



Water Resources Division



2003 ANNUAL REPORT



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Natural Resource Program Center
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front cover, large photo:
Missouri National Recreational River (Jackson, 2003)

front cover, inset photos:
Channel Islands National Seashore, Sleeping Bear Dunes National Park, Grand Teton National Park (NPS)

opposite: Black Canyon of the Gunnison National Park (NPS, 1993)



Flood on Clear Creek, Obed Wild and Scenic River (Hughes, 2002)

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

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

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Acadia National Park (NPS)

A Word from the Associate Director Natural Resource Stewardship and Science

Mike Soukup, Ph.D.



This annual report provides a summary of the 2003 accomplishments of the National Park Service's Water Resources Division. The Division provides Servicewide program management, accountability, technical assistance, and policy guidance with respect to the preservation, protection, and management of water and aquatic resources of units of the National Park System. WRD provides its services directly to parks through a broad range of programs in the areas of water rights; water quality; floodplain management; groundwater analysis; watershed and wetlands protection and restoration; water resources management planning; fisheries and marine resources management; policy, legislative, and regulatory analysis; information management; and training. The Division's work plan is developed from the annual Servicewide Comprehensive Call and an annual technical assistance call to identify park needs, which in turn determines WRD's priorities. In addition to direct support to parks, the Division provides day-to-day support to regional offices, networks, and the Washington office in addressing water resources issues facing the NPS. The Division is located in Fort Collins, Colorado, with additional offices in Denver, Colorado, and Washington, D.C.

I am extremely pleased with the accomplishments of the Water Resources Division reflected in this annual report. As with each succeeding year, these accomplishments are indicative of the professionalism of the Division and of its ability to work cooperatively with

management and staff of parks, support offices, regional offices, and the Washington office on water resource issues. I continue to believe that WRD provides a model for cost effective, centralized support for the vast majority of parks that do not have the range of water resource technical expertise they need.

Much of this year's success can be attributed to the continued significant support from Congress for the Natural Resource Challenge. The Challenge will enable the Service to make major strides in preserving, protecting and understanding water resources of the National Park System. The Challenge has been effective in garnering budget increases for water quality monitoring, water resources protection and restoration projects, watershed condition assessments, and additional park-based aquatic resource professionals. I continue to be very pleased with the leadership role that the Water Resources Division has played in developing and guiding implementation of the water resources component of the Challenge and providing program accountability to Congress.

And kudos for this year's accomplishments are particularly well deserved given that Dan Kimball, a pillar of strength in the Division, has been moved to accept the challenge of new opportunities in the Service. As we "forge ahead," a well-spoken phrase of Dan's, we continue to miss his competent professional management style. ♥

Comments from the Division Chief

Dan Kimball



This past year the Water Resources Division continued to emphasize the implementation of new programs resulting from the Natural Resources Challenge. In FY 2003, a funding increase was

received to support three additional aquatic resource professionals, bringing the number of new professionals in the field to a total of sixteen. Funding was also received to support watershed assessments in parks, and water quality monitoring in five additional Park Vital Signs Networks. The accomplishments achieved with these increases and previous Challenge increases are discussed throughout this report. The Division also continued to provide the highest level of support possible to parks in addressing a wide variety of water and aquatic resources-related issues. Significant accomplishments of the Division for FY 2003 include:

- Issued *Directors Order #77-2: Floodplain Management* and accompanying Procedural Manual, and re-issued *Director's Order #77-1: Wetland Protection*.
- Completed Water Resources Management Plans for Sleeping Bear Dunes National Lakeshore, Richmond National Battlefield Park, Hagerman Fossil Beds National Monument and New River Gorge National River/Gauley River National Recreation Area/Bluestone National Scenic River, and completed Water Resources Scoping Reports for Wrangell-St. Elias National Park & Preserve, Boston Harbor Islands National Recreation Area, and Petrified Forest National Park.
- Developed technical portions of Fisheries Management Plans for Amistad National Recreation Area, Biscayne National Park, and North Cascades National Park.
- Developed a technical guideline for coral reef restoration actions and a programmatic Environmental Impact Statement for reef restoration work in cooperation with the NPS Coral Reef Restoration Advisory Team.
- Evaluated alternative discharge locations for the Las Vegas sewage treatment plant at Lake Mead.
- Participated on a team evaluating water supply alternatives in remote areas of ten NPS units including Dinosaur National Monument, Grand Teton National Park, Buffalo National River, and Capitol Reef National Park.
- Provided technical and policy assistance to C & O Canal National Historical Park and the National Capital Region during the permit process for discharges of the Washington Aqueduct.
- Prepared technical assessments in support of numerous aquatic resource restoration projects including spring restoration (Big Bend National Park, Death Valley National Park), wetland restoration (Minuteman National Historic Site, Saratoga National Battlefield, Rocky Mountain National Park, Grand Teton National Park, and Moores Creek National Battlefield), playa restoration (Big Bend National Park), disturbed land restoration (Golden Gate National Recreation Area), and stream restoration and stabilization (numerous parks).
- Evaluated flood mitigation alternatives at Manzanita National Historic Site, and

