-park and adjacent land uses, including point and non-point source pollution, active and inactive hazardous waste sites, landfills, underground storage and septic tanks, chemical spills, land development, ground water consumption, and shoreline erosion;
- ◆ the need for a more complete understanding of both compliance with, as well as the protection offered by, various federal, state, and local water quality/water management regulations; and,
- ◆ a desire to develop long-term approaches pertaining to the management and monitoring of water resources, as well as fostering cooperation with state and local regulatory and land-use planning entities in order to achieve a coordinated approach for addressing regional water resources issues.

Based upon an initial assessment of the issues, the Virginia Institute of Marine Sciences, COLO, and WRD initiated the development of a Water Resources Management Plan (WRMP) that also included developing GIS-compatible data bases to support water resources management activities. These data bases include detailed shoreline surveys (1:3,300 scale); watershed delineation; adjacent zoning and land-use patterns; floodplain delineation; wetlands delineation; Chesapeake Bay water quality regulatory areas; as well as major sub-basin, soils, geology, and intermittent streams and natural drainage data themes.

The COLO WRMP summarizes the existing hydrological information, provides alternatives for addressing the management issues listed above, and recommends a "blueprint" for addressing the most pressing water-related natural resource issues.



National Park Service Wetlands Program: The First Three Years

**BY JOEL WAGNER
HYDROLOGIST**

After 3 years of slogging through wetlands from Alaska to Florida and wading through reams of regulations, reports, and issues, it is a good time to review what the National Park Service (NPS) Wetlands Program has accomplished and what we have planned for the future. For those who were not even aware that NPS *has* a wetlands program, it started in October 1990 as a component of the Water Resources Division's (WRD's) Watershed Protection Program. Program goals are to enhance wetlands protection, restoration, inventory, research, and education servicewide through a program of technical assistance and project funding. Following are highlights of past program activities and some future plans, organized by the seven major components identified at the program's inception.

1. **Inventories**—Wetland inventories are critical for resource management and planning functions in all NPS units, yet many parks continue to operate without even the most basic inventory data. To expedite development of this basic data, a 50-50 cost-sharing agreement was established in 1991 between the NPS and the U.S. Fish and Wildlife Service (USFWS) for National Wetland Inventory (NWI) mapping on NPS lands. Three NWI projects were funded in 1991—1993 through the Wetlands Program, and two more have been selected for funding in 1994. Examples include "standard" NWI inventories for Yukon-Charley Rivers National Preserve and Yellowstone National Park, and "enhanced" NWI inventories (expanded ground truthing; data on wetland plant communities, soils, and hydrology; and identification of wetland processes and impacts) at Acadia National Park and Blue Ridge Parkway. In addition to the NWI projects, higher resolution surveys using methods tailored to specific needs of park resources and programs were funded at North Cascades

National Park, Ozark National Scenic River, and Pecos National Monument.



2. **Technical Support**—Twenty wetland inventory, restoration, research, and protection projects were funded in the first 3 years of the program. During this period, cost sharing stretched WRD's investment of \$468,000 to over \$750,000 for these projects. In addition to the inventory projects discussed above, restoration and protection projects have been funded at Golden Gate National Recreation Area, Denali National Park and Preserve, Cape Cod National Seashore, National Capitol Parks East, Assateague Island National Seashore, and many other NPS units. Technical assistance (short-term projects or analyses conducted by WRD staff) to parks, regions, and the Washington Office has been a high priority, with over 90 such assistance efforts completed in the first 3 years of the program. Technical assistance to Washington Offices has included active participation in several interagency committees charged with national level wetlands technical coordination and policy development.

3. **Planning and Compliance**—This has been a very active area for the program, particularly regarding Section 404 of the Clean Water Act and NPS wetlands guidance. Most Section 404-related activities fall into three categories: (a) resolving issues where parks have not complied fully with permit program requirements, (b) preparing responses to non-NPS Section 404 permit applications for actions that threaten park resources, and (c) preparing NPS comments on proposed changes to Section 404 or to the U.S. Army Corps of Engineers (COE) regulations that implement the permit program. Examples of activities in these areas include participating on a technical team to resolve an alleged Section 404 violation at the Snake River Gravel Pit (John D. Rockefeller, Jr. Memorial Parkway), analyzing effects of a proposed housing development on wetlands at Gulf Islands National Seashore, and preparing comments on H.R. 350 (amendments to the Clean Water Act regarding wetlands protection and management). Activities related to NPS wetlands guidance have stemmed mostly from WRD's role in reviewing wetlands "Statements of Findings" for NPS projects that will have an adverse impact on wetland resources.
4. **Training**—Wetlands Program goals cannot be fully achieved without transferring technical and regulatory information to the field. As many as 6 training sessions per year have been provided through the program, ranging from 2-hour field and lecture sessions for the Resource Management Trainee Program to a 3-day course covering wetlands delineation, classification, mapping, and compliance. The 3-day course was first presented at Grand Teton National Park in 1993 in cooperation with USFWS



and COE. The course was highly rated by all participants and will be offered again in conjunction with the Albright Employee Development Center in 1994. We expect to continue offering the full course and several shorter training sessions annually.

5. **Guidance**—The Wetlands Program has responsibility for incorporating wetlands-related laws, executive orders, and regulations into NPS policy and guidance documents. The program has developed the Wetlands Management section of the NPS Natural Resources Management Guideline (NPS-77) and has made a commitment to issue new NPS Wetlands Protection Guidelines once the Clinton Administration releases its promised new executive order on wetlands protection.
6. **Wetlands Database**—Several significant steps have been taken toward development of an NPS wetlands data base. First, a subset of the USFWS's NWI database covering NPS units is maintained and updated every 6 months. Parks can now obtain information from WRD regarding availability of NWI maps or digital data for U.S. Geological Survey quadrangles within and immediately adjacent to NPS units. Type, date, and scale of aerial photography used, date of map completion, and other useful information about NWI maps can also be retrieved. Second, progress has been made in developing a wetlands category for the WRD's "Water Resources Issues/Threats Data Base." Data on wetlands impacts in NPS units and measures needed (or now being taken) to resolve these issues have been entered into the data base and are being reviewed. A third accomplishment is the development of an NPS wetlands research data base. Information on wetlands research (broadly defined to include most resource management) being conducted servicewide is updated every 2 years to promote exchange of data and information within the NPS and across agencies.
7. **Public Awareness**—A full-color brochure entitled *Wetlands in the National Parks* was developed to provide park visitors with basic information on wetland types; wetland functions and values, wetland origins, and NPS's role in wetlands management, research, restoration, interpretation, and education. To date, approximately 100,000 brochures have been distributed to the public through park visitor center

displays, interpretive programs, public affairs offices, and through other federal and state agency programs.

The Wetlands Program has some exciting prospects for 1994. We will add a second staff member to help keep pace with the rapidly growing need for wetlands-related technical assistance and training and to focus more effort on servicewide components of the program. We also look forward to teaching the training course again at Grand Teton National Park and intend to continue offering this course annually. Finally, in an effort to promote interaction between wetland scientists and resource managers, WRD will coordinate and chair a session entitled "Wetlands Research and Management in the National Parks" at the 1994 annual meeting of the Society of Wetland Scientists.



Water Resources Planning for Small Parks

**BY DAVID SHARROW
HYDROLOGIST**

**AND MARK FLORA
BRANCH CHIEF**

Water Resources Management Plans (WRMPs) are the documents of choice for developing strategies to address water resources issues facing large NPS units, but some parks do not need such an involved approach. The Water Resources Division (WRD) has adapted a Scoping Report for Water Resources to meet the needs of parks with water resources issues that are limited in number and complexity. Scoping Reports completed in 1993 for Morristown National Historic Park (MORR) and Jewel Cave National Monument (JECA) can serve as models for similar parks.

Periodically, parks need to evaluate the condition of their water resources and, based on legislative mandates, lay out a strategy to address these issues. Of the planning documents commonly prepared for NPS units, General Management Plans are too general, and Natural and Cultural Resource Management Plans (RMP) often lack the depth for a full analysis of water resources issues. Several parks have prepared WRMPs that, while similar to RMPs, include much more detail in the examination of legal and policy mandates, and contain summaries of existing water resources knowledge and literature. Issues are analyzed and specific actions proposed as project statements suitable for inserting directly into the park's RMP.

Unfortunately, most units do not have the staff or expertise to undertake a WRMP, so only those with the most complex and pressing water resources issues have prepared them. In order to assist parks in making a decision whether to invest significant funds and 1½ years in preparing a full WRMP, the WRD has begun preparing Water Resources Scoping Reports (WRSRs).

recommendations, including recommendations as to whether a WRMP is needed. If a full plan is appropriate, the WRSR lays a foundation for it.

It soon became apparent that some parks did not fall neatly into either of the two categories of needing or not needing a WRMP. Certainly many units had numerous complex issues and proceeded with a full plan, a few had limited issues that were easily addressed in the regular RMP, but many other parks fell in between. They had significant water resources issues, but these were limited in number and complexity. To address these needs, we began preparing WRSR's that were a little more involved and attaching project statements. This approach was applied at JECA and MORR.

Water is a very important concern at JECA, though at first glance it appears to be nearly absent. There is no perennial surface water in the park, save a few tiny springs, and the entire known cave (80+ miles of it) sits above the ground water table. Even in this relatively dry setting on the south slopes of the Black Hills, the soils, vegetation, and geology combine to concentrate enough water to create wet areas in the cave that are essential for some of the rare and spectacular cave minerals. Water is also probably the most effective vehicle for carrying contaminants from the surface down into the cave.

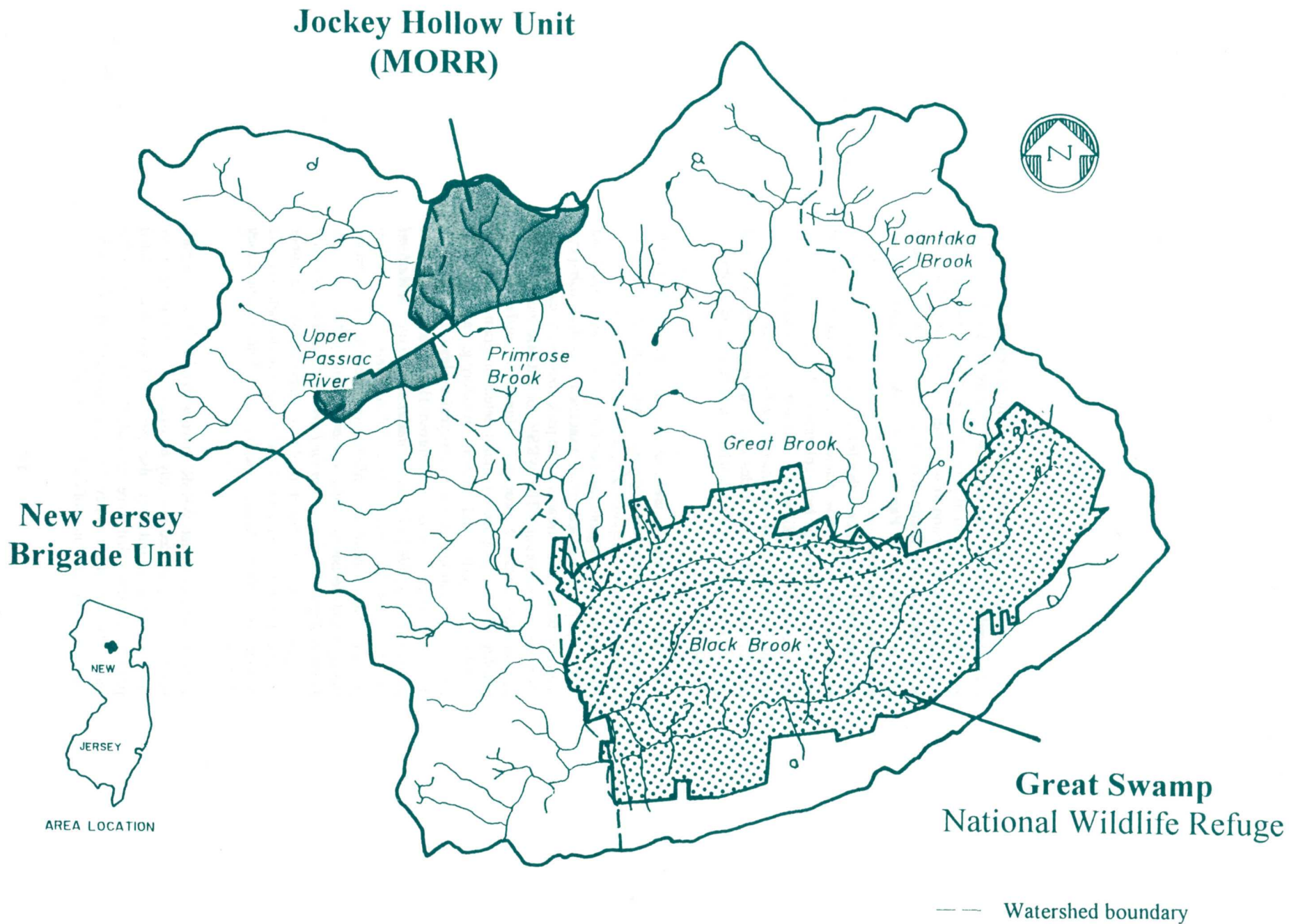
Problems had developed in the past when effluent from the park's leaking sewage system was found to be flowing almost immediately into the cave. Other possible sources of contamination, all directly above the cave, are park facilities including a visitors center, parking lot, housing and maintenance yard, and a state highway that is salted in the winter and carries the risk of accidental fuel spills. Additionally, movement of water from the surface to and through the cave was not well understood but had been shown to be complex. The WRSR prepared in cooperation with park Cave Management Specialist Mike Wiles provides a status and history of these issues and six project statements addressing *Water Resources Monitoring*, *Surface and Ground Water Interactions*, *Water Rights*, *Hydrologic Connections with Hell Canyon*, *Monitoring of Ground Water Levels*, and *Restoration of Natural Flow Patterns*.

MORR is located in the rolling hills of north central New Jersey, only 30 miles west of New York City (Figure 1). Land use in the area has been mostly rural agriculture and woodlots, but it has recently seen a conversion to suburban development. Park lands are located on the headwaters of Primrose Brook and on a portion of the Upper Passaic River. Water quality remains generally good, consistent with the location at the top of a watershed and for an area with a few roads and minor residential developments. The few bacterial samples taken revealed generally low levels of fecal coliforms. Threats to the water resources around MORR include salt and runoff from highways, increased runoff and sediment loading from residential development, drift of pesticides and fertilizers from lawns and golf courses, septic system leachate, and leaking underground storage tanks.

There are a few marshy areas and riparian wetlands along the streams, but these resources have not been inventoried in sufficient detail to support management decisions. The State of New Jersey has designated some of the streams as "Wild Trout Streams," providing additional protection to native fish populations, while other streams in the park continue to carry a less stringent classification. The WRSR for MORR includes five project statements. A project to *Monitor Long-Term Water Quality Trends* proposes a multifaceted program to include monthly, quarterly, and annual monitoring, and periodic intensive monitoring on 15- to 20- year cycles. The source of elevated bacteria levels in Primrose Brook is addressed in *Investigate Possible Coliform Contamination Issue*. A *Wetland and Riparian Zone Inventory and Assessment* is proposed to provide basic resource information needed to support management decisions. Finally, there is a project statement to *Enhance Regulatory Protection for Park Waters*, which proposes to upgrade the state water quality designation for the upper Passaic River to Category 1, allowing no degradation and seeking "Wild Trout Stream" designation for Primrose and Jersey Brooks.

Both of these expanded WRSR's have worked well to serve park needs. They provided not only an overview of the unit's water resources issues, but they also generated key water-related project statements that were "uploaded" into the RMP's for the parks. It is felt that this new "expanded format" WRSR may be appropriate in many units of the National Park System.

Figure 1. Major drainages of the Great Swamp Watershed (Upper Passaic Basin), Morristown NHP (J. Nolan).



Water Rights Branch Highlights

**BY OWEN R. WILLIAMS
BRANCH CHIEF**

Last year, I began my overview by noting that the year had been a time of increasing workload for the Water Rights Branch (WRB). That trend continued in 1993. As in 1992, the increasing workload was the outgrowth of generally positive events. Especially worth noting were the successful conclusion of Compact negotiations for three NPS units in Montana, the initiation of a settlement agreement with the Las Vegas Valley Water District concerning applications to appropriate water near the mouth of the Virgin River, and the advancement of negotiations in Utah for Zion National Park and in Colorado for Black Canyon of the Gunnison National Monument. Also worthy of note is the progress made in numerous studies and field data collection efforts in support of litigation or negotiations in many NPS units around the country.

These accomplishments, and the many more described in this report, were the result of the combined hard work of a quality staff made up of dedicated and talented professionals. Three employees were added to the Branch's staff this year: Andrew Hautzinger, Mildred Schulze, and Mark Wondzell. Bringing broad-based and diverse skills to the Branch, these individuals come, respectively, from the Bureau of Land Management, the Department of Defense, and the Fish and Wildlife Service. I believe the NPS benefits from the integration of diverse points of view, and the WRB, as a result, is more effective.

With the addition of these individuals, WRB finally has its full complement of federal staff. Workload requirements beyond the capacity of this staff have been met through the contracting of work to the private sector and to academia. The result has been an expansion of WRB's capacity to provide necessary services in a timely manner. This capacity has been significantly increased through contracts with Colorado State University for the completion of specific projects by Research Associates (RA's). RA's currently working on WRB projects include Gustavo Diaz, Bernadette Berger, Nancy Stevens, Dan Evans, and Hilary Renner.

Several projects begun in past years were continued in 1993. In particular, these projects include: preparations for hearings on the water rights applications of the Las Vegas Valley Water District (involving Death Valley National Monument, Lake Mead National Recreation Area, and Great Basin National Park); studies in support of water rights litigation in Oregon (Crater Lake National Park), Utah (Zion National Park), and Colorado (Rocky Mountain National Park); a motion for summary judgment concerning Rocky Mountain National Park reserved rights; quantification of claimed reserved water rights for City of Rocks National Reserve; studies of surface and ground water diversion impacts upon biota in Hawaii (Kalaupapa National Historic Site); studies to determine the probable causes for recent water level declines at Devil's Hole (Death Valley National Monument); and investigations into methods for repair/replacement of Vendome Well (Chickasaw National Recreation Area). WRB also protested 29 water rights applications, participated in hearings involving two protests, and reached a stipulated settlement in one.

Another accomplishment took a form quite different from those described above. Assisted by staff at Rocky Mountain National Park, the entire WRB staff presented a multi-day field hydrology workshop (the first that I am aware of) for attorneys from the Interior's Office of the Solicitor and the Department of Justice. Participants came from offices in Colorado, California, and Washington, D.C. The attorneys were so impressed by the experience that WRB has been requested to repeat—and expand—the session to give more attorneys the experience and to strengthen the understanding gained by those who attended the first session.

This has been a productive year for the protection of NPS water rights, and I anticipate that 1994 will be at least as productive, if not more so. The NPS in general, and I in particular, owe a debt of gratitude to the staff of the Water Resources Division. Because of their professionalism and dedication, the NPS water resources protection program continues to succeed.

The following articles describe two water rights issues that are of some consequence. These will provide a little more depth and detail to help describe the nature of some of the activities touched upon earlier.

With regard to the future, I am encouraged by the successful working relationships we enjoyed while negotiating with state representatives in 1993. Opportunities may exist to resolve additional disputes using similar techniques in 1994. Having said that, it is important to note that the assistance provided by park management and staff was critical to any success enjoyed in 1993 and will be just as essential if we are to achieve success in 1994.



Breakthrough in Negotiations for Federal Reserved Water Rights in Montana

**BY CHUCK PETTEE
SUPERVISORY HYDROLOGIST**

The State of Montana commenced a general adjudication of the rights to the use of water within the state in 1979 by statute. This law also created a Reserved Water Rights Compact Commission (Commission) charged with the responsibility of negotiating settlement agreements or compacts with indian tribes and agencies of the United States to resolve federal reserved water rights within the structure of the statewide water rights adjudication. The procedure requires compacts to be ratified by the Montana State Legislature, signed into law by the governor, approved by the United States Congress, and then decreed by the Montana Water Court.

Compact negotiations between the National Park Service (NPS) and the Commission began in the early 1980s and, in 1993, achieved a major milestone when agreement was reached on water rights at three of the five Montana NPS units with reserved lands. The NPS negotiation team was comprised of Department of Justice attorneys and Billings Field Solicitor and WRB staffs.