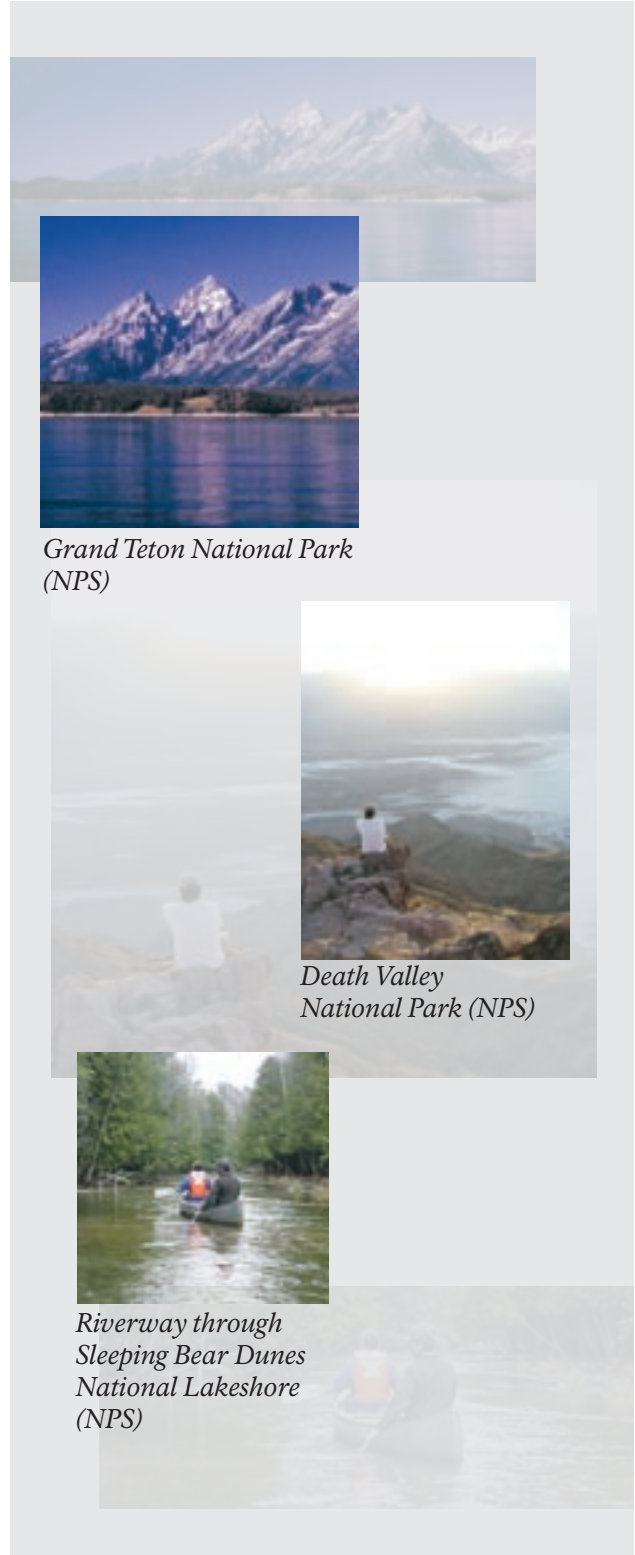
assisted in the development of a flood warning system at Haleakala National Park.