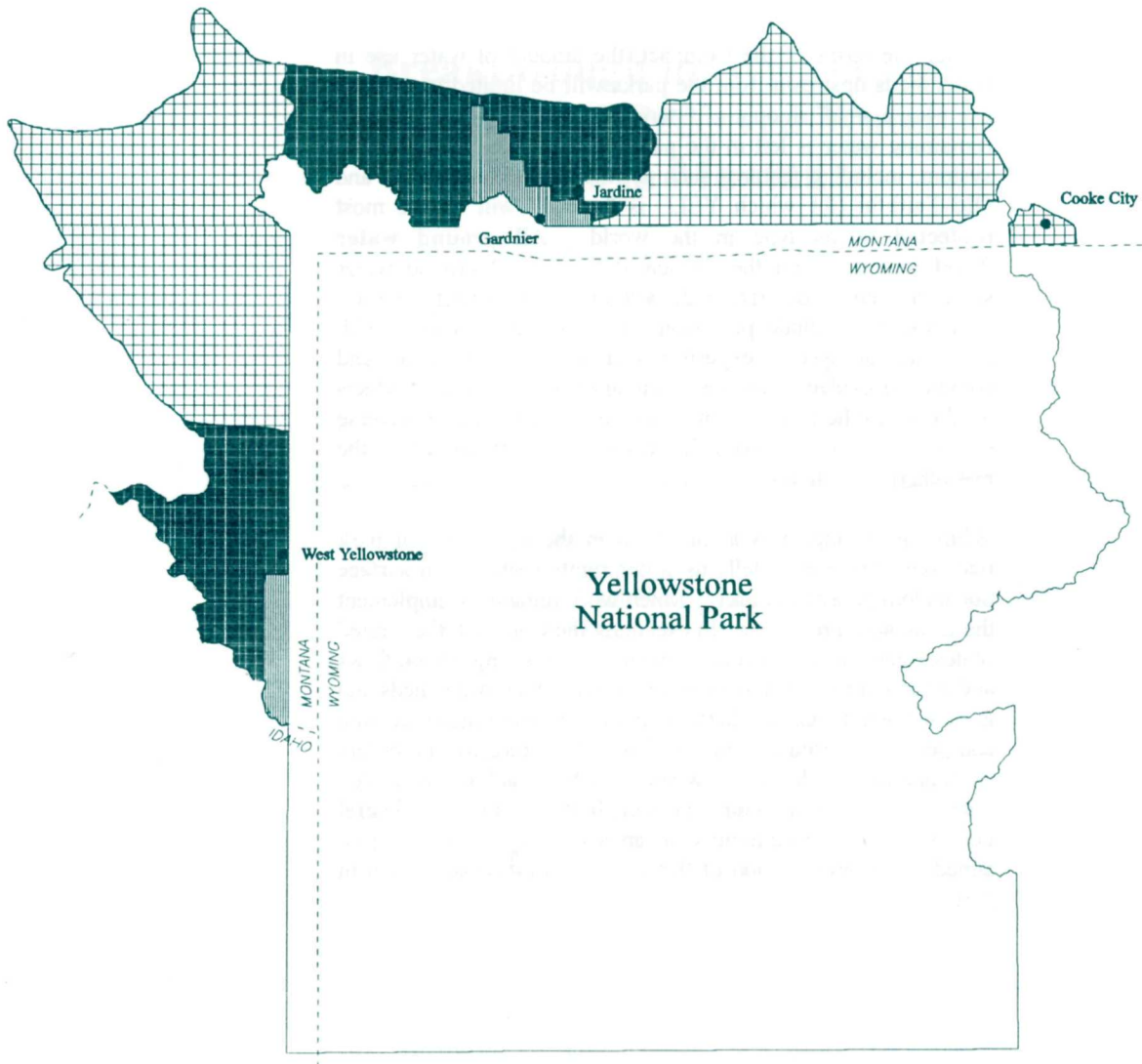
A compact defining federal reserved water rights for Glacier National Park, Big Hole National Battlefield, and the Montana portion of Yellowstone National Park (YELL) was recommended by the Commission and received the required state and federal administrative approvals. Abstracts specifying water rights as they are defined in the Compact will be entered as NPS claims in the adjudication process and supported by all parties. Such support gives credibility to the expectation that the claimed rights will be decreed by the Montana Water Court. The Compact also commits the parties to resolving water rights for the remaining two NPS units with reserved lands in Montana: Little Bighorn Battlefield National Monument and Bighorn Canyon National Recreation Area. Negotiators hope to complete a Compact for these two units in time for action during the 1995 state legislative session.

Under the terms of the Compact, the amount of water use in watersheds upstream from the parks will be limited to existing use plus a small amount of future use, in most cases, while all remaining water is left in the park streams. The hydrothermal system, including features such as Mammoth Hot Springs and Old Faithful (for which YELL is famous), will be the most protected of its type in the world. **All ground water development** within the delineated "controlled ground water subarea" shown on Figure 2, will require a permit. Permit approval will include provision for review by scientists with hydrothermal system expertise and will require clear and convincing evidence that no potential exists for adverse effects to the hydrothermal system. Any doubt concerning adverse effects will be resolved **in favor of protection** of the hydrothermal system within YELL.

While the Compact is a milestone in the protection of park resources, experience tells us water rights issues often surface but seldom go away entirely. Much work remains to implement the Compact's provisions. In executing the Compact, the United States made a long-term commitment to monitoring stream flows and evaluating water development within critical watersheds and ground water areas. While this commitment will require funding and personnel resources, the level of expenditure will be orders of magnitude smaller than it would have been had the issue been resolved through litigation. Further, both the state and federal governments have committed to an active protection program aimed at the preservation of the YELL hydrothermal system in perpetuity.

CONTROLLED GROUND WATER AREA

YELLOWSTONE NATIONAL PARK AND VICINITY, MONTANA



LEGEND



Subarea I



Subarea II



Known Geothermal Resource Area
(KGRA) (within Subarea I)

--- State Boundary

— Controlled Ground water
Subarea Boundary



Miles



Figure 2. Map depicting controlled ground water area, Yellowstone NP (C. Gable).

Water Rights and Natural Resources at Cape Hatteras National Seashore

**BY MARK WONDZELL
HYDROLOGIST**

**LARRY MARTIN
HYDROLOGIST**

**AND PAUL CHRISTENSEN
HYDROLOGIST**

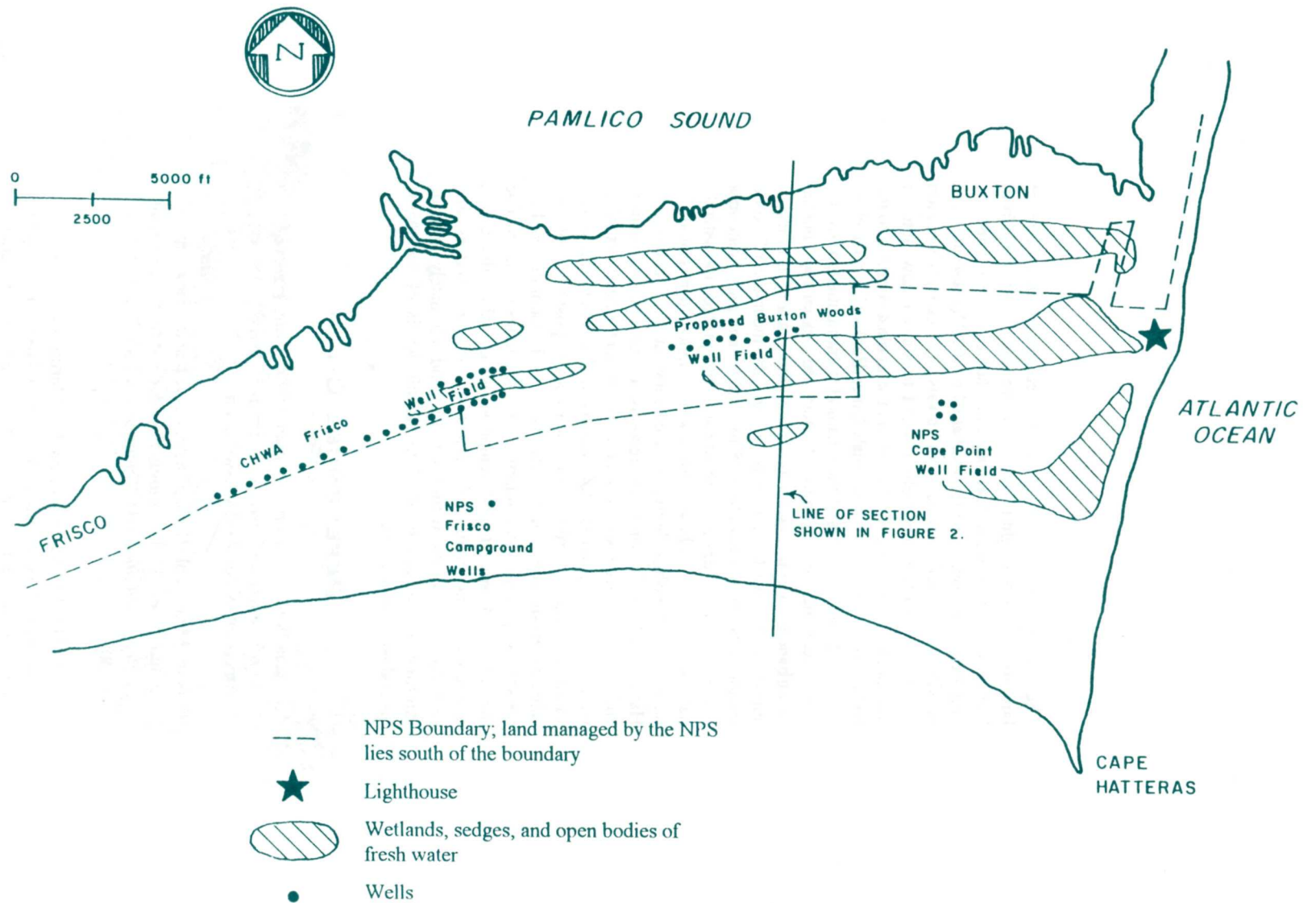
The Water Resources Division (WRD), together with Cape Hatteras National Seashore (CAHA), the State of North Carolina, and the Cape Hatteras Water Association (CHWA) (a user-owned, community-based water supply group), is investigating possible impacts of water withdrawals on the maritime forests, interdunal wetlands, and brackish fringe marshes of Hatteras Island, the eastern-most island of North Carolina's Outer Banks. Hatteras Island, home to the largest remaining maritime forest in North Carolina (the 3,000-acre Buxton Woods) (Shaw 1992), currently relies on a single common source of ground water to supply potable water to area residents, vacationers, and park visitors. Increasing permanent and vacation populations and coastal development along North Carolina's Outer Banks foretell of increasing demands for freshwater and increased aquifer withdrawals which may imperil the fragile ecosystem of this barrier island.



The Hatteras Island ecosystem is dependent on the balance between recharge and discharge of the island's freshwater aquifer. This aquifer, which exists as an unconfined lens, thickest at the center of the island and thinnest near the coast, floats on the more dense saline ground water below. Local surface hydrology is closely linked to the aquifer which is maintained and continually recharged by abundant annual precipitation. The water table, which is often very near the surface and periodically rises to or above ground level, is frequently expressed as interdunal wetlands or ponds. These wetlands (locally referred to as "sedges") occur in narrow, parallel bands bounded by stabilized dune ridges of pine and oak forests and contribute greatly to the biodiversity of the barrier island. During extended dry periods, however, the water level in these ponds and wetlands may drop below land surface. Increased ground water withdrawals may increase the frequency, extent, and duration of these lowered water tables during temporary dry periods (Gregory et al. 1991), thus potentially altering the distribution or composition of natural vegetation within CAHA.

CHWA currently supplies water to island residents via the Frisco well field, which consists of 35 wells (40 to 60 feet deep) extending approximately 9,000 feet along the east-west axis of the island (Martin 1992). CHWA has also submitted an application to the North Carolina Division of Coastal Management for a permit to develop a new well field east of the existing well field and just north of CAHA (Figure 3). The existing and proposed water withdrawals and associated potential resource impacts pose unique and intriguing legal and scientific questions for WRD staff. North Carolina is a "riparian rights" jurisdiction; as a result, water use (at least with regard to surface waters) is governed by the doctrine of riparian rights. Riparian rights holders have common rights to the stream and must make such use of the water as is reasonable (under *all* circumstances) without unreasonably interfering with the uses of other holders (Radosevich et al. 1976). The State of North Carolina has also adopted this rule of reasonable use with respect to ground waters; thus landowners may use ground water for beneficial purposes on overlying land provided the use is deemed reasonable and non-wasteful (AWWA 1990).

Figure 3. Map depicting Cape Hatteras NS, showing location of well-fields, NPS boundary, and approximate extent of large wetlands, sedges, and open water bodies (J. Nolan).



The National Park Service (NPS) recognizes that adjacent landowners have a right to withdraw and use ground water from Hatteras Island's freshwater aquifer; however, we must be prepared to demonstrate that point at which CAHA resources are or will be impacted by water withdrawals. The native vegetation of Cape Hatteras is uniquely adapted to survive low nutrient availability, salt spray, wind shear, and sand blast common to the barrier islands of North Carolina's Outer Banks (Barbour et al. 1985). These islands and their natural communities, however, are becoming increasingly subject to extensive human disturbances. Ground water pumping, ditching and draining of surface water, wastewater disposal, and the incursion of exotic species have prompted the NPS to conduct and participate in a series of studies designed to identify and protect the island's natural resources. These studies are designed to examine the natural relationship between hydrology and vegetation on Hatteras Island, determine the response of the aquifer to natural and human-induced stress, determine current rates of surface water discharge from Buxton Woods, and estimate the spatial variability (i.e., vertical and horizontal position) of the saltwater/freshwater aquifer interface, both naturally and in response to ground water pumping. These studies will determine the limits of spatial and temporal water table fluctuation necessary to maintain and protect the existing sedges and surrounding uplands within CAHA, and ultimately provide information that can be used to identify levels of acceptable ground water withdrawal.

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Water Operations Branch Highlights

**BY DR. WILLIAM L. JACKSON
BRANCH CHIEF**

Water resources management technical support to parks, regions, and the Denver Service Center (DSC) continued to be the cornerstone of Water Operations Branch (WOB) activities in 1993. As delineated elsewhere in this report, technical assistance was provided to approximately 60 parks in all 10 National Park Service (NPS) regions in the specialized areas of water quality protection, the analysis of aquatic contaminants issues, ground water monitoring and modeling, floodplain assessment, river management, and the development of digital hydrographic data bases.

The Branch's technical assistance function was extremely varied and included such things as assistance in the application of the Clean Water Act for the protection of park water quality (Southwest Region), channel and riparian restoration (Dinosaur National Monument), ground water modeling (Cape Cod National Seashore), field assessment of a river channel avulsion (Curecanti National Recreation Area), river restoration planning (Yosemite National Park), and water quality sampling (Yellowstone National Park).

To augment its program of direct park support, WOB also continued to develop and implement programs of national scope. I am particularly excited about the progress made by our water quality team in developing a servicewide water quality data base and in the drafting of a programmatic plan for a servicewide water quality baseline inventory. Both of these programs have been developed with support from the NPS Inventory and Monitoring Program. As discussed in one of the following articles, the data base development program is fully operational, and parks will begin receiving comprehensive water quality data analysis reports in 1994. The field inventory program is scheduled to be fully operational in 1995. Finally, WOB developed a formal Memorandum of Understanding with the U.S. Geological Survey (USGS) to coordinate the long-term water quality monitoring needs of the National Park System with

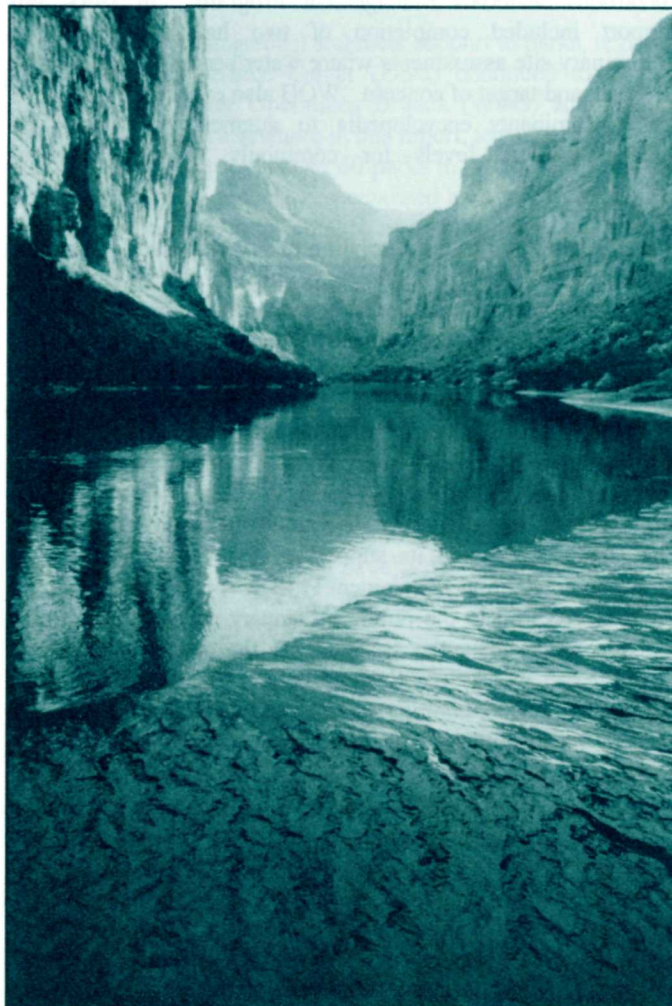
the USGS National Water Quality Assessment program. An NPS coordination position is being established at the USGS National Headquarters in Reston, Virginia, to help further the objectives of this agreement.

In addition to the programmatic activities of the water quality team, the Branch provided technical support to the NPS Hazardous Materials Management Program. In 1993, this support included completion of two hazardous materials preliminary site assessments where water served as the primary pathway and target of concern. WOB also expanded sections of the contaminants encyclopedia to augment information on aquatic concern levels for commonly spilled hazardous substances.

WOB contributed to the resolution of several issues of national significance. A Special Directive officially revising the NPS Floodplain Management Guidelines was issued in 1993. WOB, which drafted the new guidelines, has been assisting regions and DSC in their implementation. As described in an article to follow, the Branch worked closely with the Southwest Region and Hot Springs National Park to defeat a proposal to construct a flood-control tunnel under West Mountain in the park. Specifically, at the Director's request, WOB provided substantial input to the design of alternative flood management concepts. The Branch continued its support of the Glen Canyon Dam Environmental Impact Statement (EIS) process. A final draft EIS was released to the public in January 1994. Branch staff also provided substantial assistance to the development of the Elwha River Ecosystem Restoration Report to Congress, the design of a cooperating agency water quality monitoring program for Lake Powell, the assessment of resource response to flooding in the Midwest Region and at Chiricahua National Monument, and NPS participation in the permit process for a proposed hazardous materials dump near Amistad National Recreation Area.

Like most of you with whom we work in the parks, the staff of WOB at times feels overwhelmed with its workload. This has resulted in a few things falling through the cracks and other requests of our time having to be deferred. However, I take great pride in the professionalism and productivity of the staff; we all have the attitude that we will keep pedaling as fast as we can,

knowing that whatever contribution we can make to park water resources programs is important to the protection and management of our parks' natural ecosystems.



Flooding in Chiricahua National Monument

**BY GARY SMILLIE
HYDROLOGIST**

**AND MICHAEL MARTIN
HYDROLOGIC TECHNICIAN**

During the evening of Saturday, August 28, 1993, large floods occurred in Chiricahua National Monument in Rhyolite and Bonita creeks. High water in Rhyolite Creek backed up behind the box culvert under the park road and partially inundated the visitors center parking lot, approaching the building itself. Damage occurred to paved surfaces, and erosion was widespread. Bonita Creek partially flooded the park campground, and a tributary, Surprise Canyon, overtopped the road and destroyed one campsite; however, no campers were injured. Below the confluence of the creeks, high water rose nearly to the Superintendent's house before receding.

Just 3 days later, in the early morning of August 31, the largest flood in many years took place in Rhyolite Creek, with water rising to within about 2 vertical feet of the visitors center. The Superintendent's house was severely threatened by flood waters that broke out of the main channel upstream. These waters filled a side channel on the opposite side of the structure from Bonita Creek, effectively isolating the house from any overland escape route. Fortunately, flooding in Bonita Creek through the campground was much less severe and no loss of facilities or injury resulted. The last of the flooding episodes occurred later in the morning of August 31, and was less intense than the earlier two events.

While floods are natural and generally beneficial to river channels and riparian ecosystems, the park received widespread damage to infrastructure and facilities. Footpaths and bridges were obliterated upstream and downstream of the visitors center. The dirt road leading down to the Superintendent's residence was washed out and scoured down 6 feet or more in places. A sewage pipe was partially exposed and bent by a large boulder

that was rolled downstream by the flow. Picnic tables and signs were moved or damaged. Many trees were washed into the stream course, channels and banks were eroded, and new channels were occupied. Nearly all of this damage was incurred along Rhyolite and lower Bonita creeks, with some damage associated with the flooding in Surprise Canyon. Bonita Creek above the confluence did not cause damage except for deposition of a small amount of debris.

Members of the Water Operations Branch visited the park soon after the flooding episodes to get a first-hand look. Given the degree of flood-related effects, park management decided that an estimate of the magnitude and frequency of the largest of the three floods would be useful for determining the extent to which existing facilities are within the 100-year floodplain. A topographic survey was conducted using high-water marks to allow indirect measurement of the magnitudes of the flood event in several locations. Peak discharges were calculated using the slope-area method, and flood recurrence intervals were determined using regional regression equations published by the U.S. Geological Survey (Roeske 1978). Peak discharge below the confluence of the two streams is estimated to have been about 3,750 cubic feet per second (cfs) with a recurrence interval of about 100 years (Figures 4 and 5). Above the confluence, discharge in Bonita Creek is estimated to have been approximately 600 cfs, which is approximately the five-year flood event for that watershed. Peak discharge in Rhyolite Creek is estimated to have been about 3,250 cfs, which is near the calculated 500-year flood magnitude.

The wide disparity in recurrence intervals for Bonita (approximately five-year flood) and Rhyolite creeks (approximately 500-year flood) is surprising, and it prompted further investigation into the application of regional regression equations into flood recurrence interval determination and floodplain delineation. It is very likely that a much rarer event actually occurred in Rhyolite Creek, but it is suspected that the method used to estimate recurrence intervals may have exaggerated the true difference. Runoff production in Rhyolite and Bonita drainages is known to be very different, probably as a result of differences in the degree of bedrock fracturing and/or thickness of alluvial fill (Johnson 1962). Recognizing the possibility of physical differences in the two watersheds leads to

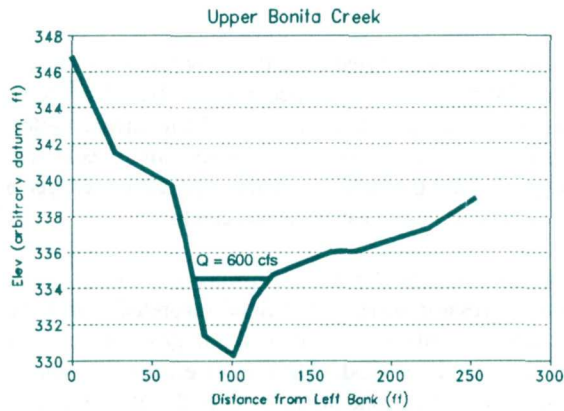


Figure 4. Cross-section of Upper Bonita Creek in Chiricahua NM depicting estimated 5-year flood elevation (M. Martin).

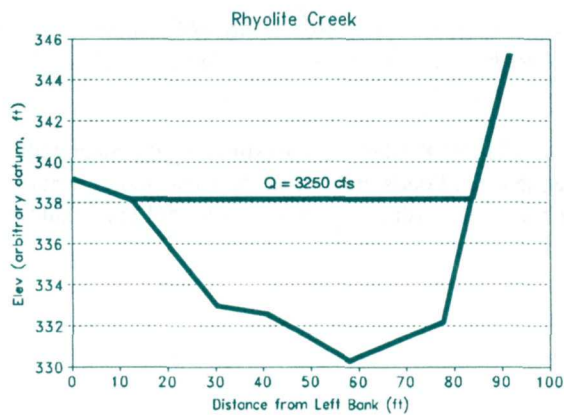


Figure 5. Cross-section of Rhyolite Creek in Chiricahua NM depicting estimated 500-year flood elevation (M. Martin).

an interesting dilemma. In absence of site-specific stream gage records, the preferred manner to develop hydrologic data is through extrapolation of information collected at similar locations, usually by utilizing regional regression equations. However, if vast differences exist between two streams, how can one regional relationship apply to both? If one assumes that Bonita Creek is less flashy in nature than the "average"

southeastern Arizona stream and that Rhyolite is more flashy, the effect on the estimated recurrence intervals based on the regional information would be to underestimate the recurrence interval for Bonita Creek and over-estimate it for Rhyolite Creek. This may partially explain the wide difference in estimated recurrence intervals between these two adjacent creeks.

The implications of these conclusions are that while use of regional regression equations in flood magnitude estimation and subsequent floodplain delineation for ungaged watersheds is a widely accepted method, both over-estimation and under-estimation of flood-prone areas may result. Regional equations should be used with discretion, and knowledge of both the natural systems in question, and those from which the equations are derived, should be employed to whatever extent is possible.

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Baseline Water Quality Inventories and Analyses in Preparation for All Park Units

**BY DEAN TUCKER
COMPUTER PROGRAM ANALYST**

**AND GARY ROSENLIB
WATER QUALITY COORDINATOR**

During 1993, the Water Resources Division (WRD), in cooperation with the Servicewide Inventory and Monitoring Program, embarked on a 3- to 4-year project designed to characterize baseline water quality at approximately 255 park units containing significant natural resources. Rather than collecting new field data to establish a current baseline, this effort initially focuses on retrieving, reformatting, and analyzing historical surface water quality data contained in the Environmental Protection Agency's (EPA's) Storage and Retrieval (STORET) national water quality data base system. The goal of this effort is to provide descriptive water quality information to each national park unit in a format usable for park planning and management.

Specific objectives of the project are to: (1) retrieve water quality and related data from EPA's STORET and other data base systems; (2) develop a complete inventory of all retrieved data; (3) produce descriptive statistics (Table A) and appropriate box-and-whiskers and time-series plots (Figure 6) of the water quality data to characterize annual, seasonal, and period-of-record central tendencies and trends; (4) compare park water quality data with relevant EPA national water quality criteria on a station-by-station basis; (5) compare park water quality data with the Inventory and Monitoring Program's Level I water quality parameters; and (6) reformat the water quality and other related data for use with the park-based Water Quality Data Management System (currently under development in WRD) and other appropriate analytical tools, including GIS.

Every park unit participating in this project will receive a detailed analog report documenting the results of all inventories and analyses. All the tables, figures, graphs, and text in the report will also be provided in digital format to the park. Additionally, each park will receive several hydrographic digital data bases, including: (1) all retrieved water quality parameter data; (2) 1:100,000 scale River Reach File hydrography; (3) surface water quality monitoring station locations; (4) stream gage locations; (5) National Pollutant Discharge Elimination System permit locations; and (6) drinking water intake locations. Examples of some of these products are displayed for Rock Creek Park, Station 0045 at Beach Drive and Wyndale Road, in Table A, and Figure 6.

The baseline water quality report and associated data bases are intended to inventory existing park water quality data, help establish baseline water quality at the park, identify **potential** water quality problems, identify gaps in Level I water quality parameter coverage, and establish a park water quality data base. While the report will enable park resource managers to compare and contrast water quality data collected as part of ongoing inventory and monitoring programs with historical water quality trends, the report is not intended to assess the significance of specific water quality issues and problems. Consequently, the report is best used as a reference document to help design new goal-driven water quality inventory and monitoring programs rather than as conclusive evidence of existing water quality problems. In fact, it is intended that the baseline water quality reports will be crucial to focusing park-specific water quality field inventory programs, scheduled to begin in 1995 as part of NPS's Servicewide Inventory and Monitoring Program.

WRD, teamed with our contractor, Horizon Systems, Inc., hopes to complete 50 baseline water quality inventory and analysis reports during 1994. The order in which parks will be completed has been established by the Regional Water Resources Program Managers and the Regional Inventory and Monitoring Coordinators. For additional information on this project, please contact either Dean Tucker or Gary Rosenlieb.

Station Inventory for Station: ROCR0045

NPS Station ID: ROCR0045 LAT/LON: 38.985838/ 77.058060 Agency: 21MDMONT Date Created: / /
 Location: ROCK CR AT BEACH DR WYNDALE RD FIPS State/County: 24031 MARYLAND/MONTGOMERY
 Station Type: /TYPA/AMBT/STREAM STORET Station ID(s): 40010 /RKC-009.76
 RMI-Indexes: 0214001 002280
 RMI-Miles: 0112.87 0009.76
 HUC: 02070010 Depth of Water: 0 Aquifer:
 Major Basin: NORTH ATLANTIC Elevation: 0 Water Body Id:
 Minor Basin: POTOMAC RIVER ECO Region:
 RF1 Index: 020700100036 RF1 Mile Point: 8.980 Distance from RF1: 2.60 On/Off RF1: OFF
 RF3 Index: 02070010000100.00 RF3 Mile Point: 0.00 Distance from RF3: 0.37 On/Off RF3:
 Description:

STATION ESTABLISHED ON ROCK CREEK AT BEACH DRIVE AND WYNDALE ROAD NEAR MEADOWBROOK RECREATION CENTER. STATION WAS ESTABLISHED FEBRUARY 1971.

Parameter Inventory for Station: ROCR0045

Parameter	Period of Record	Obs	Median	Mean	Maximum	Minimum	Variance	Std. Dev.	10th	25th	75th	90th
00010 TEMPERATURE, WATER (DEGREES CENTIGRADE)	02/11/71-02/07/89	146	12.	12.521	24.	-1.	50.435	7.102	2.7	7.	19.	22.
00065 STAGE, STREAM (FEET)	06/25/79-05/15/80	6	7.215	6.225	7.4	1.02	6.517	2.553	**	**	**	**
00075 TURBIDITY, HELLIGE (PPM AS SILICON DIOXIDE)	01/06/72-12/13/77	70	16.5	25.393	160.	1.	808.804	28.439	3.05	6.	41.	58.
00076 TURBIDITY, HACH TURBIDIMETER (FORMAZIN TURB. UNIT)	02/09/78-12/05/84	37	9.4	26.895	280.	2.5	2855.314	53.435	4.	6.7	18.5	61.
00094 SPECIFIC CONDUCTANCE, FIELD (UMHOS/CM @ 25C)	12/05/84-02/07/89	3	284.	263.	300.	285.	2587.	50.963	**	**	**	**
00299 OXYGEN, DISSOLVED, ANALYSIS BY PROBE	12/05/84-02/07/89	2	10.3	10.3	10.4	10.2	0.82	0.141	**	**	**	**
00300 OXYGEN, DISSOLVED	02/11/71-12/09/80	143	9.6	9.691	14.1	5.5	3.869	1.967	7.2	8.1	11.2	12.4
00301 OXYGEN, DISSOLVED, PERCENT OF SATURATION	02/11/71-12/05/84	77	85.5	86.544	120.1	62.5	103.861	10.191	73.84	79.75	93.2	100.22
00310 DO, 5 DAY, 20 DEG C	01/06/72-08/12/86	108	2.35	2.444	8.3	0.	2.348	1.532	8.9	1.325	3.	4.31
00325 DO, 0.25M K2CR2O7	12/05/84-06/04/90	3	15.	13.833	24.	2.5	116.583	10.797	**	**	**	**
00400 PH (STANDARD UNITS)	02/11/71-02/07/89	138	7.4	7.464	8.8	6.6	0.152	0.389	7.	7.2	7.7	7.91
00400 CONVERTED PH (STANDARD UNITS)	02/11/71-02/07/89	138	7.4	7.389	8.8	6.6	0.176	0.42	7.	7.2	7.7	7.91
00400 MICRO EQUIVALENTS/LITER OF H+ COMPUTED FROM PH	02/11/71-02/07/89	138	0.04	0.049	0.251	0.002	0.002	0.045	0.012	0.02	0.063	0.1
00403 PH, LAB, STANDARD UNITS	01/06/72-12/09/80	106	7.3	7.3	8.1	6.6	0.108	0.329	6.87	7.	7.6	7.7
00403 CONVERTED PH, LAB, STANDARD UNITS	01/06/72-12/09/80	106	7.3	7.179	8.1	6.6	0.123	0.351	6.87	7.	7.6	7.7
00403 MICRO EQUIVALENTS/LITER OF H+ COMPUTED FROM PH	01/06/72-12/09/80	106	0.05	0.066	0.251	0.008	0.003	0.052	0.02	0.025	0.1	0.136
00500 RESIDUE, TOTAL (MG/L)	01/28/76-12/05/84	53	163.	194.585	564.	86.	9025.799	95.004	130.	137.	208.	318.4
00530 RESIDUE, TOTAL NONFILTRABLE (MG/L)	12/05/84-08/12/86	2	9.	9.	10.	8.	2.	1.414	**	**	**	**
00608 NITROGEN, AMMONIA, DISSOLVED (MG/L AS N)	04/12/86-08/12/86	1	0.12	0.12	0.12	0.12	0.	0.	**	**	**	**
00620 NITRATE NITROGEN, TOTAL (MG/L AS N)	12/05/84-08/12/86	2	1.825	1.825	1.64	0.43	0.732	0.856	**	**	**	**
00625 NITROGEN, KJELDHAL, TOTAL, (MG/L AS N)	08/12/86-08/12/86	1	0.14	0.14	0.14	0.14	0.	0.	**	**	**	**
00630 NITRATE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)	01/06/72-12/09/80	106	1.61	1.656	3.27	0.3	0.455	0.675	0.676	1.115	2.075	2.55
00650 PHOSPHATE, TOTAL (MG/L AS P)	01/06/72-06/12/80	100	0.15	0.2	2.42	0.03	0.074	0.271	0.05	0.09	0.21	0.309
00665 PHOSPHORUS, TOTAL (MG/L AS P)	12/05/84-08/12/86	2	0.055	0.055	0.07	0.04	0.	0.021	**	**	**	**
00666 PHOSPHORUS, DISSOLVED (MG/L AS P)	08/12/86-08/12/86	1	0.02	0.02	0.02	0.02	0.	0.	**	**	**	**
00671 PHOSPHORUS, DISSOLVED ORTHOPHOSPHATE (MG/L AS P)	08/12/86-08/12/86	1	0.02	0.02	0.02	0.02	0.	0.	**	**	**	**
00940 CHLORIDE, TOTAL IN WATER	12/05/84-06/04/90	3	22.	21.667	24.	19.	6.333	2.517	**	**	**	**
31505 COLIFORM, TOT. MPN, CONFIRMED TEST, 35C (TUBE 31506)	01/24/80-06/04/90	15	11000.	14444.	46000.	930.	148639482.857	12191.779	930.	4600.	24000.	32800.
31505 LOG COLIFORM, TOT. MPN, CONFIRMED TEST, 35C (TUBE 31506)	01/24/80-06/04/90	15	4.041	3.956	4.663	2.968	0.263	0.513	2.968	3.663	4.38	4.493
31506 GEOMETRIC MEAN =			9030.988									
31506 QM COLIFORM, TOT. MPN, CONFIRMED TEST, TUBE CONFIG.	01/06/72-12/04/79	94	15000.	33425.851	240000.	930.	3181496430.988	56404.755	2300.	4300.	24000.	110000.
31506 LOG COLIFORM, TOT. MPN, CONFIRMED TEST, TUBE CONFIG.	01/06/72-12/04/79	94	4.176	4.123	5.38	2.968	0.342	0.585	3.362	3.633	4.38	5.841
31506 GEOMETRIC MEAN =			13275.797									
31510 FICAL COLIFORM, MPN, TUBE CONFIGURATION	01/06/72-12/04/79	94	2400.	8837.234	240000.	238.	677823325.601	26035.64	430.	930.	9300.	18800.
31510 LOG FICAL COLIFORM, MPN, TUBE CONFIGURATION	01/06/72-12/04/79	94	3.38	2.464	5.38	2.362	0.37	0.608	2.633	2.968	3.968	4.249
31510 GEOMETRIC MEAN =			2910.867									

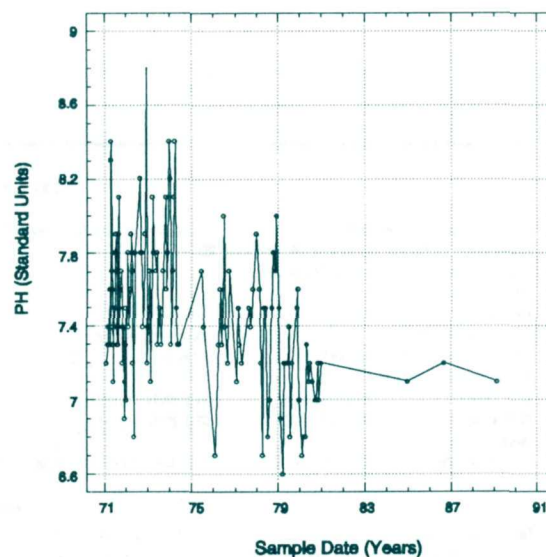
** - less than 9 observations # - Computed with 50% or more of the total observations as values that were half the detection limit p - has a corresponding time series plot

EPA Water Quality Criteria Analysis for Station: ROCR0045

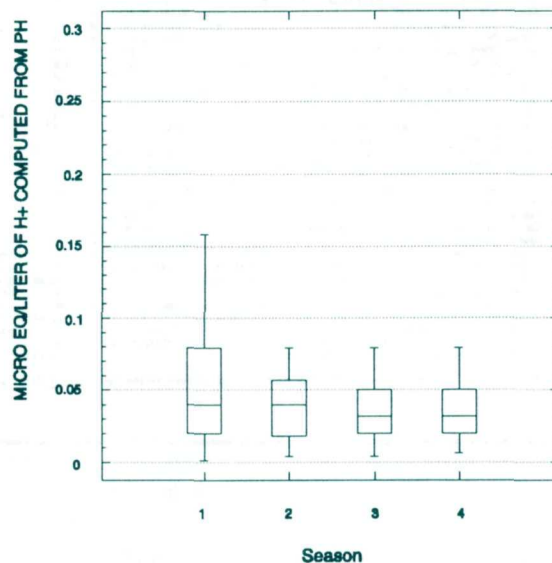
Parameter	Std. Type	Std. Value	Total Obs	Exceed Standard	Prop. Exceeding	10/81- 2/15- Obs	Exceed	Prop.	2/16- 4/15- Obs	Exceed	Prop.	4/16- 6/30- Obs	Exceed	Prop.	7/01- 9/30- Obs	Exceed	Prop.
00299 OXYGEN, DISSOLVED, ANALYSIS BY PROBE	Fresh Acute	4.	2	0	0.00	2	0	0.00									
00300 OXYGEN, DISSOLVED	Fresh Acute	4.	143	0	0.00	45	0	0.00	22	0	0.00	39	0	0.00	37	0	0.00
00400 PH	Other-Hi Lim.	9.	138	0	0.00	44	0	0.00	24	0	0.00	37	0	0.00	33	0	0.00
	Other-Lo Lim.	6.5	138	0	0.00	44	0	0.00	24	0	0.00	37	0	0.00	33	0	0.00
00403 PH, LAB	Other-Hi Lim.	9.	106	0	0.00	34	0	0.00	18	0	0.00	27	0	0.00	27	0	0.00
	Other-Lo Lim.	6.5	106	0	0.00	34	0	0.00	18	0	0.00	27	0	0.00	27	0	0.00
00620 NITRATE NITROGEN, TOTAL AS N	Drinking Water	10.	2	0	0.00	1	0	0.00							1	0	0.00
00940 CHLORIDE, TOTAL IN WATER	Fresh Acute	860.	3	0	0.00	2	0	0.00				1	0	0.00			
31515 FICAL COLIFORM, MPN	Other-Hi Lim.	200.	15	14	0.93	6	5	0.83	1	1	1.00	4	4	1.00	4	4	1.00

Table A. Descriptive water-quality statistics and criteria analysis for Rock Creek Park, Station 45. (D. Tucker).