- Participated in the development of the Colorado River Annual Operating Plan.
- Assisted the Department of the Interior in securing a settlement agreement that sets a course to secure water rights for the Black Canyon of the Gunnison National Park in Colorado.
- Secured final Snake River basin adjudication decree for water rights at City of Rocks National Preserve in Idaho.
- Collaborated with other Interior and non-federal interests to advance the level of scientific information available to decision-makers for ground water systems in southern Nevada to protect resources at Lake Mead National Recreation Area and Death Valley National Park.
- Assisted Saguaro National Park to initiate efforts to secure protection for instream flows in Rincon Creek under Arizona law.

The many new programs made possible through the Natural Resource Challenge have greatly enhanced the Service's capabilities to address water resource management issues. They have also greatly increased WRD's responsibility to effectively manage these programs and account for the many substantive program accomplishments. That being said, WRD's "bread and butter" has always been the high level of technical support provided directly to parks, and we will continue to remain focused on the mission of preserving, protecting, and managing water resources in units of the National Park System.

On a personal note, new opportunities with the Service have taken me away from the daily operation of the Water Resources Division. As I pursue these new opportunities, I continue to keep abreast of the Division's activities and know that the Division is in good hands of the acting

Division Chiefs Bill Jackson and Chuck Pettee. ♡



Grand Teton National Park (NPS)

Death Valley National Park (NPS)

Riverway through Sleeping Bear Dunes National Lakeshore (NPS)

Washington Program Coordination Office

Sharon Kliwinski

During 2003 the Washington Program Coordination Office emphasized providing effective support to the Associate Director for Natural Resources Stewardship and Science. The Washington office continued to be excited by the opportunities provided NPS by the many new Natural Resource Challenge programs, while working closely with the parks and Regions to provide accountability for those programs to OMB and the Congress. While new programs and policy priorities present day to day challenges, we strive to maintain the preservation of park resources as our guiding focus and securing the integrity of park natural resource programs as our goal.

The Program Office continued to be deeply involved in the Clean Water Act permit for the Washington Aqueduct, the water treatment facilities that provide drinking water to about one million Washington, D.C. and Northern Virginia consumers. The interpretation and use of good science and a detailed evaluation of legal options played important roles in shaping the final permit and its impact on park resources and the aquatic resources of the Potomac River.

The Program Office also became immersed in a major new Departmental program called the Cooperative Conservation Initiative. The initiative brought new funding for the National Park Service for cost-shared conservation projects that address unfunded natural resource restoration needs or problems. The Program Office assisted in developing guidance for program implementation and in the review of partnership projects to be funded through this new funding source.

As the aquatic resource professional staff grew in the field, we were fortunate to welcome a new employee, Elizabeth Crisfield, to the Washington, DC staff. Elizabeth serves as the water resources liaison for Everglades National Park and will track and help on issues arising from South Florida ecosystem restoration. Elizabeth brings to the Washington office a long needed staff level professional capability focused on South Florida ecosystem restoration, one of the largest restoration projects in the world.

In summary, as we work through the opportunities and challenges presented in 2003 we look forward to continuing to serve the National Park Service in 2004. ♥

Water Resources in National Parks Reference Collection

*Laura Harte, Collection Archivist
Office of the Division Chief*

Since its inception in 1984, the primary function of the Collection has been to provide technical information and assistance to the Water Resources Division. This in-house Collection has proven to be an invaluable resource to WRD staff in their efforts to manage the water resources of our National Parks.

This unique Collection contains individual articles, entire publications, unpublished reports, water resources management plans, water quality data, water resources scoping reports, technical reports, well logs, slides, photos, and maps. Information can be found on an individual park's water quality, ground water resources, flood risks, and special water-related studies. This information often serves as good starting point when addressing site-specific water resources issues as well as more broadly-based water resource management planning projects. Diverse examples include:

- An original copy of the 1912 Hetch Hetchy proposal for Yosemite NP;
- "Hydrologic Data Collected During the 1994 Lake Mills Drawdown Experiment, Elwha River, Washington" (Olympic NP);
- "Hydrogeologic Investigation of Sinking Spring" (done by a volunteer at Abraham Lincoln Birthplace NHS);
- a 1903 map of the original 33 springs at Platte National Park (now Chickasaw NRA); and
- a wide collection of well information, including driller logs, yield tests, etc.