Station: ROCR0045 Parameter Code: 00400
PH (STANDARD UNITS)



Station: ROCR0045 Parameter Code: 00400
MICRO EQ/LITER OF H⁺ COMPUTED FROM PH



Station: ROCR0045 Parameter Code: 00400
MICRO EQ/LITER OF H⁺ COMPUTED FROM PH

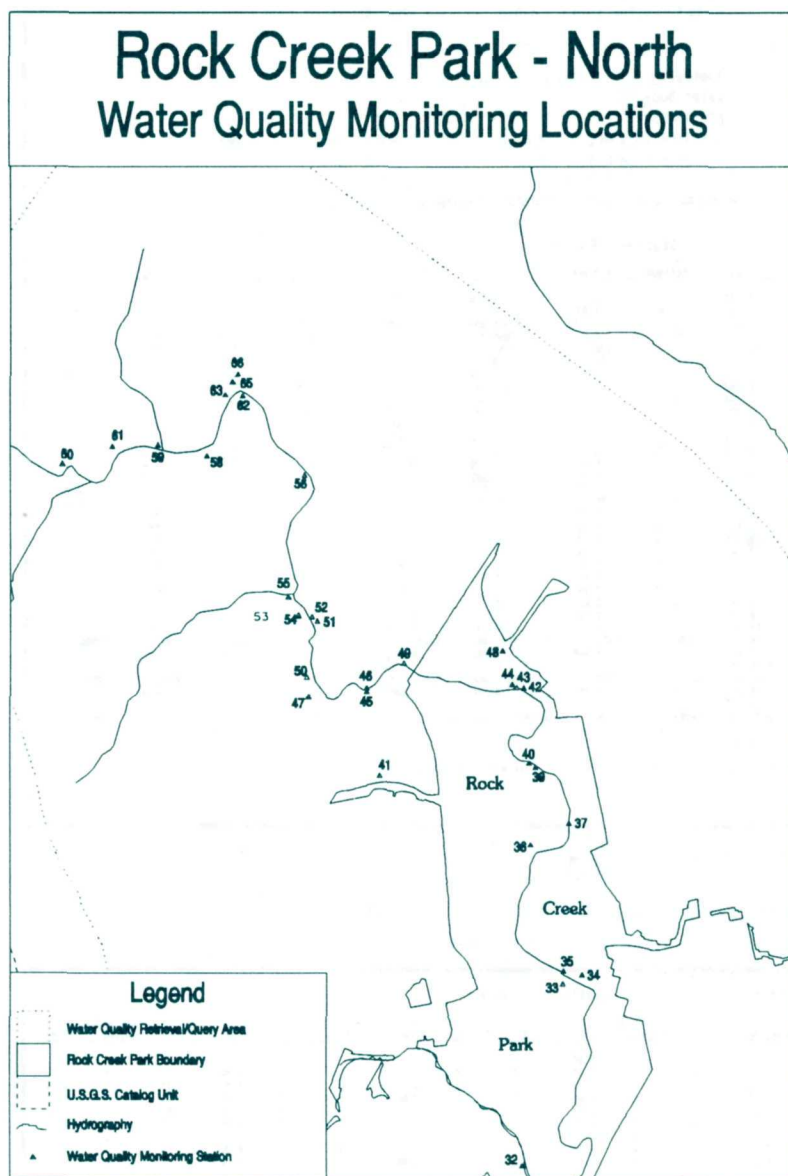
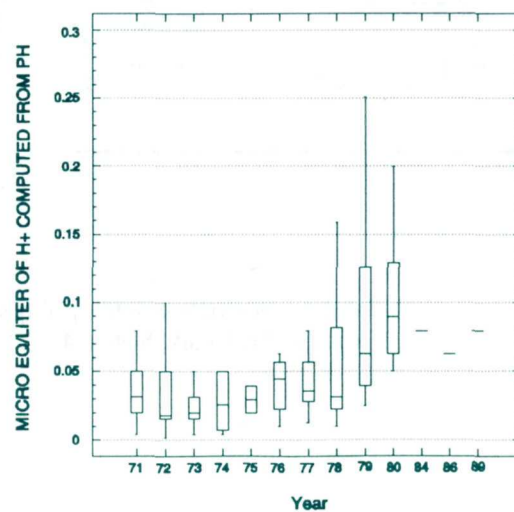


Figure 6. Location map, time-series, and box-and-whiskers plots for Rock Creek Park, Station 45. (D. Tucker).

Flooding Along Bath House Row at Hot Springs National Park

**BY WILLIAM WERRELL
HYDROLOGIST**

The thermal springs of Hot Springs National Park are located along the west side of Hot Springs Mountain. The spring openings are slightly linear for a distance of about 1,000 feet, located low on the east side of a narrow, steep canyon that is the natural stream course for Hot Springs Creek.

Created in 1832 to protect the hot springs, and composed of 4 square miles, the reservation apparently remained in a nearly pristine condition until the 1880s, when a need to develop the area to facilitate public bathing and drinking under sanitary conditions prompted changes. These changes included reservation boundary adjustments to permit private property near the springs, including a strip of land within the canyon, west of Hot Springs Creek. Development included the building of Creek Arch over the natural channel of Hot Springs Creek by the Corps of Engineers (COE), backfilling to the sides of the arch to create level ground, and the establishment of Central Avenue for access. Private business buildings on private land and bath houses, as permitted by government lease near the springs, began to develop.

Hot Springs Creek drains a basin containing a combination of homes and businesses located to the north. Flooding has always been a problem down Central Avenue. The Creek Arch capacity to convey flood waters is exceeded every 2 to 3 years. When the Creek Arch is flowing full, extra water flows down Central Avenue. When the street is full, flooding of both businesses and bath houses occurs.

The area is more flood-prone now than in the past. Over the years, resurfacing of Central Avenue has reduced the cross-sectional area available to convey water. Also, basin development has resulted in impermeable surfaces (streets,

parking lots, etc.), that prevent rainfall infiltration. This causes increased surface water runoff with higher flood heights.

Since 1988, the City of Hot Springs has been working with COE in studying the flooding problem. The National Park Service (NPS) has cooperated with these efforts. A 1990 COE report presents and evaluates a series of options to provide an added degree of flood protection. Modification of the Central Avenue area was not recommended because of (1) insufficient room for an open channel; (2) costs associated with city utilities; (3) business owners' objections to street construction activities that might cause loss of business; and (4) the historic designation of the Creek Arch, which may preclude any modification. The recommended alternative, therefore, was to construct a tunnel under West Mountain, in the park, to convey floodwaters from the basin to below town. A detailed plan for test well drilling was prepared by COE in consultation with NPS to ensure that potential tunnel construction impacts to thermal features would be minimized. However, it was realized that there remained a finite chance that the thermal springs could be affected.

A Special-Use Permit to conduct test well drilling in support of tunnel planning was denied by the Southwest Regional Director late in 1993. Major considerations in denying the permit were the general inappropriateness of tunnel construction in a national park and the potential for the tunnel to impact thermal ground water flow to the springs. The NPS Director did not want to deny the Special-Use Permit for test well drilling without also forwarding feasible alternatives for flood control. Thus, NPS management was directed to review the project and provide alternatives. In response, a paper was prepared by Regional and WRD staff presenting alternatives that included (1) the establishment of a flood warning system; and (2) modification of Central Avenue by lowering the street level and placement of a culvert under the street and/or modification of the Creek Arch (Figure 7). A premise of the latter is that only loose, alluvial material will be removed and that adequate cross-sectional area for a flood channel can be provided. Removal of bedrock could impact hot springs flow. It is believed this can be accomplished by closely working with construction entities to keep the street open and through close coordination with the State Historic Preservation Officer regarding the arch.

The NPS paper was presented to COE, Arkansas congressional representatives, and the City of Hot Springs. With tunnel construction no longer a feasible flood-control alternative, it is expected that the NPS alternatives will be seriously considered as part of a re-evaluation of the flooding issue.

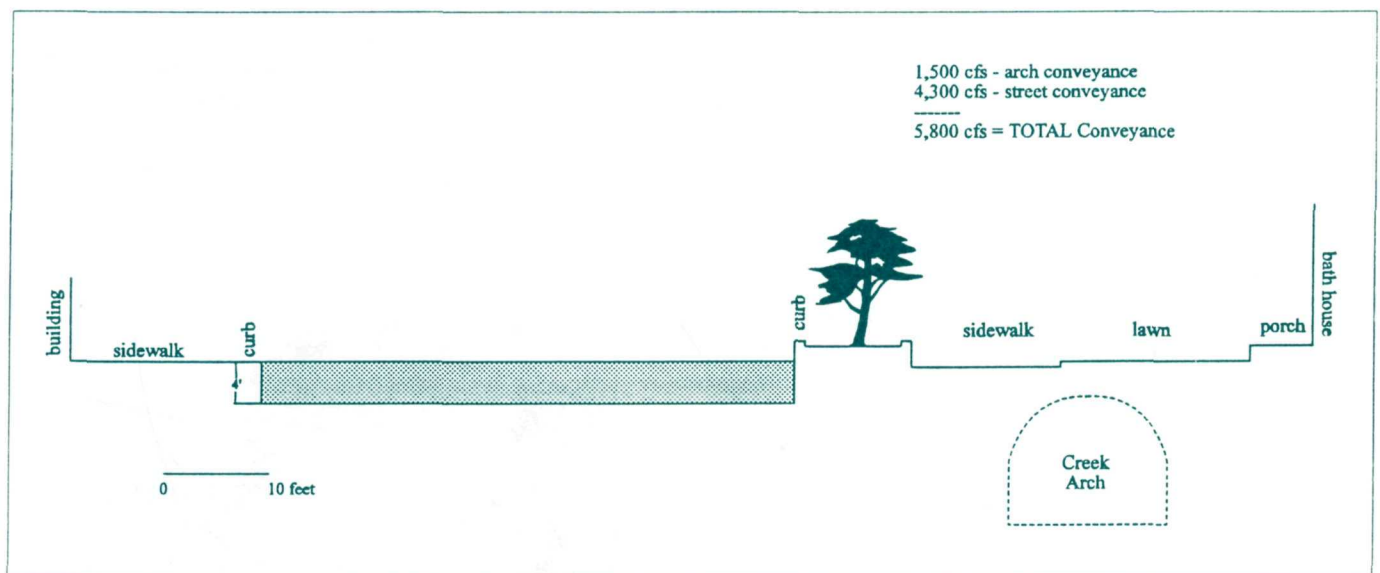


Figure 7. Discharge capacities with the street lowered to a four-foot depth in Zone 2, Hot Springs NP (J. Nolan).

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

ALASKA REGION

Office of the Division Chief



Katmai National Park and Preserve

- Reviewed draft Environmental Impact Statement for the proposed Katmai Research Drilling Project and coordinated and prepared the Natural Resources Directorate's comments on that proposal

Planning and Evaluation Branch

Bering Land Bridge National Preserve

- Reviewed Resource Management Plan



Denali National Park and Preserve

- Provided review and input for South Slope Development Concept Plan

Gates of the Arctic National Park and Preserve

- Reviewed Resource Management Plan
- Reviewed Wetlands Statement of Findings (Bettles Field Storage Yard)

Katmai National Park and Preserve

- Conducted water resources site scoping visit
- Reviewed Resource Management Plan
- Reviewed and provided input into Brook's Camp Development Concept Plan

Lake Clark National Park and Preserve

- Reviewed Resource Management Plan

Sitka National Historical Park

- Reviewed Resource Management Plan

Water Operations Branch

Bering Land Bridge National Preserve

- Reviewed water quality monitoring needs related to placer mining in Goodhope and Serpentine river drainages

Cape Krusenstern National Monument

- Assisted Alaska Regional Office in conducting macroinvertebrate sampling on three rivers crossed by Red Dog Mine haul road

Denali National Park and Preserve

- Reviewed status of water quality monitoring programs and assessed hydrologic hazards of alternative sites for rest area development near Toklat River
- Reviewed hydrogeology of the entrance area and provided advice on location for future water supply wells
- Evaluated hydrologic hazards in the vicinity of a proposed visitor center at the Toklat River crossing
- Assisted Alaska Regional Office in preparation of a report describing hydrologic and hydraulic characteristics of Moose Creek
- Provided advice to the Denver Service Center regarding flood hazards at several candidate locations for a proposed rest stop facility

Glacier Bay National Park and Preserve

- Provided written advice and material on how to digitally encode park hydrography to ensure compatibility with RF3 and other national data bases

Katmai National Park and Preserve

- Reviewed and commented on the Katmai research drilling Environmental Impact Statement for Alaska Region
- Performed flood hazard reconnaissance near the community of King Salmon
- Provided assistance on oil spill, mining, Natural Resource Damage Assessment, and other contaminants issues

Kenai Fjords National Park

- Performed an inspection of a bridge that has experienced rapid accumulation of sediment

Lake Clark National Park and Preserve

- Reviewed water quality project statement
- Provided assistance on oil spill, mining, Natural Resource Damage Assessment, and other contaminants issues

Wrangell-Saint Elias National Park and Preserve

- Reviewed environmental hazards in McCarthy and Kennicott and potential for surface and ground water contamination from past mining and milling activities
- Evaluated potential impacts to the hydrologic resources from abandoned mine site at Kennicott
- Identified basic hydrogeology and potential threats to drinking water supplies in the McCarthy area

Multi-Park

- Provided data interpretation information for lead and zinc residues to Alaska Regional Office Resource Management Specialist
- Conducted a special training session for Natural Resource Specialists in Anchorage



MID-ATLANTIC REGION

Planning and Evaluation Branch



Allegheny Portage Railroad National Historical Site

- Reviewed Resource Management Plan

Appomattox Courthouse National Historic Park

- Reviewed Resource Management Plan

Bluestone National Scenic River and Gauley River National Recreation Area

- Reviewed General Management Plan

Colonial National Historic Park

- Assisted in preparation of Water Resources Management Plan
- Reviewed Resource Management Plan

Delaware Water Gap National Recreation Area

- Reviewed Resource Management Plan

Fort McHenry National Monument

- Reviewed Resource Management Plan

Friendship Hill National Historic Site

- Reviewed Resource Management Plan

Gettysburg National Military Park

- Reviewed Resource Management Plan

Hopewell Furnace National Historic Site

- Provided input into the development of a Water Resources Management Plan
- Reviewed Resource Management Plan

Richmond National Battlefield Park

- Reviewed General Management Plan

Thomas Stone National Historical Site

- Reviewed Resource Management Plan

Upper Delaware National Scenic and Recreational River

- Reviewed Resource Management Plan

Valley Forge National Historic Park

- Reviewed and revised Project Statement
- Reviewed General Management Plan

Multi-Park

- Presented Water Resources Scoping Workshop for Colonial National Historic Park, Delaware Water Gap National Recreation Area, Fredericksburg and Spotsylvania National Military Park, Hopewell Furnace National Historical Site, Petersburg National Battlefield, Richmond National Battlefield Park, Upper Delaware National Scenic and Recreational River, and Valley Forge National Historic Park

Water Rights Branch

Colonial National Historic Park

- Assisted in developing Water Resources Management Plan

Water Operations Branch

Colonial National Historic Park

- Reviewed and commented on proposal to investigate water quality of the shallow ground water system and identify possible sources of contamination
- Provided review and comment on the Colonial National Historical Park Water Resources Management Plan
- Reviewed and commented on Round One Remedial Investigations Report for sites 9, 11, 12, 16-19, and 21 at the Naval Weapons Station Yorktown, Virginia, near the park
- Performed a STORET data retrieval of ground water monitoring locations to support a joint project between the park and Virginia Institute of Marine Science

Delaware Water Gap National Recreation Area

- Reviewed report of U.S. Geological Survey dye tracer study on Delaware River
- Co-authored Request for Proposal to link a water quality/watershed model with GIS, reviewed responses, and helped modify and oversee project
- Converted hydrologic and other park digital data from SAGIS to ARC/INFO

Fort Necessity National Battlefield

- Ordered and reviewed references and conducted field assessment to assist in selecting a test well drilling site

Fredericksburg and Spotsylvania National Military Park

- Assessed stream erosion, watershed management, and urban impacts on stream channels and water quality
- Provided written advice and recommendations on formatting the park's water quality data base to be compatible with the National Park Service Water Quality Data Management System (under development) and the Environmental Protection Agency's STORET system

George Washington Birthplace National Monument

- Evaluated proposed cogeneration plant and ash landfill and assessed possibility of hydrologic impact on the park's water supply and wetlands
- Analyzed potential impacts to the park from nearby power plant water withdrawals and fly ash landfill

Gettysburg National Military Park

- Provided review and comment on Resource Management Plan

Richmond National Battlefield Park

- Provided comments on the draft report "Assessment of an Urban Landfill on Tributary Water Quality: Fort Darling Unit of the Richmond National Battlefield Park"

Valley Forge National Historic Park

- Assisted with the development of a U.S. Geological Survey study plan to investigate ground water contamination investigation

Multi-Park

- Reviewed and commented on State of Virginia's antidegradation program

MIDWEST REGION

Planning and Evaluation Branch



Saint Croix National Scenic Riverway

- Provided Water Resources Management Plan oversight
- Reviewed Resource Management Plan

Voyageurs National Park

- Reviewed Wetlands Statement of Findings (Route 1)

Water Rights Branch

Missouri National Recreation River

- Reviewed the Lewis and Clark Rural Water Supply Feasibility Evaluation proposal

Water Operations Branch

Cuyahoga Valley National Recreation Area

- Provided comments on a draft report entitled "Scope of Work and Evaluation Criteria for the Benthic Macroinvertebrate Inventory in the Tributaries of the Cuyahoga Valley"

Indiana Dunes National Lakeshore

- Made arrangements for the loan of water monitoring equipment for researching the restoration of the hydrology of Great Marsh; inspected field sites
- Provided data interpretation on contaminants at Long Lake
- Assisted park staff in developing ideas for contaminants studies
- Participated in an interagency meeting on research options for joint work with the U.S. Fish and Wildlife Service

Mississippi National River and Recreation Area

- Provided an analysis of contaminants levels in sediments

Niobrara-Missouri National Scenic Riverways

- Provided reference material on bioengineering applied to streambank protection
- Requested data from U.S. Geological Survey gaging stations, cross-sections, and stage/discharge

- tables to verify boundary delineation efforts
- Evaluated the location of preliminary boundaries delineated on aerial photographs

Ozark National Scenic River

- Reviewed water quality monitoring program
- Reviewed Sole Source Aquifer Application and Environmental Protection Agency denial of application
- Provided hydrogeological analysis of potential impacts of underground mining in areas adjacent to the park

Pipestone National Monument

- Provided advice to the park regarding the likely effects of proposed changes in a drainage ditch that collects water from agricultural lands and a small municipality and then flows through the park

Saint Croix National Scenic Riverway

- Reviewed Wisconsin Pollutant Discharge Elimination System permit for Holiday gas station cleanup
- Provided STORET retrieval and interpretation of hardness data on Saint Croix River related to the zebra mussel

Multi-Park

- Provided Contaminants Encyclopedia sections on Antimycin A, Bayluscide, Rotenone, and other aquatic pest control compounds to the Great Lakes Coordinator
- Provided Contaminants Encyclopedia sections and lengthy comments on draft Great Lakes Water Quality Guidance
- Provided Contaminants Encyclopedia section on the relationship between mercury concentration and nutrients; organic materials; TOC; DOC; and other eutrophication-related factors; hardness; and phosphates
- Reviewed the Lake Superior long-term inventory and monitoring proposal



NATIONAL CAPITAL REGION

Office of the Division Chief



Rock Creek Park

- Assisted park management and the U.S. Geological Survey with the evaluation of enhancing and/or relocating a Rock Creek gaging station for educational purposes

Planning and Evaluation Branch

Chesapeake and Ohio Canal National Historic Park

- Provided review of a Memorandum of Understanding between the park and the State of Maryland regarding wetlands compliance for routine maintenance of structures in wetlands
- Advised park on strategy for establishing a wetlands mitigation bank to compensate for unavoidable wetland impacts associated with maintenance and construction at the park

Harpers Ferry National Historic Park

- Reviewed Resource Management Plan

Manassas National Battlefield Park

- Coordinated technical assistance (provided by Lee Pelej of Environmental Protection Agency) regarding alternatives for managing wetlands

Monocacy National Battlefield

- Reviewed Resource Management Plan

Rock Creek Park

- Provided assistance in identifying causes for wetland degradation and advised in reformulating project statements for addressing this issue

Water Operations Branch

Catoctin Mountain Park

- Assessed stream erosion and watershed management on stream channels and provided monitoring recommendations

George Washington Memorial Parkway

- Provided recommendations on proper experimental design, field work protocols that include the use of fat bags, selection of target species and sites, and laboratory methods to be used in a contaminants study being planned for the Dyke Marsh area

Greenbelt Park

- Evaluated stream erosion, channel structures, and urban impacts on stream channels and provided recommendations

Manassas National Battlefield Park

- Reviewed sediment sampling project funded by the Water Resources Division

National Capital Parks-East

- Coordinated and provided review and comment on Site Investigations and Remedial Assessment Plans prepared by Washington Gas and Electric for contaminated property

Prince William Forest Park

- Inspected the watershed and assessed the possible influences of encroaching urbanization on the water resources of the park
- Reviewed ground water quality information related to a county landfill and assessed threats to park springs, streams, and water supply wells

NORTH ATLANTIC REGION

Planning and Evaluation Branch



Acadia National Park

- Initiated Water Resources Management Planning activities
- Revised Beach Monitoring Protocols

Minute Man National Historic Park

- Coordinated technical assistance (provided by Carl Melberg of U.S. Fish and Wildlife Service) regarding alignment of and wetlands compliance for a proposed bike path

Morristown National Historic Park

- Published Water Resources Scoping Report
- Prepared Water Quality Standards Revision Petition
- Reviewed Great Swamp Advisory Committee Report

Saint-Gaudens National Historical Site

- Reviewed General Management Plan

Saugus Iron Works National Historical Site

- Coordinated technical assistance (provided by Carl Melberg of U.S. Fish and Wildlife Service) regarding alternatives for reconstruction of the historic harbor facilities that would impact wetlands

Water Rights Branch

Fire Island National Seashore

- Assisted with Water Resources Scoping Report

Water Operations Branch

Adams National Historical Site

- Retrieved daily and peak values for Furnace Brook in support of Denver Service Center project

Cape Cod National Seashore

- Continued investigation of potential impact of ground water withdrawals on freshwater discharges to wetlands
- Assisted in defining a study plan and scope of work for a Water Resources Division-funded project to investigate the hydrogeology of kettle ponds
- Project coordination for a Water Resources Division-funded project investigating the paleo-limnology of Ryder Pond

Morristown National Historic Park

- Reviewed draft Water Resources Scoping Report
- Investigated a potential hazardous material site and evaluated the possible threat to park resources

Saratoga National Historic Park

- Investigated a potential hazardous material site and evaluated the possible threat to park resources