Over the years the Collection has expanded from its original scope to include materials on marine resources and fisheries. With this expansion came a necessity to organize,

manage and provide reference assistance of the Collection to the Division staff. In 2001, the Water Resources Division hired an Archivist to implement the necessary changes, as well as manage and maintain the collection. Since then the Collection has continued to expand its resources and its services.

In 2003 Collection materials were reviewed to determine if they were within the scope of the Collection and if they were accessioned into the Collection's database. As a result much of the Collection's database and Collection materials have been edited, accessioned, and reorganized. Additionally, work is being conducted to incorporate the Collection's database into the National Park's NatureBib database. This will enable NPS staff Servicewide and partners to view the Collections holdings. Collection services provided have expanded to include research assistance to on- and off-site hydrologists, bibliographical assistance to Inter-agency and outside agencies (both nationally and internationally), and the compilation of requested materials. An inter-library loan service has been established to enable NPS staff to acquire or borrow materials from other agencies, publishers, and libraries. In the coming year, the Collection will expand further with the addition of a Collection map room. This room is being established to accommodate the ever growing Collection. The goal for 2004 is to continue to organize, expand and manage the Collection, while providing prompt, professional assistance to WRD Staff and all other inquiring parties. ♥

PLANNING AND EVALUATION BRANCH HIGHLIGHTS

*Mark Flora, Chief
Planning and Evaluation Branch*

Planning and Evaluation Branch (PEB) activities in FY 2003 were focused upon developing Servicewide policy and guidance for the protection of wetlands, fisheries, and marine resources; developing a coastal watershed condition assessment strategy and initiating pilot coastal watershed condition assessments; providing programmatic oversight and accountability for more than 60 NRPC-funded projects; and providing direct support to NPS units in the areas of water resources planning, wetlands protection and restoration, fisheries management, and marine resources conservation.

In the policy and regulatory arena, PEB is pleased to report that NPS Director Fran Mainella re-issued *Director's Order #77-1* on October 30, 2002. This Director's Order provides updated guidance and procedures for wetland protection within the National Park Service. During the year, PEB staff also completed the "Wetlands" section of the NPS Interim Technical Guidance on Assessing Impacts and Impairment to Natural Resources, participated in activities of the NPS Coral Reef Advisory Team to develop Servicewide guidelines for coral reef restoration, and worked closely with the NPS Office of Policy and Regulation and the Department of the Interior (DOI) Solicitor on developing interim regulations reflecting critical changes for the management and protection of coral reef resources within the National Park system. PEB staff also provided Assistant Secretary Manson with a briefing paper detailing current NPS strategies to protect manatees in several NPS units, organized a meeting between NPS law enforcement and NOAA National Marine Sanctuary Program personnel to

facilitate greater cooperation in enforcement activities, and developed end and intermediate outcome goals and measures for the wetlands, riparian, fisheries, and marine resource elements of the DOI's Strategic Plan.

During the year, PEB staff has provided programmatic oversight, technical review and guidance for more than 60 WRD or NRPC-funded projects relating to water resources planning, wetlands protection and restoration, fisheries management, and marine resources conservation. Included in this task is providing appropriate fiscal oversight and accountability for the \$4.7 million of Natural Resource Challenge funding (multi-year total) allocated to support these projects.

PEB staff has also provided the lead for the regulatory review and approval of 14 wetlands statement of findings, Servicewide review and comments on 15 EIS/EA environmental compliance documents, and NPS policy review of the water-related aspects of 28 NPS planning documents (primarily General Management Plans and Special Resource Studies).

Accomplishments during the year were numerous and several are highlighted in the following articles. Of particular note, PEB's Water Resources Planning Program was successful in completing Water Resources Management Plans for Richmond National Battlefield and Hagerman Fossil Beds National Monument, as well as assisting with the completion of Water Resources Scoping Reports for Wrangell-St Elias National Park and Preserve and Petrified Forest National Park. PEB's Wetlands Protection and Restoration Program participated in wetland restoration activities for the Snake River Gravel Mine (Grand Teton National Park/ John D. Rockefeller, Jr., Memorial Parkway), the Glacier Creek Livery (Rocky Mountain National Park), the Hidden Valley Ski Area (Rocky Mountain National Park), and the

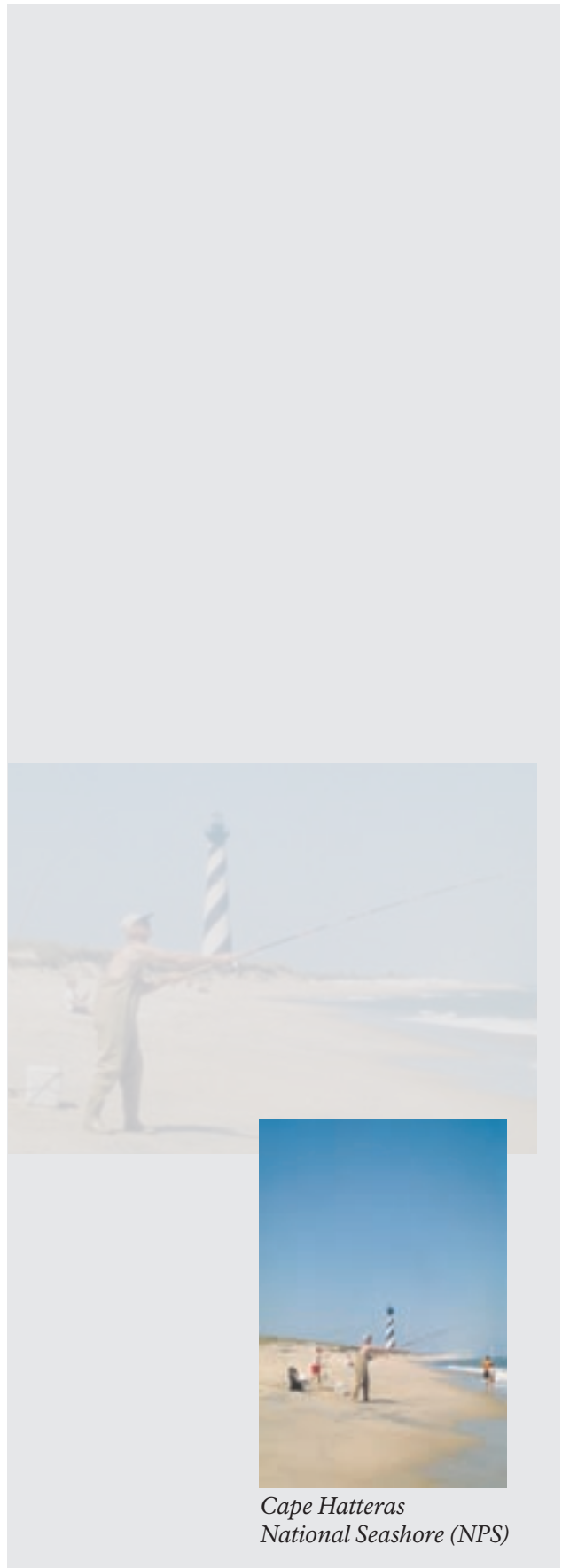
Pine Savanna Restoration Project (Moore's Creek National Battlefield). The Fisheries Management and Marine Conservation Program has been actively overseeing fisheries population and habitat restoration activities in a number of parks, working with States in the cooperative development of several Fisheries Management Plans, and assessing and supporting opportunities for the cooperative establishment of marine protected areas.

PEB staff has also provided the lead...and NPS policy review of the water-related aspects of 28 NPS planning documents.

In addition, the Fisheries Management and Marine Conservation Program developed a coastal watershed assessment strategy in FY 2003 and initiated Phase I coastal watershed assessment pilot studies for eight South Atlantic and Gulf Coast units of the National Park system, including Cape Hatteras National Seashore, Cape Lookout National Seashore, Cumberland Island National Seashore, Fort Pulaski National Monument, Timucuan Ecological and Historic Preserve, Gulf Islands National Seashore, and Padre Island National Seashore.

PEB is also proud of the numerous opportunities we have had to serve parks directly by providing technical support at the request of park staff. More than 60 opportunities to work directly with park and regional staffs in activities ranging from issues assessment and proposal development to implementation of new field techniques are summarized in a later section of this report.