Saugus Iron Works National Historical Site

- Responded in writing to three technical assistance requests for information related to contaminants
- Performed STORET retrieval of sediment and heavy metals data in support of dredging project

PACIFIC NORTHWEST REGION

Planning and Evaluation Branch



City of Rocks National Reserve

- Reviewed Development Concept Plan

Fort Vancouver National Historical Site

- Reviewed Resource Management Plan

Nez Perce National Historic Park

- Reviewed Resource Management Plan

North Cascades National Park

- Reviewed Resource Management Plan

Olympic National Park

- Provided wetlands policy advice on two issues that the park is concerned with at the Hoh Rain Forest: (1) parking lot expansion and (2) effects of a "created" wetland on large Sitka spruce trees near the visitor center

Oregon Caves National Monument

- Reviewed Resource Management Plan

Regionwide

- Gave lectures on (1) WRD programs and services available to parks and (2) wetlands and floodplains at the Region's Resource Management Workshop in Corvallis, Oregon
- Taught a 3-day wetlands training course for the region at Olympic National Park

Water Rights Branch

City of Rocks National Reserve

- Filed water rights claims for Snake River adjudication

Crater Lake National Park

- Conducted Klamath adjudication studies
- Coordinated with Solicitor's Office and Department of Justice attorneys, as well as technical specialists from other agencies, to ensure consistent claims for federal water rights

Craters of the Moon National Monument

- Reviewed and submitted objections to the Idaho Department of Water Resources Director's Report of water rights claims for Snake River Basin adjudication

Mount Rainier National Park

- Advised park on water use for watershed rehabilitation
- Assisted park by seeking legal advice from the Regional Solicitor's Office concerning water use for revegetation project

San Juan Island National Historical Park

- Began implementation of action plan to protect water rights and water resources

Water Operations Branch

City of Rocks National Reserve

- Provided advice on siting and construction for a water supply well near the entrance to the park

Crater Lake National Park

- Reviewed Crater Lake limnological studies report
- Reviewed geology and hydrology references and conducted field assessment to assist in selecting a test well drilling site in the panhandle area of the park

Craters of the Moon National Monument

- Investigated abandoned mine tailings as potential HAZMAT site and evaluated possible threats to park resources
- Completed a preliminary assessment and a detailed report for an abandoned mine site

Hagerman Fossil Beds National Monument

- Attended workshop to address the problem of recurring landslides that threaten the fossil resources of the monument
- Assisted park in developing a Natural Resource Preservation Program proposal for the monument
- Conducted seepage study of irrigation ditch and holding ponds

Lake Chelan National Recreation Area

- Provided data interpretation information related to asphalt issues

North Cascades National Park

- Provided advice and materials on how to digitally encode park hydrography to ensure compatibility with RF3 and other national data bases

Olympic National Park

- Assisted in analysis of issues associated with the restoration of Elwha River ecosystem
- Assisted in implementation of Lake Ozette project
- Provided advice and materials on how to digitally encode park hydrography to ensure compatibility with RF3 and other national data bases
- Provided locations of U.S. Geological Survey Water Quality Monitoring stations in and near the park in a GIS-compatible format

Oregon Caves National Monument

- Provided project coordination for Water Resources Division-funded study of cave water quality

San Juan Island National Historical Park

- Completed field work necessary for a water resources inventory and prepared a cursory report on ground water development potential

ROCKY MOUNTAIN REGION

Planning and Evaluation Branch



Bent's Old Fort National Historical Site

- Reviewed Resource Management Plan

Bighorn Canyon National Recreation Area

- Initiated Water Resources Management Plan and Scoping Report

Bryce Canyon National Park

- Participated in Resource Management Plan Workshop

Dinosaur National Monument

- Prepared a final restoration plan for the Hog Canyon riparian/wetland project
- Assisted in developing a proposal and getting Bureau of Reclamation funding for a study entitled "Comparative Ecosystem Dynamics in Riparian Zones along Regulated and Unregulated Rivers, the Green and Yampa"

Grand Teton National Park and John D. Rockefeller Jr. Memorial Parkway

- Reviewed Road Material Source Environmental Assessment
- Provided extensive technical assistance regarding a Section 404 enforcement action by the Environmental Protection Agency against NPS for violations at the Snake River Borrow Pit

Rocky Mountain National Park

- Conducted a site visit to Lily Lake to locate proposed visitor access facilities that would not impact wetlands
- Provided wetland technical assistance related to a concessioner-operated horse corral adjacent to Glacier Creek

Yellowstone National Park

- Provided technical assistance in evaluating proposed New World Mine
- Reviewed Wetlands Statement of Findings (East Entrance Road)

Zion National Park

- Reviewed and provided input into Development Concept Plan (Headquarters Area)

Regionwide/Denver Service Center

- Joined representatives from U.S. Fish and Wildlife Service, Environmental Protection Agency, Soil Conservation Service, and Corps of Engineers in presenting a 2-day workshop on wetlands compliance (Denver) and a 3-day wetlands delineation training course (Wyoming/Grand Tetons)

Multi-Park

- Presented Water Resources Scoping Workshop for Dinosaur National Monument, Curecanti National Recreation Area, Grant-Kohrs Ranch National Historical Site, and Yellowstone National Park

Water Rights Branch

Bent's Old Fort National Historical Site

- Monitored status of conditional water rights

Big Hole National Battlefield

- Negotiated reserved water rights compact for Montana Basin 41D adjudication

Bighorn Canyon National Recreation Area

- Assisted park in application of court decree to water diversion needs
- Assisted with Natural Resource Management Plan
- Negotiated with Reserved Water Rights Compact Commission

Black Canyon of the Gunnison National Monument

- Assisted park and region with negotiations for contract and in implementation of interim flow delivery contract
- Conducted studies to quantify reserved water rights
- Coordinated interim flow releases according to preliminary Aspinall Flow Delivery Contract

Canyonlands National Park

- Monitored progress of water rights claim

Capitol Reef National Park

- Assisted with development of water supply well
- Assisted with Water Resources Management Plan
- Began collection of hydrology data to quantify reserved water rights
- Coordinated with contractor for review of adjudicated water rights claims

Florissant Fossil Beds National Monument

- Assembled materials for litigation plan to obtain water rights for a new visitor center
- Obtained permit from the State Engineer for the "A-frame" well
- Provided technical review of Plan for Augmentation
- Provided technical review of Temporary Water Supply Plan and state-imposed conditions to the plan

Glacier National Park

- Assisted with special use permit for West Glacier
- Conducted multiple adjudication studies
- Negotiated reserved water rights compact for Montana adjudications in basins 76LJ, 76I, 40T, 40F, 41L, and 41M

Glen Canyon National Recreation Area

- Monitored progress of Colorado River adjudication

Grand Teton National Park

- Completed hydrologist summary with recommendations for adjusting acquired water rights

Grant-Kohrs Ranch National Historical Site

- Monitored progress of Montana adjudication for Basin 76G
- Provided information to legal counsel for Westside Objectors

Great Sand Dunes National Monument

- Assisted with development of research management strategy
- Assisted with hydrologic data collection program

Little Bighorn Battlefield National Monument

- Negotiated with Reserved Water Rights Compact Commission

Mesa Verde National Park

- Assisted with water rights issues for West Mancos water supply system
- Monitored progress of adjudication for Water Division 7

Pipe Spring National Monument

- Completed spring decline study

Rocky Mountain National Park

- Assisted with the preparation of exhibits and oral arguments in support of Motion for Summary Judgment
- Assisted with study to determine importance of water/riparian vegetation to visitor experience
- Briefed new superintendent on status of reserved water rights issues
- Conducted adjudication study for Water Division 1
- Reviewed water rights filings prepared by park
- Reviewed weather modification proposal and assessed water rights implications

Yellowstone National Park

- Assisted House Subcommittee on Mining and Energy in developing technical language for Old Faithful Protection Act
- Assessed water rights status of the proposed New World Mine
- Assisted with implementation of monitoring at Reese Creek
- Continued tracking of non-National Park Service claims and objections in Montana adjudication basin 43B
- Coordinated technical team on ground water and geothermal resource protection
- Negotiated reserved water rights compact for Montana adjudication basins 43B, 41H, and 41F

Zion National Park

- Assessed water rights and prepared objections for Book 2, Virgin River adjudication
- Assisted Department of Justice with presentation to the State Engineer, Attorney General's Office, and Washington County Water Conservation District regarding reserved water rights at the park
- Assisted with water rights filing for Taylor Creek well
- Conducted adjudication studies for Virgin River adjudication
- Conducted studies on Kolob Reservoir water releases
- Negotiated with State of Utah for Washington County
- Prepared report on age and origin of water issuing from springs in Hanging Gardens
- Prepared report on precipitation-runoff relationships for the Upper Virgin River Basin
- Prepared report on stochastic modeling and daily-flow generation on the North Fork Virgin River

Multi-Park

- Responded to temporary preliminary decrees for Montana's parks
- Reviewed Colorado Water Court resumes
- Reviewed and commented on aspects of state water code pertaining to protection of instream flows (Colorado)
- Participated in Virgin River Interior Coordinating Committee meetings

Water Operations Branch

Arches National Park

- Prepared hydrogeological analysis of Atlas Uranium Mill tailings near Moab, Utah

Canyonlands National Park

- Assisted in development of park research and information needs plan
- Assisted in planning aquatic macroinvertebrate biomonitoring studies for the Green River, Colorado River, and various freshwater springs
- Reviewed water quality inventory and monitoring plan and analyzed water quality data obtained from the park and state of Utah
- Completed a topographic survey and floodplain analysis for Lathrop Canyon
- Completed a topographic survey and floodplain analysis for Salt Creek Drainage

Capitol Reef National Park

- Prepared scope of work, bid documents, and coordinated contracting for reconstruction of a water supply well; supervised construction and conducted testing of the well
- Reviewed tinaja wetland project proposal
- Reviewed water quality data from new supply well and compared results with data from Fremont River
- Prepared analysis of ground water quality for potable purposes

Curecanti National Recreation Area

- Reviewed current water quality monitoring program and made recommendations regarding changes needed to address emerging water quality issues
- Investigated channel avulsion of Gunnison River above Blue Mesa Reservoir and prepared briefing paper on preliminary observations

Dinosaur National Monument

- Conducted riparian area restoration project in Hog Canyon
- Reviewed and commented on project proposal for investigation of effects of fluctuating streamflow on riparian vegetation
- Reviewed and commented on project proposal for investigation of geomorphic processes
- Completed Echo Park floodplain analysis
- Participated in a paleoflood survey of Yampa Canyon

Florissant Fossil Beds National Monument

- Requested from the State of Colorado the "Rules and Regulations for Water Well Construction for Drillers and Contractors" and determined appropriate conditions for new ground water supply at the A-frame residence
- Evaluated options for improving the potable water source for seasonal quarters

Glacier National Park

- Completed topographic survey and channel-modification analysis for Divide Creek

Glen Canyon National Recreation Area

- Attended meeting on interagency long-term monitoring and research at Lake Powell and provided input on draft plan
- Amended cooperative agreement with USGS to implement water resources inventory and monitoring project
- Assisted in the development and technical review of study proposals for a WRD-funded project on trace elements
- Participated in two interagency meetings to coordinate efforts in studying metallic contaminants (trace elements) in Lake Powell

Grant-Kohrs Ranch National Historical Site

- Responded in writing to five requests on the extensive contaminants projects being done as part of a natural resource damage-assessment

Pipe Spring National Monument

- Investigated the recent collapse of the National Park Service water supply well and the effects on the ground water resources

Rocky Mountain National Park

- Provided advice on possible water quality impacts of Glacier Creek livery operation
- Initiated a program to monitor and evaluate potential changes in long-term snowfall caused by cloud seeding
- Reviewed the potential impact of a well at the Kawuneeche Housing Area upon nearby private water sources

Wind Cave National Park

- Reviewed and developed recommendations for future management of a water collection and distribution system located in a detached unit of the park
- Completed topographic survey and floodplain analysis for Cave Creek Canyon

Yellowstone National Park

- Conducted water quality sampling at Bridge Bay marina
- Assisted in survey of wetland area near Tangled Creek
- Reviewed and commented on draft Resource Management Plan

- Provided analysis of possible hydrogeologic impacts from the New World Mine near Cooke City and toured site
- Performed survey of Soda Butte Creek to be used in an inundation-frequency analysis
- Surveyed the road crossing area of Tangled Creek to assist in the design of the new park road
- Provided advice regarding the potential for erosion of an old dump site located along Trout Creek in the Hayden Valley

Zion National Park

- Completed topographic survey and floodplain analysis of concessionaire site

Multi-Park

- Reviewed the Draft Supplement to the 1980 Final Environmental Statement for the Animas-La Plata Project, Colorado and New Mexico (DES-92/0041)

SOUTHEAST REGION

Planning and Evaluation Branch



Big Cypress National Preserve

- Participated in Water Resources Management Plan Scoping Workshop
- Reviewed Oil Exploration Environmental Assessment for Shell Western Exploration and Production, Inc.

Big South Fork National River and Recreation Area

- Provided Water Resources Management Plan Project oversight

Congaree Swamp National Monument

- Initiated Water Resources Management Planning activities

Cumberland Island National Seashore

- Reviewed Resource Management Plan

Everglades National Park

- Reviewed Resource Management Plan

Natchez Trace Parkway

- Reviewed Resource Management Plan

Obed Wild and Scenic River

- Provided Technical Assistance in development of General Management Plan
- Reviewed Resource Management Plan

Russell Cave National Monument

- Reviewed Resource Management Plan

Virgin Islands National Park

- Presented Water Resources Issues Briefing for Water Operations Branch/Colorado State University

Water Rights Branch

Cape Hatteras National Seashore

- Assisted in developing data-collection programs with the State of North Carolina and Cape Hatteras Water Association
- Continued North Carolina State University investigation on relationship of vegetation to the hydrologic system

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

- Conducted scoping of water development issue

Water Operations Branch

Big South Fork National River and Recreation Area

- Evaluated erosion and watershed conditions and identified back country roads and trails causing upland erosion and sedimentation



Blue Ridge Parkway

- Performed general STORET retrieval for two areas along the parkway in support of the Region's Water Resources Program Manager's water quality training program at the park

Cape Hatteras National Seashore

- Provided technical assistance to the Buxton Woods wellfield issue
- Reviewed and commented on proposals for additional ground water investigations
- Conducted field investigations of surface water drainage patterns and hydrogeology
- Provided assistance regarding the potential for impacts to water quality in the shallow ground water system from septic field leachate

Cape Lookout National Seashore

- Provided assistance regarding the potential for impacts to water quality in the shallow ground water system from septic field leachate

Fort Sumter National Monument

- Provided recommendations to the Region's Water Resources Program Manager on laboratory analysis that should be performed at hazardous waste sites in Charleston near the park

Great Smoky Mountains National Park

- Reviewed and commented on proposed scope of work for environmental review in preparation for an Environmental Impact Statement for Foothills Parkway

Kennesaw Mountain National Battlefield Park

- Assessed erosion and watershed conditions and identified urbanization affecting stream channel stability and water quality

Mammoth Cave National Park

- Provided assistance to staff in developing a study plan for biomonitoring surface rivers

Russell Cave National Monument

- Inspected channel erosion that has recently occurred; participated in a meeting with park and region staff and members of the Corps of Engineers

Virgin Islands National Park

- Provided oversight of GIS-based soil-erosion modeling project and compiled status report on modeling and gaging efforts
- Provided WRD review of water resources in the draft Natural Resource Management Plan
- Reviewed Island Resources Foundation proposal to the United Nation's Environment Program/Caribbean Environment Program on best management practices for land-use development



SOUTHWEST REGION

Planning and Evaluation Branch



Bandelier National Monument

- Reviewed Resource Management Plan

Big Bend National Park

- Initiated Water Resources Management Planning activities

Carlsbad Caverns National Park

- Provided technical assistance to the Denver Service Center (Central Team) as part of the General Management Plan process for the park

Chickasaw National Recreation Area

- Reviewed Resource Management Plan

El Morro National Monument

- Reviewed Resource Management Plan

Jean Lafitte National Historic Park

- Reviewed General Management Plan
- Provided technical review and comment on the scope of work for applying the U.S. Fish and Wildlife Service's coastal ecological landscape spatial simulation model to the Barataria Unit

Padre Island National Seashore

- Reviewed draft development plans and a letter to the Corps of Engineers from the Southwest Regional Director requesting wetlands technical assistance at Bird Island Basin

Palo Alto Battlefield National Historical Site

- Reviewed Resource Management Plan

Pea Ridge National Military Park

- Reviewed Resource Management Plan

Pecos National Historical Park

- Revised General Management Plan draft

Miscellaneous

- Reviewed Texas Water Quality Standards Report

Water Rights Branch

Aztec Ruins National Monument

- Researched water rights

Bandelier National Monument

- Researched water rights

Capulin Volcano National Monument

- Began preparation of summary of water rights and alternative actions to protect rights

Chickasaw National Recreation Area

- Assisted with Resource Management Plan
- Began investigating feasibility of repairing or replacing the Vendome well and prepared Statement of Work

Hubbell Trading Post National Historical Site

- Monitored progress of adjudication for Little Colorado River

Pecos National Historical Park

- Researched Grist Mill and acequia water rights issues
- Assisted with General Management Plan

Petroglyph National Monument

- Assisted with General Management Plan

San Antonio Missions National Historical Park

- Summarized water rights and land-ownership data for acequia

Sunset Crater Volcano National Monument

- Monitored progress of Little Colorado River adjudication

Walnut Canyon National Monument

- Conducted Little Colorado River adjudication study
- Monitored progress of Little Colorado River Basin adjudication

Wupatki National Monument

- Monitored progress of Little Colorado River adjudication

Water Operations Branch

Amistad National Recreation Area

- Attended meetings related to Dryden landfill; reviewed draft settlement agreement and scope of

work between Chem Waste, Inc., and National Park Service for off-site inventory and monitoring; and performed technical analysis of potential impacts from proposed landfill

Bandelier National Monument

- Assisted in developing interagency agreement between National Park Service and U.S. Geological Survey for establishing fixed-station National Water Quality Assessment water quality monitoring site on the Rito de los Frijoles

Big Bend National Park

- Computed discharge for 1.5 years of the Oak Spring gaging station record; prepared an instruction sheet for park personnel use to improve data collection

Buffalo National River

- Attended a Water Resources Division-sponsored Stream Management Workshop on river dynamics and erosion control; appraised water resource issues in the Buffalo River watershed
- Assembled well data and consulted with Denver Service Center regarding five test wells drilled in the 1970s at Tyler Bend
- Reviewed Challenge Cost-Share program project application

Chickasaw National Recreation Area

- Provided advice to the Denver Service Center regarding flood hazard along Travertine Creek
- Attended a meeting of Environmental Protection Agency representatives who work with the Wellhead Protection Program in several states; lead a tour of the park springs

Hot Springs National Park

- Provided technical assistance in support of flood-control planning for park; assisted in preparing a technical report on flood control alternatives

Pecos National Historical Park

- Responded in writing to nine technical assistance requests for information related to contaminants, including detailed analyses of fish contaminants data

Petroglyph National Monument

- Evaluated storm-drainage reports and suggested a plan of action for storm-drainage management
- Assisted park staff in identifying current priorities and needs and discussed ongoing documentation of erosion and gully processes with the U.S. Geological Survey
- Provided assessment of alternative approaches to managing developed storm flows on properties proposed for acquisition

White Sands National Monument

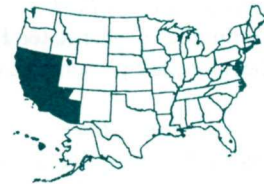
- Provided guidance on parameters to include in analyses of ground water

Multi-Park

- Provided up-to-date guidance on oil lab analysis to Regional Water Resources Program Manager and to various parks
- Coordinated the completion of the final draft report "A Study of the Adequacy of Texas Water Quality Standards for Protecting the Water and Water-Related Resources of the Nine Units of the National Park System in Texas"
- Provided review and comment on draft State of New Mexico Water Quality Regulations for Southwest Region

WESTERN REGION

Planning and Evaluation Branch



Channel Islands National Park

- Reviewed Resource Management Plan
- Reviewed Development Concept Plan (Santa Rosa Island)

Golden Gate National Recreation Area (Presidio)

- Reviewed General Management Plan
- Reviewed and commented on a Scope of Work for a wetlands restoration feasibility study at Crissy Field

Grand Canyon National Park

- Provided technical assistance on General Management Plan
- Provided technical assistance in development of the Water Monitoring Program
- Participated in a workshop to develop resource management alternatives for a general Management Plan
- Provided technical assistance in evaluating water supply alternatives

Great Basin National Park

- Reviewed and revised Water Resources Management Plan

Joshua Tree National Monument

- Reviewed Resource Management Plan

Lake Mead National Recreation Area

- Reviewed and evaluated 1992 hydrologic data from the Sacatone Spring restoration project; conducted a site visit to reestablish monitoring instrumentation after flood damage

Lassen Volcanic National Park

- Reviewed Resource Management Plan

Organ Pipe Cactus National Monument

- Reviewed Resource Management Plan

Petrified Forest National Park

- Monitored progress of adjudication for Little Colorado River

Point Reyes National Seashore

- Continued revisions of Water Resources Scoping Report
- Reviewed Resource Management Plan

Redwood National Park

- Reviewed Development Concept Plan (Davison Ranch)

Santa Monica Mountains National Recreation Area

- Participated in Water Resources Management Plan Issue Scoping Workshop and Project Statement development

USS Arizona Memorial

- Reviewed Resource Management Plan

Water Rights Branch

Casa Grande National Monument

- Monitored progress of Lower Gila Basin adjudication

Coronado National Memorial

- Monitored progress of San Pedro Basin adjudication

Death Valley National Monument

- Evaluated Bureau of Land Management's plan for a resource management area adjacent to the park
- Assisted and participated in hearing regarding water rights application of Beatty General Improvement District
- Began climatic study of region through University of Nevada at Reno
- Began gathering existing hydrologic data and investigation of water rights and water use in the region
- Developed project and study plans to protect water rights
- Established additional network for monitoring of Devil's Hole for detection of crustal movement and barometric pressure
- Held second annual Devil's Hole Workshop in Carson City, Nevada
- Monitored Devil's Hole pool level
- Negotiated settlement of Saga Exploration and Lida Livestock protests
- Prepared for hearings on Las Vegas Valley Water District applications
- Prepared statement of work and assisted in implementing contract to prepare hydrologic conceptual model of Death Valley Region

- Protested Nevada water rights applications
- Compiled and reviewed monitoring data on U.S. Nevada Gold Search Joint Venture, Department of Energy, and LAC Bullfrog water permits

Fort Bowie National Historical Site

- Monitored progress of Upper Gila Basin adjudication
- Negotiated withdrawal of protests for water rights filings for Apache and Mine Tunnel Springs

Golden Gate National Recreation Area

- Assisted with Big Lagoon Restoration Plan
- Funded evaluation of the effect of wells on the Banducci Tract upon stream flow in Redwood Creek
- Prepared and provided technical review of contract for water rights research for Presidio transfer
- Researched water rights for Redwood Creek
- Reviewed General Management Plan/Environmental Impact Statement for Presidio transfer to National Park Service

Grand Canyon National Park

- Assisted with the development of a South Rim spring monitoring plan
- Assisted with a legal/technical assessment of the Canyon Forest Village development proposal
- Assisted with General Management Plan
- Assisted with water rights issues associated with the sale of water to Tusayan
- Monitored the progress of the Little Colorado River adjudication

Great Basin National Park

- Assisted with Water Resources Management Plan
- Established gaging stations on Lehman and Baker Creeks
- Prepared for hearings on Las Vegas Valley Water District applications
- Protested water rights applications



Kalaupapa National Historic Park

- Conducted Waikolu Stream Study
- Protested well application
- Testified at public meeting concerning protest

Lake Mead National Recreation Area

- Assessed new draft of Bureau of Reclamation regulations for Colorado River
- Assessed water rights implications of water treatment/supply alternatives
- Initiated settlement agreement with Las Vegas Valley Water District concerning their surface water applications on the Virgin River

- Prepared for hearing on Las Vegas Valley Water District applications
- Protested water rights applications

Lassen Volcanic National Park

- Provided water rights statement for Martin Creek

Montezuma Castle National Monument

- Monitored progress of adjudication for Verde River Basin

Organ Pipe Cactus National Monument

- Coordinated completion of a U.S. Geological Survey hydrology report

Point Reyes National Seashore

- Assisted with Water Resources Management Plan
- Assisted with water rights issues at the Point Reyes Bird Observatory
- Coordinated state water use compliance inspections and reporting requirements
- Initiated a water rights assessment and inventory

Saguaro National Monument

- Monitored progress of San Pedro and Santa Cruz River adjudications

Tonto National Monument

- Assisted with response to the U.S. Forest Service request for water
- Monitored progress of Salt River Basin adjudication
- Prepared comments for the Preliminary Salt River Watershed Hydrographic Survey Report

Tuzigoot National Monument

- Monitored progress of Little Colorado River adjudication

Yosemite National Park

- Responded to Department of Justice request regarding water rights interests in the Walker River Basin

Multi-Park

- Participated in San Pedro adjudication Federal Work Group
- Reviewed hydrographic survey reports for the San Pedro and Little Colorado adjudications
- Participated in Virgin River Interior Coordinating Committee meetings

Water Operations Branch

Channel Islands National Park

- Reviewed and commented on Resources Management Plan

- Reviewed proposed video script regarding the natural resources; presented comments of video length, number of topics presented, and questions on grazing

Chiricahua National Monument

- Performed preliminary reconnaissance of the area damaged by three large floods that occurred within a several day span and provided advice to the park regarding hazard to park staff and visitors resulting from changes in channel alignment
- Visited park and advised on Faraway Well production based on a past aquifer test; consulted on new visitor center site; submitted a proposed monitoring program
- Completed a detailed analysis of the recent flooding and developed flood-hazard information for the park campground and visitor center

Death Valley National Monument

- Investigated potential for conducting ground water monitoring to detect tracers emanating from the Nevada Test Site
- Completed an initial assessment of issues related to benzene, toluene, and PCB contamination at Devil's Hole
- Attended Western Region Natural and Cultural Resources Conference and received a "Cowbird Award" for the Division
- Contacted the Regional Historian and arranged a joint visit to Scotty's Castle to discuss details of flood protection for the Gate House
- Collected ground water data at Stovepipe Wells for future paper

Eugene O'Neill National Historical Site

- Provided Maintenance Division with past field data to assist them in determining current spring flow and potential site rehabilitation

Golden Gate National Recreation Area

- Reviewed project proposal "Redwood Creek and Big Lagoon Restoration, Muir Woods District"
- Provided advice to park staff concerning the adequacy of state plans for laboratory and field work to be done at a wetlands restoration site
- Reviewed draft of General Management Plan and Environmental Impact Statement for Presidio

Grand Canyon National Park

- Provided extensive review comments of the Draft Glen Canyon Dam Environmental Impact Statement
- Provided technical support to the Glen Canyon Dam Environmental Studies Program
- Prepared an analysis of issues associated with proposed water developments near Tusayan, Arizona
- Evaluated flood-management options for Cottonwood Campground
- Reviewed and commented on proposal for monitoring water quality from springs and investigating possible ground water flow paths
- Provided ongoing advice and data analyses for beach erosion studies



Great Basin National Park

- Reviewed GIS and data-management sections of Water Resources Management Plan
- Reviewed and commented on the Great Basin Resource Management Plan

Kaloko-Honokohau National Historic Park

- Finalized study plan and assisted Cooperative Parks Study Unit and Western Region in review of bid proposals for Kaloko Honokohau anchialine pond water quality investigations

Lake Mead National Recreation Area

- Assisted Denver Service Center in developing potable ground water supplies at five sites

Pinnacles National Monument

- Assisted the park in developing a new ground water source and recommended a study to determine the exact location of a fault

Santa Monica Mountains National Recreation Area

- Reviewed Santa Monica Bay Restoration Project report and provided comments and recommendations to the park
- Performed a STORET retrieval for the park

Tonto National Monument

- Assessed water supply and water resources protection issues

Yosemite National Park

- Provided up-to-date literature on *giardia*

SERVICEWIDE

Office of the Division Chief

- Represented the Service on the Department of the Interior's Clean Water Act Reauthorization Work Group; reviewed and commented on CWA legislative proposals, and prepared cost estimates in association with those proposals
- Represented the Service on EPA's Interagency Work Group on Abandoned Mine Lands and worked with the Department of the Interior agencies to develop a consolidated Interior position on the mitigation of water pollution associated with abandoned mines
- Provided Washington coordination for the Assistant Secretary's office for the first meeting of the Interagency Task Force on Everglades Ecosystem Restoration
- Represented the Service at briefings and Congressional hearings concerning the Gulf of Mexico program
- Assumed responsibility for coordination of the National Park Marine Debris Monitoring Program
- Participated in Natural Resources Strategic Planning efforts

Planning and Evaluation Branch

- Provided General Management Plan Task Directive Development support for Office of International Affairs - INRENARE/Marena Project (USAID/ Panama)
- Provided classroom and field sessions at the Water Resources Division's Resource Management Trainee Course
- Taught wetland management and compliance for a training course entitled "Environmental Compliance: Tools for Protecting Parks" (course conducted by the Environmental Law Institute in conjunction with NPS's Environmental Quality Division)
- Drafted Director's response to proposed changes in the Departmental Manual regarding Interior review of Clean Water Act Section 404 permits

- Provided a presentation to the Federal Interagency Coordination Meeting on Wetlands Research and Development in Washington, D.C. summarizing present National Park Service wetlands research and future wetlands research needs
- Prepared National Park Service comments to the Department of the Interior on the "Wetlands Reform Act of 1993" (H.R. 350 - proposed amendments to CWA)
- Developed data and information for an interagency effort to develop a hydrogeomorphic approach to wetland functional assessment
- Provided technical support on water resources issues to R-MAP
- Participated in Resource Management Plans (RMP) Workshop providing input into future RMP guidelines revisions
- Participated on National Park Service Natural Resources Interpretation Committee to evaluate and improve interpretation of natural resources issues in the National Park Service

Water Rights Branch

- Prepared report on available technology for computerizing water rights information contained in National Park Service's dockets and storing original documents
- Assisted in the design of and conducted classroom and field water rights sessions in Water Resource Management segment of Natural Resources Management Training Course
- Reviewed and commented on Bureau of Reclamation Instream Flow Strategic Plan
- Developed and presented field hydrology workshop for Department of Justice and Office of the Solicitor attorneys
- Presented talk to National Park Service Ranger Skills Training class on significance of the Devil's Hole pupfish case

Water Operations Branch

- Provided an instructor to the "Colorado State Youth in Natural Resources Program" at CSU Pingree Park campus
- Participated on the Servicewide Inventory and Monitoring Task Force
- Assisted in the design and coordinated and facilitated the 1993 Water Resources Course for Natural Resources Management Trainees

- Coordinated development of a National Park Service park-based Water Quality Data Management System
- Managed a contract with Horizons Systems, Inc., for retrieval of water quality data from STORET
- Reviewed contracted National Park Service draft of water quality inventory and monitoring guidance document
- Reviewed proposals for development of marine/estuarine and lake/riverine water quality protocols for Level I inventory and monitoring
- Completed survey and data base of bacteriological monitoring associated with water-use activities in parks
- Served or participated on the following Department level committees that drafted DOI's policy positions on the Clean Water Act:
 - Antidegradation and Outstanding National Resource Waters
 - Ground water
 - Coordination of Federal Water Quality Monitoring and Research
- Reviewed and commented on section-by-section analysis of the Water Pollution Prevention and Control Act of 1993 prepared by the Office of Legislative Affairs
- Developed and finalized a national-level Memorandum of Understanding between the National Park Service and U.S. Geological Survey outlining the basic precepts on how the two agencies will coordinate their efforts in the National Water Quality Assessment program
- Represented National Park Service at two National Water Quality Assessment Program Federal Interagency Advisory Council meetings
- Represented National Park Service at the Intergovernmental Task Force for Monitoring Water Quality (ITFM) committee meeting and consolidated division comments on ITFM reports
- Developed a formalized working relationship with the Division of Engineering and Safety's Hazardous Materials program to conduct pre-remedial investigations (including preliminary assessments and site investigations)
- Drafted and submitted amendments to university cooperators for development of water quality inventory protocols
- Coordinated and chaired water quality issues session for the Resources Management and Trainee course

- Prepared summary of Clean Water Act for Resources Management Handbook being prepared by the Wildlife and Vegetation Division
- Developed National Park Service water quality program submission to Environmental Protection Agency's guide to Federal Water Quality Programs and information
- Provided review and comment on the Bureau of Land Management's Rangeland Reform Policy
- Lectured on floodplain compliance in the National Park Service at the Environmental Law Institute's short course entitled "Tools for Protecting Parks"
- Attended a training session on safety evaluation of dams
- Finalized new Floodplain Management Guidelines and completed the formal procedure for agency adoption
- Participated in the Colorado River Management Work Group
- Provided review and comments on the document "NOAA CoastWatch Change Analysis Project Guidance for Regional Implementation"
- Finished prototyping the park-based water quality data base management system and assessed the costs and benefits of transferring development to the Windows environment
- Established a geo-referenced park-boundary digital data base for use in GIS-based water resources analyses and queries
- Compiled and integrated a number of hydrographic-related digital data bases into GIS format, including (1) the Hydrologic-Climatic Data Network, (2) U.S. Geological Survey (USGS) Hydrologic Units, (3) USGS Water Quality Monitoring Station Locations, and (4) USGS 7.5" quadrangle outlines
- Wrote software called GEOMEAN to analyze bacteriological data by computing running geometric means based on a specified number of observations during a specified number of days and comparing this result against a criterion value
- Wrote software called RF3ATLAS to convert Environmental Protection Agency 1:100,000 scale River Reach File III (RF3) attributes and trace data to DBASE III+ and ATLAS*GIS formats

Publications 1993

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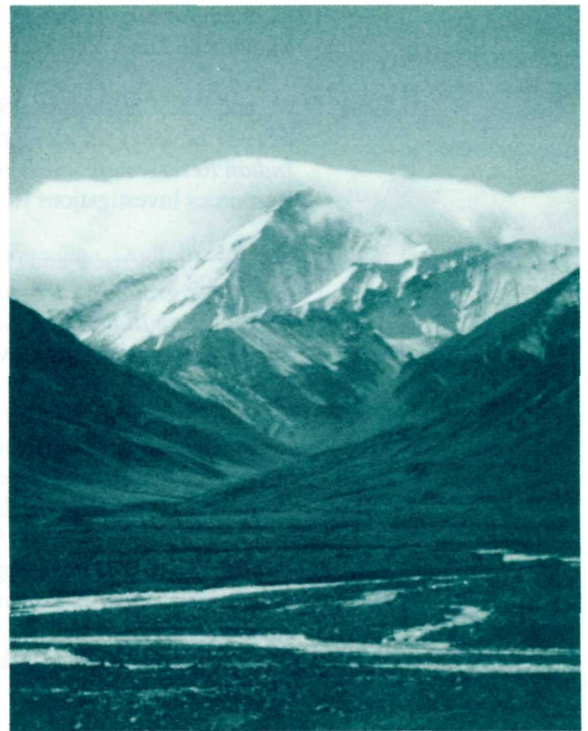
Davis, G.E., M. Flora, L.L. Loope, B. Mitchell, C.T. Roman, G. Smith, M. Soukup, and J.T. Tilmant. 1993. Assessment of Hurricane Andrew's immediate impacts on natural and archeological resources of Big Cypress National Preserve, Biscayne National Park, and Everglades National Park. *The George Wright Forum* 10, no. 1:30-40.

Flora, M.D., C.T. Roman, R. Masson, and L. Wightman. 1993. *Morristown National Historical Park water resources scoping report*. Technical report no. NPS/NRWRD/NRTR-93/17.

Karle, Kenneth F., and Roseann V. Densmore. In press. Stream and floodplain restoration in a riparian ecosystem disturbed by placer mining. *Ecological Engineering, the Journal of Ecotechnology*.

U.S. Fish and Wildlife Service. 1993. *National wetland inventory maps and digital database for Glacier National Park, Montana*.

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Briar, D.W., and P.K. Christensen. 1993. *Lithologic logs of observation wells and test holes drilled in 1987 in valley fill along the north flank of the Little Rocky Mountains, Fort Belknap Indian Reservation, north-central Montana*. Helena: U.S. Geological Survey Water-Resources Investigations Report 92-4163.

Briar, D.W., P.K. Christensen, and D.J. Ollermann. 1993. *Hydrology of valley fill and potential for additional ground-water withdrawals along the north flank of the Little Rocky Mountains, Fort Belknap Indian Reservation, north-central Montana*. Helena: U.S. Geological Survey Water-Resources Investigations Report 92-4162.

Custer, S.G., D.E. Michels, W. Sill, J.L. Sonderegger, W. Weight, and W. Woessner. 1993. *Recommended boundary for controlled ground water area in Montana near Yellowstone Park*. National Park Service. Report prepared for the Montana Reserved Water Rights Compact Commission and the Water Rights Branch, Water Resources Division.

Diaz, G.E. 1993. *Stochastic modeling and daily-flows generation at the North Fork of the Virgin River above Narrows Canyon, Zion National Park, Utah*. Draft. Completion report.

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Hill, J.R. 1993. *Water rights evaluation, Presidio of San Francisco*. Final report. Purchase order no. 1443 PX800092287. January.

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WATER OPERATIONS BRANCH

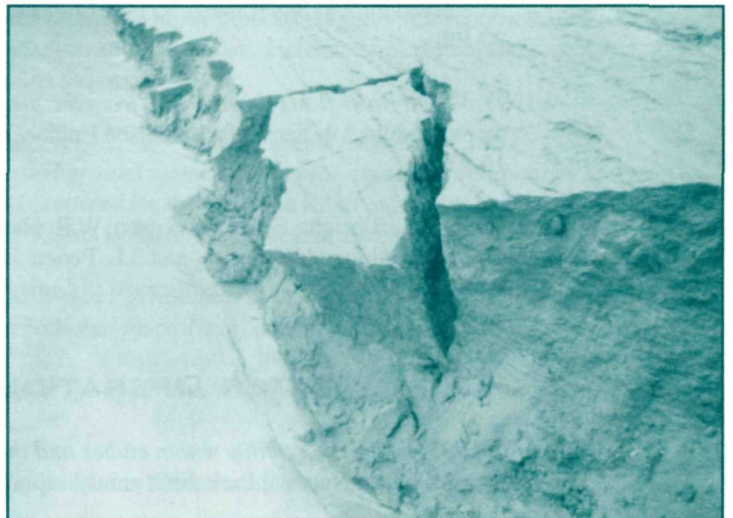
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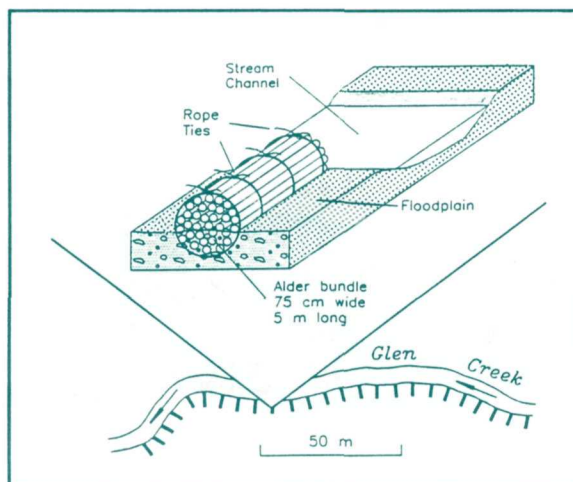
WATER RIGHTS BRANCH

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Figure 8. Illustration depicting alder bundles installed at Glen Creek during stream and floodplain restoration, Denali NP and PRES (K. Karle).



Financial Status of the Water Resources Division

BY DAN B. KIMBALL
DIVISION CHIEF

AND DEBI COX
PROGRAM ANALYST

FY94 base funding for the Water Resources Division (WRD) was \$4,913,000. (Eighteen percent of WRD's FY93 budget was transferred to the National Biological Survey in FY94.) 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, regions, and other NPS organizational units, 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 FY94.

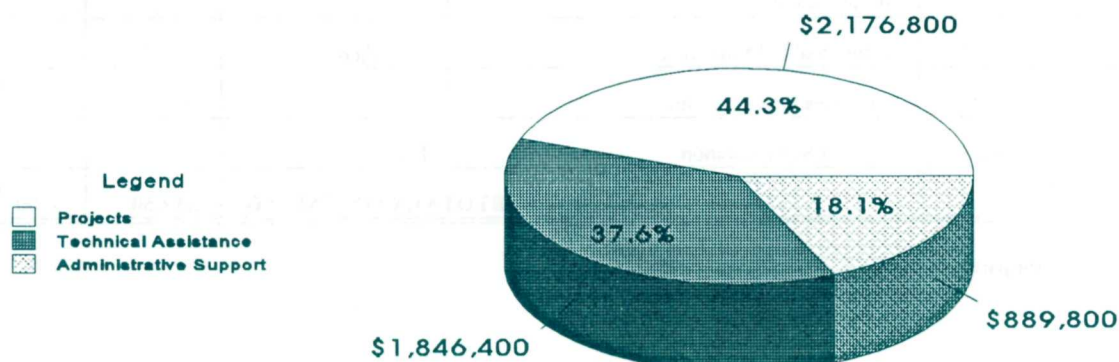


Figure 9. Distribution of WRD Program FY94 Funding.