The Planning and Evaluation Branch is honored to be part of the National Park Service and looks forward to being of continued service to the units of the National Park system during FY 2004. ♥



*Cape Hatteras
National Seashore (NPS)*

Coral Reef Monuments Gain Momentum

*Cliff McCreedy,
Marine Management Specialist
Planning and Evaluation Branch,
Washington, D.C.*

On February 27, 2003, Secretary of the Interior Gale A. Norton announced that regulations to protect the new Virgin Islands Coral Reef National Monument and the expanded Buck Island Reef National Monument would go forward. Her statement at the U.S. Coral Reef Task Force meeting in Washington, D.C., marked a critical change in management and protection of coral reefs in the Virgin Islands parks. The new monuments were created by Presidential Proclamations in January 2001 to restore these coral reef ecosystems and replenish fish and shellfish populations. Designed to be managed as fully protected marine reserves, the monuments finally became effective with Secretary Norton's announcement and promulgation of regulations in May 2003.

"The conservation of our coral reefs is a high priority at the Interior Department," Secretary Norton said. "These 'rain forests of the sea' are not only breathtaking but they are also storehouses of immense biological wealth. We will be protecting them against damage by careless boat anchoring and all extractive uses except some traditional fishing."

WRD Marine Management Specialist Cliff McCreedy worked closely with NPS Office of Policy and Regulations on finalizing the regulations and Notices of Intent for General Management Plans for the new monuments and Virgin Islands National Park.



Elkhorn coral (Acropora palmata) at Virgin Islands National Park (M. Patterson, 2002)

The new 12,708-acre (5,147-ha) Virgin Islands Coral Reef National Monument was established to increase protection of marine resources adjacent to Virgin Islands National Park on St. John, while the Buck Island Reef National Monument on St. Croix was expanded from 880 acres (356 ha) to more than 19,000 acres (7,695 ha). Recreational boating, snorkeling, and SCUBA diving are encouraged, but anchoring requires a permit at Buck Island Reef National Monument, and is not allowed at Virgin Islands Coral Reef National Monument. Fishing for blue runner and baitfish in limited portions of Virgin Islands Coral Reef National Monument is the only form of fishing allowed.

Two recent joint studies by Dr. Caroline Rogers of the U.S. Geological Survey and Dr. Jim Beets of Jacksonville University identified low biomass and numbers of species and individuals of finfish and shellfish. Ironically, Rogers and Beets reached the conclusion that species composition and numbers of fish, lobsters, and conch are no greater inside Virgin Islands National Park, where one would expect greater species protection, than outside park boundaries.

In 2003, McCreedy worked with Buck Island Reef NM Chief of Resources Zandy Hillis-Starr in developing a survey strategy and Natural Resource Preservation Program

(NRPP) proposal to assess the condition and possible recovery of coral reef fish and invertebrates in the Buck Island Reef no-take marine reserve. Success of these new reserves greatly depends on effective monitoring, enforcement and scientific evaluation of their performance over time. Funding from the NRPP program will support the Buck Island project and its collaboration with NOAA.



Biotech Kimberly Woody records sizes of conchs at Buck Island Reef National Monument (P.A. Mayor, 2003)

Scientific collaborations and interagency partnerships will be critically important to NPS ocean park managers. Hillis-Starr and scientists with the National Oceanic and Atmospheric Administration's (NOAA) NCCOS Biogeography Program have been collaborating since January 1999 to map and document benthic habitats and marine species in the existing and expanded Buck Island Reef area. In 2004 they will intensify their work, using a NOAA research vessel, equipment, and scientists. Virgin Islands Coral Reef National Monument plans similar surveys of fish and invertebrate populations. These efforts will evaluate coral health, document previously harvested species of fish and marine invertebrates, and shed light on their possible recovery in the reserves.

All the Virgin Islands parks are highly popular destinations for tourists to

enjoy beautiful landscapes above and below water. Each is developing general management plans (GMP) beginning in 2004. Development of GMPs and outreach and education will be critical to designing the future of these parks in collaboration with fishers, local communities, the tourism industry, and the Virgin Islands territorial government. ♥

Wetland Mitigation Partnerships: Opportunities for Funding Wetland Restorations in National Parks

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

There is renewed interest in improving park water resources by working beyond park boundaries, within the entire watershed, in order to effect positive changes. Parks are creating partnerships with public and private entities in efforts to tap into the constant source of compensation funding produced by the wetland protection and mitigation permit processes. Local, state, and federal wetland protection statutes require compensatory mitigation for permitted impacts to wetlands. If alternatives are shown to be ecologically superior, the permittees can compensate within the watershed, off site of where the impact occurs. If a park is in the same watershed and park resource managers are aware of their wetland restoration needs, then they can sometimes work with the permittees to complete the restoration on park property at no cost to the park.