FY94 WRD Prioritized Projects

GENERAL WATER RESOURCES

Table 1. Continuing Projects

PARK	REGION	CONTINUING PROJECT TITLE	WRD PROJECT COORDINATOR	FUNDING \$(000s)	
				FY94	FY95
DINO	RMR	Sediment Transport Investigations on the Green River	Smillie	25.00	
BIBE	SWR	Prepare Water Resources Management Plan	Flora	25.00	
COSW	SER	Prepare Water Resources Management Plan/Acquire GIS System	Flora	25.00	
ACAD	NAR	Prepare Water Resources Management Plan	Flora	15.00	
NOCA	PNR	Glacier Effects on Water Resources	Rosenlieb	16.00	
WHSA	SWR	Ground Water Quality Monitoring	Martin	17.00	
CACO	NAR	Research Kettle Pond Hydrogeology	Martin	15.00	
BICA	RMR	Prepare Water Resources Management Plan	Sharrow	25.00	
SACR	MWR	Prepare Water Resources Management Plan	Sharrow	25.00	
GLBA	AR	Establish Hydrologic Monitoring Stations in Glacier Bay Watershed	Long	34.50	
BUFF	SWR	Water Quality Monitoring	Rosenlieb	27.00	
GAAR	AR	Water Resources Baseline	Long	50.00	
VIIS	SER	Effect of Sedimentation	Tucker	20.00	
		SUBTOTAL CONTINUING		319.50	0.00

See Appendix A for park names.

Table 1 (cont.). New Projects

PARK	REGION	NEW PROJECT TITLE	WRD PROJECT COORDINATOR	FUNDING \$(000s)	
				FY94	FY95
CHAT/ BISC	SER	Water Resources Scoping Reports	Flora	19.00	
BLCA	RMR	Study Stream Morphology-Gunnison	Smillie/Wondzell	30.00	20.00
MORA	PNR	Id/Enumerate Plankton	Irwin	17.50	17.50
CACA	SWR	Determine Water Infiltration Rates	Rosenlieb	25.00	25.00
SAMO	WR	Update WRMP	Sharrow	30.00	0.00
WRST	AR	Hydrology & Hydrology Hazard of Hidden Creek Lake	Smillie	26.00	24.00
NACE	NCR	Monitoring of Last Tidal Marsh in Capital	Wagner	20.00	20.00
COSW	SER	Develop a Flood Pres. Decis. Support System	Smillie	25.00	25.00
DEWA	MAR	Scenic Rivers Monitoring Program	Tucker	50.00	0.00
OZAR	MWR	Water Resources Study and WRMP	Flora	22.00	28.00
		SUBTOTAL NEW		264.50	159.50
		TOTAL CONTINUING AND NEW PROJECTS		584.00	159.50

See Appendix A for park names.

FY94 Watershed Protection Program Funding

WATER QUALITY ACTIVITY

Table 2. Continuing Water Quality

PARK	REGION	CONTINUING PROJECT TITLE	WRD PROJECT COORDINATOR	FUNDING \$(000s)	
				FY94	FY95
JECA	RMR	Analyze Contaminants in Cave Water Supplies	Rosenlieb	20.00	
APIS	MWR	Monitor ONRWs	Rosenlieb	30.00	
OLYM	PNR	Assess Impacts on Lake Ozette Ecosystem from Logging Activities	Long	17.00	
GLCA	RMR	Research Trace Elements in Lake Powell	Irwin	20.00	
MACA	SER	Inventory Aquatic Organisms and Determine Impact of Pollution	Irwin	20.00	
CHIS	WR	Monitor Water Quality on Santa Rosa Island	Rosenlieb	15.00	
COLO	MAR	Water Resources Baseline	Martin	6.00	
GWMP	NCR	Investigate Toxins at Dyke Marsh	Irwin	15.00	
GRCA	WR	Reconnaissance Sampling to Enable Design of Water Quality Monitoring Program	Long	20.00	
		SUBTOTAL CONTINUING WATER QUALITY		163.00	0.00

See Appendix A for park names.



Table 2 (cont.). New Water Quality

PARK	REGION	NEW PROJECT TITLE	WRD PROJECT COORDINATOR	FUNDING \$(000s)	
				FY94	FY95
BUFF	SWR	Monitor Rain Events	Rosenlieb	12.50	12.50
MACA	SER	Assess QW Relative to Contaminants Trans.	Irwin	26.50	13.50
YUCH	AR	Biomonitoring at Coal Creek	Irwin	15.00	0.00
ASIS	MAR	Inventory Sediment Contaminants	Irwin	18.00	16.00
INDU	MWR	Assessment, Source, Fate of E. Colli	Rosenlieb	20.00	20.00
DEWA	MAR	Monitor Aquatic Biological Parameters	Irwin	40.00	0.00
GRBA	WR	Monitoring of Surface Water Chemistry	Long	20.00	20.00
ELMO	SWR	Snapshot QW of Historic Pool	Long	12.00	0.00
CANY	RMR	Colorado River Benthic Characterization	Irwin	20.00	20.00
OLYM	PNR	Assess Effects of Soleduck Resort	Long	17.50	0.00
BAND	SWR	Operate NAWQA Station	Long	8.00	6.00
		SUBTOTAL NEW WATER QUALITY		209.50	108.00
		TOTAL CONTINUING AND NEW WATER QUALITY		372.50	108.00

See Appendix A for park names.

FY94 WETLANDS ACTIVITY

Table 3. Continuing Wetlands

PARK	REGION	CONTINUING PROJECT TITLE	WRD PROJECT COORDINATOR	FUNDING \$(000s)	
				FY94	FY95
BICY	SER	Copeland Prairie Restoration	Wagner	40.00	
OZAR	MWR	Inventory and Characterization of the Riparian Zone of the Current and Jacks Forks Rivers	Wagner	20.00	
		SUBTOTAL CONTINUING WETLANDS		60.00	0.00

Table 3 (cont.). New Wetlands

PARK	REGION	NEW PROJECT TITLE	WRD PROJECT COORDINATOR	FUNDING \$(000s)	
				FY94	FY95
BUFF	SWR	Inventory/Map Riparian Zone	Wagner	17.00	23.00
BLRI	SER	Delineation, Mapping, Inventory	Wagner	30.50	9.50
DEWA	MAR	Develop & Implement Wetlands/Riparian Zone Mgt.	Wagner	20.00	20.00
DINO	RMR	Rehab. Hog Canyon Riparian Area	Wagner	14.00	21.00
BICY	SER	Restore Wetlands within Loop Road	Wagner	7.00	33.00
GRTE/ YELL	RMR	Inventory Wetlands	Wagner	40.00	0.00
SAMO	WR	Zuma Lagoon Restoration	Wagner	22.50	0.00
NOCA	PNR	National Wetlands Map Revision	Wagner	14.00	0.00
		SUBTOTAL NEW WETLANDS		165.00	106.50
		TOTAL CONTINUING AND NEW WETLANDS		225.00	106.50

See Appendix A for park names.

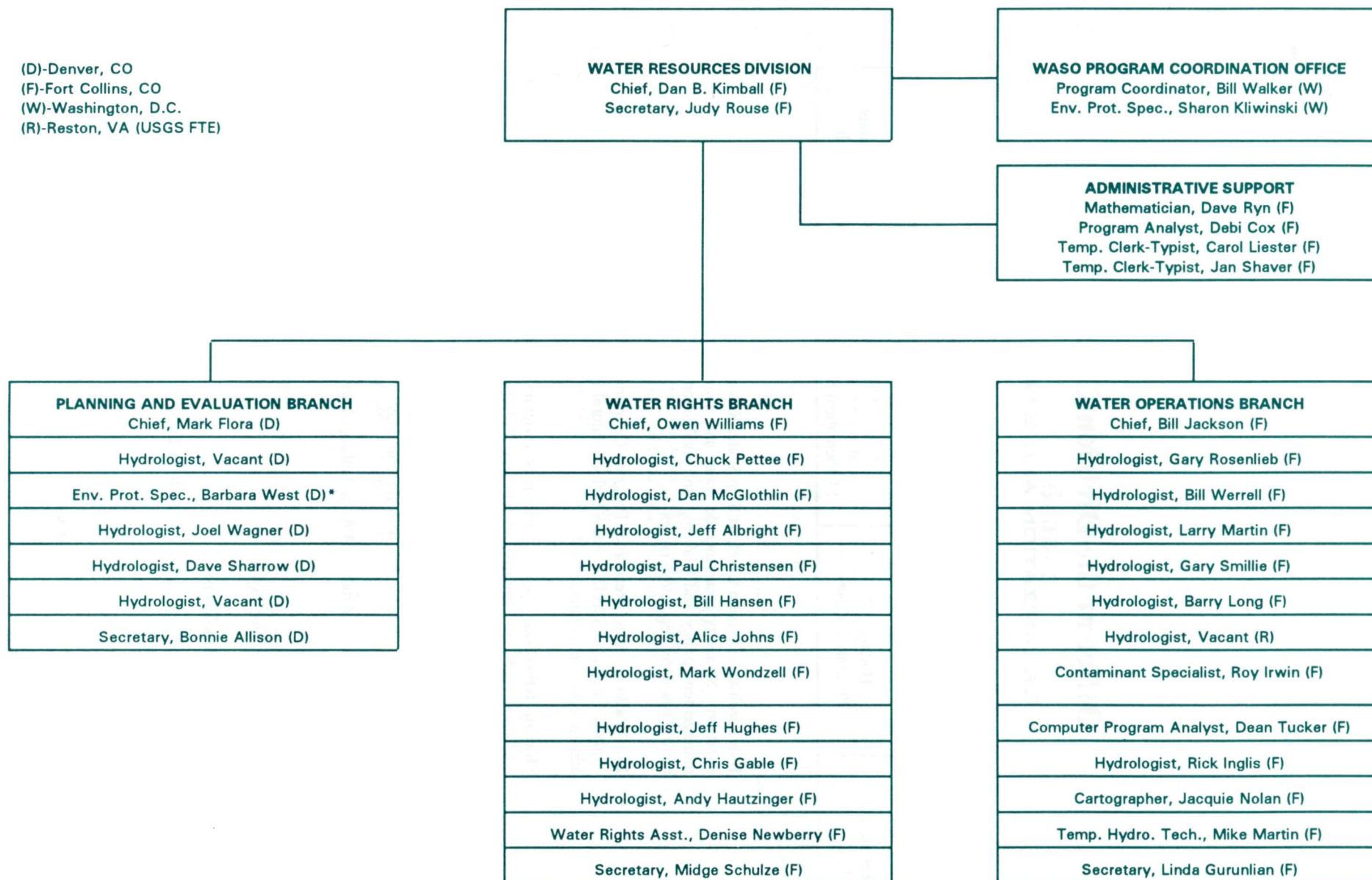
Table 4. Projects Funded through the Water Rights Program
Fiscal Year 1994

PARK	REGION	PROJECT TITLE	WRD PROJECT COORDINATOR	FUNDING \$(000s)
ZION	RMR	Negotiation/Litigation Preparation	Hansen	82.00
GRCA	WR	Spring Monitoring	Hansen	30.00
CRLA	PNR	Departure Analysis Studies	Albright	24.10
DEVA	WR	Hydrology, Water Rights and Use Studies	Christensen	77.90
BLCA	RMR	Quantification/Contract Negotiation	Wondzell/Petee	74.30
ORPI	WR	USGS Ground Water Study	Hansen	24.50
ALL	ALL	Preparation of Dockets for Scanning	Newberry	16.80
DEVA/ LAME/ GRBA	WR	Preparation for Administrative Hearings for the Las Vegas Valley Water District Water Rights Applications	Johns	75.20
ROMO	RMR	Departure Analysis Data Collection	McGlothlin	68.30
CARE	RMR	Departure Analysis Data Collection	Albright	30.50
CAHA	SER	Vegetation-Ground Water Study	Christensen	85.00
ALL	ALL	Preparation for Administrative Hearings	Johns	10.00
PORE	WR	Water Rights Assessment	Hansen	15.00
KALA	WR	Hydrology Study	Hughes	80.00
GRSA	RMR	Monitoring Program	Christensen	17.00
YELL	RMR	Implementation of Water Rights Compact	Albright	15.00
GRCA	WR	Departure Analysis Data Collection	Hansen	16.00
ALL	ALL	Historical Research	Williams	30.00
CACO	NAR	Ground Water Protection	Williams	30.00
		TOTAL WATER RIGHTS PROGRAM		801.60

See Appendix A for park names.

Date		Description		Amount	
1917	Jan 1	Balance		100.00	
	Jan 10	Received from A. B. C.		50.00	
	Jan 20	Received from D. E. F.		25.00	
	Jan 30	Received from G. H. I.		75.00	
	Feb 10	Received from J. K. L.		100.00	
	Feb 20	Received from M. N. O.		50.00	
	Feb 30	Received from P. Q. R.		25.00	
	Mar 10	Received from S. T. U.		75.00	
	Mar 20	Received from V. W. X.		100.00	
	Mar 30	Received from Y. Z. A.		50.00	
	Apr 10	Received from B. C. D.		25.00	
	Apr 20	Received from E. F. G.		75.00	
	Apr 30	Received from H. I. J.		100.00	
	May 10	Received from K. L. M.		50.00	
	May 20	Received from N. O. P.		25.00	
	May 30	Received from Q. R. S.		75.00	
	Jun 10	Received from T. U. V.		100.00	
	Jun 20	Received from W. X. Y.		50.00	
	Jun 30	Received from Z. A. B.		25.00	
	Jul 10	Received from C. D. E.		75.00	
	Jul 20	Received from F. G. H.		100.00	
	Jul 30	Received from I. J. K.		50.00	
	Aug 10	Received from L. M. N.		25.00	
	Aug 20	Received from O. P. Q.		75.00	
	Aug 30	Received from R. S. T.		100.00	
	Sep 10	Received from U. V. W.		50.00	
	Sep 20	Received from X. Y. Z.		25.00	
	Sep 30	Received from A. B. C.		75.00	
	Oct 10	Received from D. E. F.		100.00	
	Oct 20	Received from G. H. I.		50.00	
	Oct 30	Received from J. K. L.		25.00	
	Nov 10	Received from M. N. O.		75.00	
	Nov 20	Received from P. Q. R.		100.00	
	Nov 30	Received from S. T. U.		50.00	
	Dec 10	Received from V. W. X.		25.00	
	Dec 20	Received from Y. Z. A.		75.00	
	Dec 30	Received from B. C. D.		100.00	
	Total			2500.00	

(D)-Denver, CO
 (F)-Fort Collins, CO
 (W)-Washington, D.C.
 (R)-Reston, VA (USGS FTE)

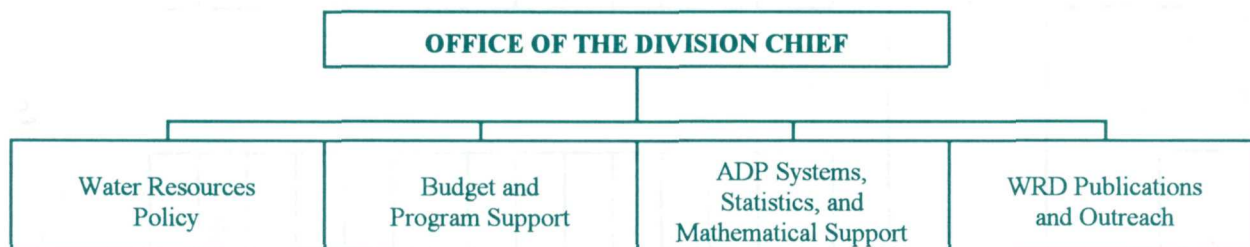


* On Detail to Assistant Secretary, Fish, Wildlife & Parks

Figure 10. Water Resources Division Staff, December 1993.

Office of the Division Chief

ORGANIZATION AND STAFF



Dan Kimball: Division Chief, M.S. in Water Resources Administration. Specialty areas include water and natural resources management policy and planning and evaluation of complex natural resources regulatory issues.

Bill Walker: Water Resources Program Coordinator, Ph.D. in Aquatic Ecology. Specialty areas include natural resources and aquatic ecosystem management.

Sharon Kliwinski: Water Resources Program Coordinator Assistant, B.S. in Environmental and Pollution Sciences. Specialty areas includes environmental legislation and regulations.

Dave Ryn: Mathematician, M.S. in Mathematics. Specialty areas include computer and statistical technology.

Debi Cox: Program Analyst, B.A. in Anthropology.

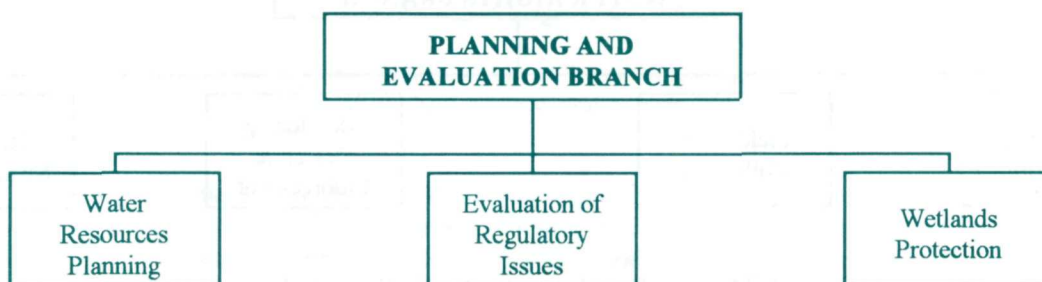
Judy Rouse: Secretary.

Carol Liester: Clerk/Typist.

Jan Shaver: Clerk/Typist.

Planning and Evaluation Branch

ORGANIZATION AND STAFF



Mark Flora: Branch Chief. Hydrologist, M.S. in Environmental Science. Specialty areas include water resources management planning, water quality, and watershed management.

Barbara West*: Environmental Protection Specialist, M.A. in Public Administration. Specialty areas include regulatory support and evaluations.

Joel Wagner: Hydrologist, M.S. in Environmental Science. Specialty areas include wetlands delineation, hydrology, and regulatory issues.

Vacant: Wetlands Specialist.

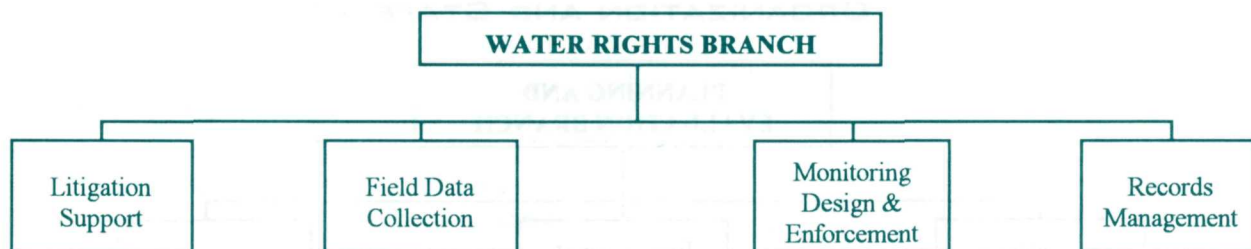
David Sharrow: Hydrologist, B.S. in Watershed Science. Specialty areas include water resources management planning and water resources impacts of mining.

Bonnie Allison: Secretary.

*Currently on detail to Assistant Secretary, Fish, Wildlife and Parks

Water Rights Branch

ORGANIZATION AND STAFF



Owen Williams: Branch Chief, M.S. in Watershed Science. Specialty areas include water law, upland watershed management, fluvial geomorphology, and surface water hydrology.

Chuck Pettee: Supervisory Hydrologist, Team Leader, M.S. in Watershed Science. Specialty areas include water rights, surface water hydrology, and hazardous materials.

Dan McGlothlin: Supervisory Hydrologist, Team leader, B.S. in Watershed Hydrology. Specialty areas include water law, surface water hydrology, and upland watershed management.

Paul Christensen: Hydrologist, M.S. in Geology. Specialty areas include hydrogeology, ground water hydrology, and ground water modeling.

Bill Hansen: Hydrologist, M.S. in Hydrology. Specialty areas include water law, surface water hydrology, field methods, and watershed management and rehabilitation.

Alice Johns: Hydrologist, B.S. in Watershed Sciences. Specialty areas include water law, upland watershed management, fluvial geomorphology and field methods.

Jeff Albright: Hydrologist, M.S. in Watershed Management. Specialty areas include surface water hydrology, field methods, and instrumentation.

Jeff Hughes: Hydrologist, M.S. in Watershed Sciences. Specialty areas include surface water hydrology, field methods, and instrumentation.

Mark Wondzell: Hydrologist, M.S. in Agricultural Engineering. Specialty areas include surface water hydrology, riparian vegetation ecology/management, and field techniques.

Chris Gable: Hydrologist, B.S. in Watershed Sciences. Specialty areas include surface water hydrology and water quality control.

Denise Newberry: Water Rights Specialist, M.S. in Natural Resources Management and Range Science. Specialty areas include NPS law enforcement and natural resources policy and administration.

Andrew Hautzinger: Hydrologist, B.S. in Watershed Sciences. Specialty areas include surface water hydrology, field methods, instrumentation, and riparian management.

Anna Perea: Hydrology Student Trainee, Cooperative Education Program, Colorado State University. B.S. (pending) in Watershed Sciences.

Gustavo Diaz: Ph.D. in Civil Engineering. Specialty areas include water resources and modeling.

Midge Schulze: Secretary.

RESEARCH ASSOCIATES

Bernadette Berger: Research Associate, Colorado State University. B.A. in Speech Communications.

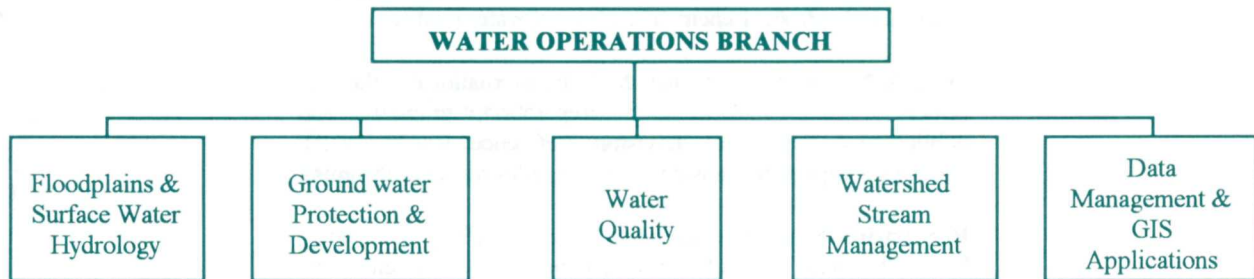
Nancy Stevens: Research Associate, Colorado State University. M.E.M. in Water Resources. Specialty areas include water quality analysis, hydrology, field methods, and instrumentation.

Dan Evans: Research Associate, Colorado State University. M.S. in Civil Engineering (Water Resources). Specialty areas include hydrology, hydraulics, sediment transport, and computer modeling.

Hilary Renner: Research Associate, Colorado State University. M.S. in Natural Resource Management. Specialty areas include watershed management, agricultural water management, field methods, and arid land hydrology.

Water Operations Branch

ORGANIZATION AND STAFF



Bill Jackson: Branch Chief, Ph.D. in Forest Hydrology. Specialty areas include sedimentation processes, fluvial geomorphology, and riparian rehabilitation and management.

Gary Rosenlieb: Water Quality Program Team Leader, M.S. in Water Resources. Specialty areas include water quality (chemistry and micro-biology), ground water quality, and hazardous materials management.

Bill Werrell: Hydrology Program Team Leader, M.S. in Geology, M.S. in Hydrology. Specialty areas include well-siting, well design and testing, aquifer analyses, springflow monitoring, and floodplain management.

Gary Smillie: Hydrologist/Hydraulic Engineer, M.S. in Civil Engineering. Specialty areas include flood-frequency analysis, open-channel hydraulics, floodplain management, and sediment transport.

Larry Martin: Hydrologist, M.S. in Hydrology. Specialty areas include ground water watershed management, riparian management, ground water modeling, GIS applications in water resources, and hydrologic data analysis.

Rick Inglis: Hydrologist, B.S. in Watershed Science. Specialty areas include field hydrologic data collection using automated recorders, watershed management, ground water monitoring, and data analysis.

Dean Tucker: Computer Programmer-Analyst, Ph.D. in Forestry. Specialty areas include data management, computer graphics, and water resources applications in GIS.

Barry Long: Hydrologist, M.S. in Forest Hydrology. Specialty areas include physical-chemical aspects of water quality.

Jacquie Nolan: Cartographer, M.A. in International Relations. Specialty areas include map preparation, graphics, and publications. Oversees Division Reference Room (which contains comprehensive water resources files for all NPS units).

Roy Irwin: Senior Contaminants Specialist, Ph.D. in Biology. Specialty areas include environmental contaminants and biological aspects of water quality (including bio-monitoring).

Michael Martin: Hydrologic Technician, M.S. in Watershed Science. Specialty areas include geochemistry, water quality, geomorphology, flood analysis, and tropical aquaculture.

Linda Gurunlian: Secretary, B.A. in English Education, technical degree in Computer Programming.

STUDENT ASSISTANTS

Wendy Basham: Assistant Contaminants Specialist/CSU Cooperative Agreement Student Assistant. B.S. (pending) in Environmental Health.

Marion Dubler: Assistant Contaminants Specialist/CSU Cooperative Agreement Student Assistant. B.S. (pending) in PreMed.

Allan Gill: GIS Computer Programmer, B.S. in Business Administration, B.S. in Landscape Architecture. GIS applications in Water Resources.

Scott Grover: Hydrologic Technician, document preparation. B.S. in Physical Geography, B.S. in Watershed Science (May 95).

Becca Smith: B.A. in Earth Science, M.S. (pending) in Geology. Specialty areas include fluvial geomorphology, sediment transport, water quality, and statistics.

Lynette Stevens: Assistant Contaminants Specialist/CSU Cooperative Agreement Student Assistant. M.S. (pending) in Watershed Science.

Mark Van Mouwerik: Assistant Contaminants Specialist/CSU Cooperative Agreement Student Assistant. M.S. (pending) in Environmental Health.

Awards

OFFICE OF THE DIVISION CHIEF

Debi Cox received a Quality Step Increase for consistently outstanding performance related, in particular, to her role in renegotiation of a Cooperative Agreement with Colorado State University and securing new office space for the WRD.

Dan Kimball received a Time-in-Service Award for 15 years with the federal government.

Judy Rouse received an accretion of duties promotion.

WATER RIGHTS BRANCH

Paul Christensen received a Special Achievement Award for sustained superior performance in his work as the Contracting Officer's Technical Representative on a very large and complex contract for the protection of resource values at three Nevada NPS units. Paul also received a Time-in-Service Award for 10 years of service to the federal government.

Bill Hansen received a Quality Step Increase for consistently outstanding levels of performance with respect to project management, water rights adjudication support in particular assignments involving the preparation for litigation, and the negotiation of NPS water rights for Zion National Park.

Alice Johns received a Quality Step Increase for her consistently outstanding performance as Team Leader for the Water Rights Branch monitoring and enforcement team, particularly for her direction of technical efforts to protect water rights at Great Basin National Park, Lake Mead National Recreation Area, and Death Valley National Monument.

Dan McGlothlin received a Special Achievement Award for his performance in handling special assignments while concurrently handling ongoing responsibilities, in particular, his contribution to the protection of resource values at three NPS units in Nevada.

Denise Newberry received a Fast Track Award for her high quality effort in assisting the Water Rights Branch staff in the work effort associated with the process of negotiating the Montana Compact. This included contribution of substantial personal time to meet the extremely short time frames required by the negotiation process. Denise also received a Time-in-Service Award for 5 years of service to the federal government.

Chuck Pettie received a Special Achievement Award for his outstanding work performance to develop and implement a preliminary water delivery contract with the Bureau of Reclamation to protect resources at Black Canyon of the Gunnison National Monument.

Owen Williams received a Time-in-Service Award for 20 years with the federal government.

WATER OPERATIONS BRANCH

Barry Long received a Fast Track Award for serving on a detail to WASO as the WRD Program Coordinator, a Fast Track Award for coordination of the 1993 Water Resources Course, and a Time-in-Service Award for 10 years of service to the federal government.

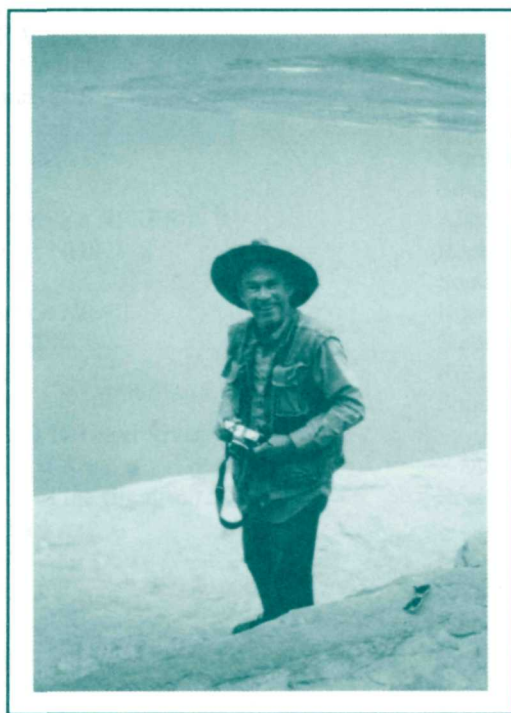
Larry Martin received a Quality Step Increase for his consistently outstanding contributions to the WRD (e.g., the analysis of water resources issues at several parks, including Cape Cod National Seashore, Grand Canyon National Park, El Malpais National Monument, and Hagerman Fossil Beds National Monument).

Gary Rosenlieb received a Time-in-Service Award for 15 years with the federal government.

Gary Smillie received a Fast Track Award for serving on a detail to WASO as the WRD Program Coordinator.

Dean Tucker received a Special Achievement Award for his contribution to the development of a servicewide water quality data base and the application of GIS technologies to park water resources issues.

Bill Werrell received a Fast Track Award for his efforts in producing a video film describing beach-erosion processes in Grand Canyon.



Appendix A

REFERENCED UNITS OF THE NATIONAL PARK SYSTEM

Acronym	Park Name	Region
ACAD	Acadia NP	North Atlantic
ADAM	Adams NHS	North Atlantic
ALPO	Allegheny Portage Railroad NHS	Mid-Atlantic
AMIS	Amistad NRA	Southwest
APCO	Appomattox Courthouse NHP	Mid-Atlantic
APIS	Apostle Islands NL	Midwest
ASIS	Assateague Island NS	Mid-Atlantic
AZRU	Aztec Ruins NM	Southwest
BAND	Bandelier NM	Southwest
BELA	Bering Land Bridge NPRES	Alaska
BELO	Bent's Old Fort NHS	Rocky Mountain
BIBE	Big Bend NP	Southwest
BICA	Bighorn Canyon NRA	Rocky Mountain
BICY	Big Cypress NPRES	Southeast
BIHO	Big Hole NB	Rocky Mountain
BISC	Biscayne NP	Southeast
BISO	Big South Fork National River and Recreation Area	Southeast
BLCA	Black Canyon of the Gunnison NM	Rocky Mountain
BLRI	Blue Ridge Parkway	Southeast
BLUE	Bluestone NSR	Mid-Atlantic
BRCA	Bryce Canyon NP	Rocky Mountain
BUFF	Buffalo National River	Southwest
CACA	Carlsbad Caverns NP	Southwest
CACO	Cape Cod NS	North Atlantic
CAGR	Casa Grande NM	Western
CAHA	Cape Hatteras NS	Southeast
CAHO	Chesapeake and Ohio Canal NHP	National Capital
CAKR	Cape Krusenstern NM	Alaska
CALO	Cape Lookout NS	Southeast
CANY	Canyonlands NP	Rocky Mountain
CARE	Capitol Reef NP	Rocky Mountain
CATO	Catoctin Mountain Park	National Capital
CAVO	Capulin Volcano NM	Southwest

CHAT	Chatahoochee River NRA	Southeast
CHIC	Chickasaw NRA	Southwest
CHIR	Chiricahua NM	Western
CHIS	Channel Islands NP	Western
CIRO	City of Rocks National Reserve	Pacific Northwest
COLO	Colonial NHP	Mid-Atlantic
CORO	Coronado NMEM	Western
COSW	Congaree Swamp NM	Southwest
CRLA	Crater Lake NP	Pacific Northwest
CRMO	Craters of the Moon NM	Pacific Northwest
CUIS	Cumberland Island NS	Southeast
CURE	Curecanti NRA	Rocky Mountain
CUVA	Cuyahoga Valley NRA	Midwest
DENA	Denali NP and PRES	Alaska
DEVA	Death Valley NM	Western
DEWA	Delaware Water Gap NRA	Mid-Atlantic
DINO	Dinosaur NP	Rocky Mountain
ELMO	El Morro NM	Southwest
EUON	Eugene O'Neill NHS	Western
EVER	Everglades NP	Southeast
FIIS	Fire Island NS	North Atlantic
FLFO	Florissant Fossil Beds NM	Rocky Mountain
FOBO	Fort Bowie NHS	Western
FOMC	Fort McHenry NM and Historic Shrine	Mid-Atlantic
FONE	Fort Necessity NB	Mid-Atlantic
FOSU	Fort Sumter NM	Southeast
FOVA	Fort Vancouver NHS	Pacific Northwest
FRSP	Fredricksburg and Spotsylvania NMP	Mid-Atlantic
GAAR	Gates of the Arctic NP and PRES	Alaska
GATE	Gateway NRA	North Atlantic
GETT	Gettysburg NMP	Mid-Atlantic
GEWA	George Washington Birthplace NM	Mid-Atlantic
GLAC	Glacier NP	Rocky Mountain
GLBA	Glacier Bay NP and PRES	Alaska
GLCA	Glen Canyon NRA	Rocky Mountain
GOGA	Golden Gate NRA	Western
GRBA	Great Basin NP	Western
GRCA	Grand Canyon NP	Western
GREE	Greenbelt Park	National Capital
GRKO	Grant-Kohrs Ranch NHS	Rocky Mountain
GRSA	Great Sand Dunes NM	Rocky Mountain
GRSM	Great Smoky Mountains NP	Southeast
GRTE	Grand Teton NP	Rocky Mountain
GUIS	Gulf Islands NS	Southeast

GWMP	George Washington Memorial Parkway	National Capital
HAFE	Harpers Ferry NHP	National Capital
HAFO	Hagerman Fossil Beds NM	Pacific Northwest
HOFU	Hopewell Furnace NHS	Mid-Atlantic
HOSP	Hot Springs NP	Southwest
HUTR	Hubbell Trading Post NHS	Southwest
INDU	Indiana Dunes NL	Midwest
JECA	Jewel Cave NM	Rocky Mountain
JELA	Jean Lafitte NHP and PRES	Southwest
JODR	John D. Rockefeller, Jr. Memorial Parkway	Rocky Mountain
JOTR	Joshua Tree NM	Western
KAHO	Kaloko-Honokohau NHP	Western
KALA	Kalaupapa NHP	Western
KATM	Katmai NP and PRES	Alaska
KEFJ	Kenai Fjords NP	Alaska
KEMO	Kennesaw Mountain NBP	Southeast
KLGO	Klondike Gold Rush NHP	Alaska
LACH	Lake Chelan NRA	Pacific Northwest
LACL	Lake Clark NP and PRES	Alaska
LAME	Lake Mead NRA	Western
LAVO	Lassen Volcano NP	Western
LIBI	Little Bighorn Battlefield NM	Rocky Mountain
MACA	Mammoth Cave NP	Southeast
MANA	Manassas NB	National Capital
MEVE	Mesa Verde NP	Rocky Mountain
MIMA	Minute Man NHP	North Atlantic
MISS	Mississippi National River and Recreation Area	Midwest
MNRR	Missouri National Recreation River	Midwest
MOCA	Montezuma Castle NM	Western
MONO	Monocacy NB	National Capital
MORA	Mount Rainier NP	Pacific Northwest
MORR	Morristown NHP	North Atlantic
NACE	National Capital Parks-East	National Capital
NATR	Natchez Trace Parkway	Southeast
NEPE	Nez Perce NHP	Pacific Northwest
NERI	New River Gorge NR	Mid-Atlantic
NIMI	Niobrara/Missouri National Riverways	Midwest
NOCA	North Cascades NP	Pacific Northwest
OBED	Obed Wild and Scenic River	Southeast
OLYM	Olympic NP	Pacific Northwest
ORCA	Oregon Caves NM	Pacific Northwest
ORPI	Organ Pipe Cactus NM	Western

OZAR	Ozark National Scenic Riverway	Midwest
PAAL	Palo Alto Battlefield NHS	Southwest
PAIS	Padre Island NS	Southwest
PECO	Pecos NHP	Southwest
PEFO	Petrified Forest NP	Western
PERI	Pea Ridge NMP	Southwest
PETE	Petersburg NB	Mid-Atlantic
PETR	Petroglyphs NM	Southwest
PINN	Pinnacles NM	Western
PIPE	Pipestone NM	Midwest
PISP	Pipe Spring NM	Rocky Mountain
PORE	Point Reyes NS	Western
PRWI	Prince William Forest Park	National Capital
REDW	Redwood NP	Western
RICH	Richmond NBP	Mid-Atlantic
ROCR	Rock Creek Park	National Capital
ROMO	Rocky Mountain NP	Rocky Mountain
RUCA	Russell Cave NM	Southeast
SAAN	San Antonio Missions NHP	Southwest
SACR	Saint Croix National Scenic Riverway	Midwest
SAGA	Saint Gaudens NHS	North Atlantic
SAGU	Saguaro NM	Western
SAIR	Saugus Iron Works NHS	North Atlantic
SAJH	San Juan Island NHP	Pacific Northwest
SAMO	Santa Monica Mountains NRA	Western
SARA	Saratoga NHP	North Atlantic
SITK	Sitka NHP	Alaska
SUCR	Sunset Crater Volcano NM	Southwest
THST	Thomas Stone NHS	Mid-Atlantic
TICA	Timpanagos Cave NM	Rocky Mountain
TONT	Tonto NM	Western
TUZI	Tuzigoot NM	Western
UPDE	Upper Delaware Scenic and Recreation River	Mid-Atlantic
USAR	USS Arizona Memorial	Western
VAFO	Valley Forge NHP	Mid-Atlantic
VIIS	Virgin Island NP	Southeast
VOYA	Voyageurs NP	Midwest
WACA	Walnut Canyon NM	Southwest
WHSA	White Sands NM	Southwest
WICA	Wind Cave NP	Rocky Mountain
WRST	Wrangell-St. Elias NP and PRES	Alaska
WUPA	Wupatki NM	Southwest
YELL	Yellowstone NP	Rocky Mountain

YOSE
YUCH
ZION

Yosemite NP
Yukon-Charley Rivers NPRES
Zion National Park

Western
Alaska
Rocky Mountain

Credits

Dan Kimball Chief Editor

Jacqueline Nolan Production, Design
 & Editing

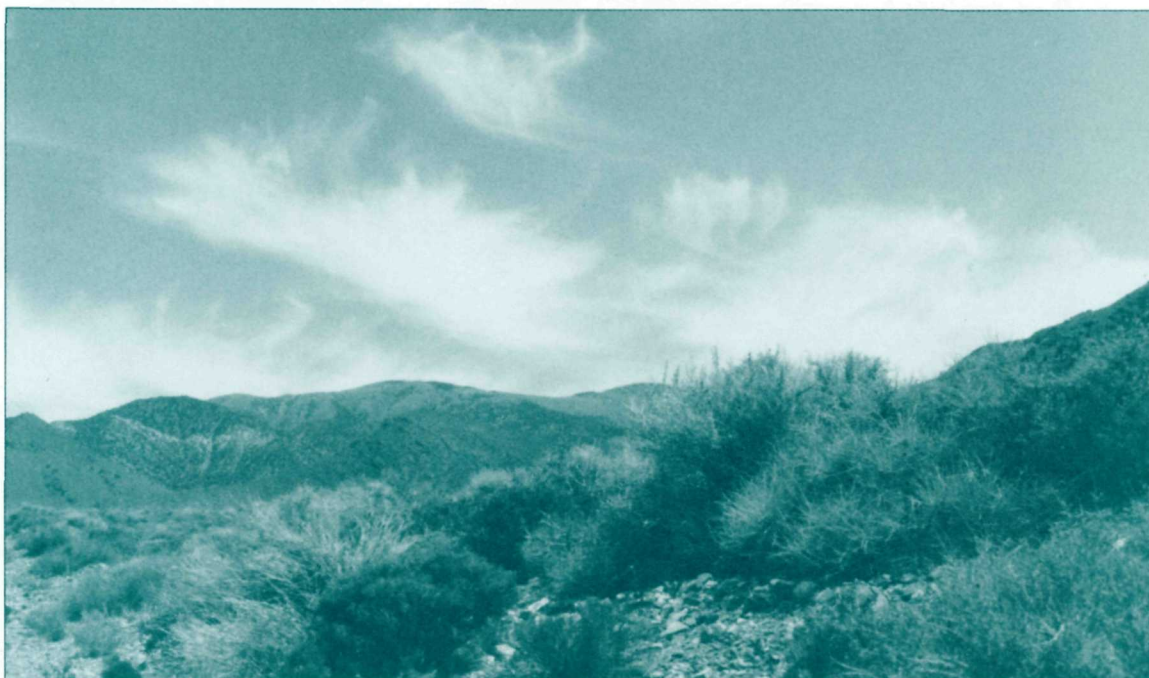
Judy Rouse Editorial Assistant

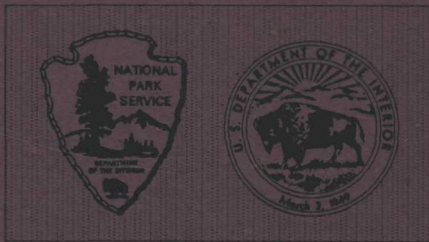
Linda Gurunlian Editorial Assistant

Midge Schulze Editorial Assistant



Special thanks to Stephanie G'Schwind for her competent and thorough editorial review of this report.





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.

June 1994



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