*Manassas Battlefield: Wetland Restoration
(Bryan Gorsira 6/03)*

The restoration being done by the Smithsonian Institute at Manassas National Battlefield Park is a great example. The Institute is creating a new facility that will impact wetlands at Dulles Airport, which is within the same watershed as the park. Bryan Gorsira, Natural Resource Program Manager, worked with Institute staff to find an appropriate compensatory mitigation site within the park. The Institute has funded the complete restoration to its 1862 condition of a park-owned, 104-acre site (of which 45 acres are wetland).

The Manassas project is an example of how parks can have their critical habitats restored by an individual partner in need of compensation credit. In watersheds with numerous partners in need of compensation, a third party partner can establish a mitigation bank on park land to satisfy the compensation demand.

The banking concept is simple. As part of the U.S. Army Corps of Engineers 404 permit process, land developers that destroy wetlands in and around the watershed are required to compensate for the loss. Wetland bank sponsors restore the physical and ecological functions of a degraded wetland within the park, and the Corps grants the sponsor credits for the improvements. Land

developers can purchase the credits they need from a bank in order to compensate for wetland losses incurred at their development sites.

The advantage of this program is that it concentrates the resources that would ordinarily be dedicated to creating small, scattered, wetland restorations into one large, well planned restoration bank project. The restoration is funded, constructed, monitored, and managed for several years by the bank sponsor; the park retains ownership of the restored wetland; the park maintains controlling interest in the project design and construction; and the quality of the restoration is guaranteed by the banking process.



*Manassas Battlefield: Wetland Restored
(Bryan Gorsira 10/03)*

The banking approach to restoring a park's resources is especially applicable at Prince William Forest Park, which occupies approximately 58 percent of the Quantico Creek watershed in Prince William County, Virginia. Because of its management responsibility, the park tries to influence the change in surrounding watershed land uses in order to effect positive environmental influences on the park. George Liffert, Resource Protection Specialist, recognized the opportunity to improve the conditions of the entire watershed. George requested help from WRD in implementing a wetland

mitigation banking program that would allow the park to improve wetland conditions in the park and in the surrounding sub-watersheds that affect the park.

One option is to create a wetland mitigation bank (completed by a sponsor) comprised of wetlands restored within the park, but the park does not have enough restoration area opportunity to attract a third party banker. The second option is to create a preservation bank that would be designed to use credit sale funds to preserve undeveloped adjacent land. The results would benefit the park indirectly and the watershed directly. Although preservation banks were considered, the park preferred to pursue the third option—to improve the health of the fish habitat in Quantico Creek, positively affecting the PRWI park watershed fishery. We identified an opportunity for a banker to restore 300 feet of riverine wetlands located downstream from the park and recover their construction costs and profits by selling credits.

As with many of our parks, we anticipate that incremental loss of wetlands from surrounding land development will continue to adversely impact watershed health and the health of park resources. Producing successful change beyond park boundaries requires motivation and resourcefulness from park staff in their search for the right opportunities and partners. Park staff should continue to think outside the park by identifying opportunities to implement wetland banking and other collaborative partnerships with private and public entities. ♥

Focus On The Future: Water Resources Planning In The Context Of Overall Park Planning

*David L. Vana-Miller, Water Resources Planning Program Team Leader
Don P. Weeks, Hydrologist
Planning and Evaluation Branch*

The Water Resources Planning Program has been operating essentially the same since 1991 with the continued development of Water Resources Issues Overviews, Water Resources Scoping Reports, and Water Resources Management Plans (WRMPs) for units across the national park system. While this program has been successful, all programs need an opportunity for self-evaluation and to make sure that their customers are satisfied with all aspects of the program.

We actually began this review with a special session at the 1999 George Wright Society. The objective of that session was to evaluate how well WRMPs satisfied the needs of particular parks (e.g., SACR, COLO, ACAD, BICY) once they were implemented over several years. The results of that session combined with our own research and evaluation since 1999 have convinced us that our small planning program must evolve to meet our customer's needs. This realization became more evident with recent changes in NPS planning (update of *Park Planning Program Standards*) and resource planning (draft *Director's Order 2.1: Resource Stewardship Planning*). These changes propose new planning documents, such as *Foundation for Park Planning and Management*, *Program Management Plans*, *Resource Stewardship Plans*, and a host of new terminology to be added to the lexicon of NPS planning, such as fundamental resources and values and fundamental desired future conditions. Our review of

these recent changes to NPS planning suggests that, on average, our products seamlessly fit in with the overall planning scheme, albeit with different emphasis and objectives. We need to flesh out further the ‘fit’ of our planning products into this new planning scheme. This may require revisions of our products to better meet goals and objectives; re-emphasizing some of our products that appear to meet the objectives of these new planning documents; and an analysis of the way(s) that our planning program dovetails with this new understanding of NPS planning.

Currently, we envision that the Planning Program’s signature product will be the *Water Resources Scoping Report* – the *Water Resources Management Plan* previously had that role. The *Scoping Report* will have a new section that describes the recommendations for future action that address the water resource issues delineated in the report. Individual parks can then compete for funding to define a cohesive water resources management program via the development of project statements for those recommendations. Additionally, our *Water Resources Issues Overview* is currently underused; however, this product could be an appropriate vehicle to accommodate the objectives in the *Foundation* document and *Resource Stewardship Plans*. During this fiscal year, we hope to solidify our thoughts such that we have a schematic view of our program and how it integrates into overall park planning. This schematic view would provide the basis for the development of water resource planning program standards and, ultimately, ‘new’ water resource planning guidelines. ♥

Understanding Hydrologic Hazards in Wrangell-St. Elias National Park and Preserve

*Don Weeks, Hydrologist
Planning and Evaluation Branch*

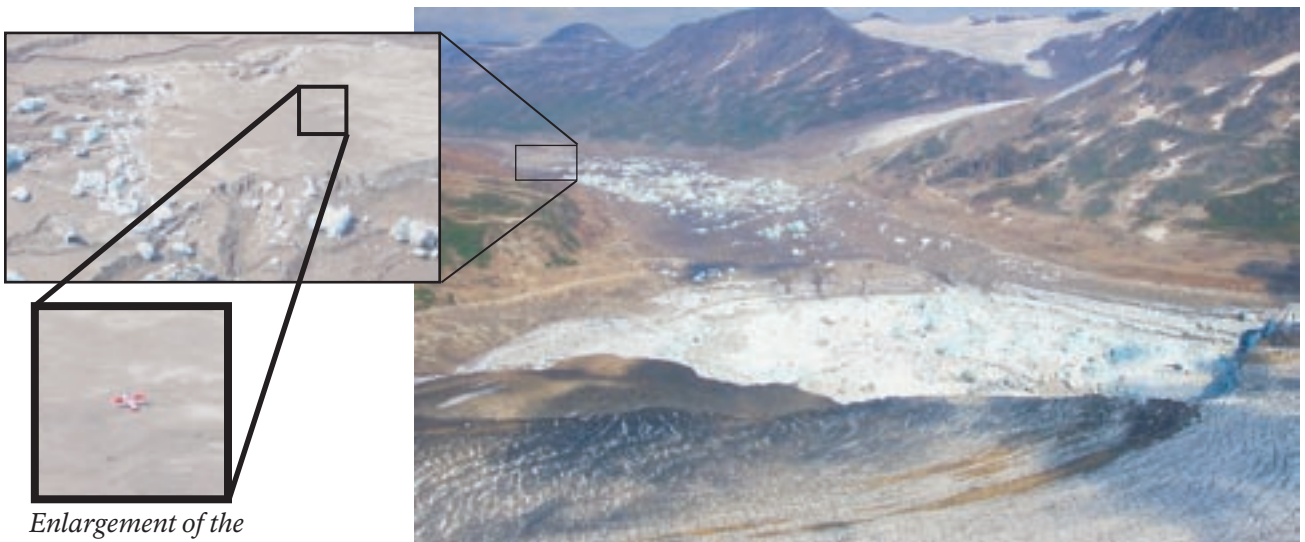
In response to a technical assistance request by Wrangell-St. Elias National Park and Preserve (WRST), the NPS Water Resources Division completed a Water Resources Scoping Report for WRST in 2003. WRST is the largest unit of the National Park system at 13.2 million acres. Here the Chugach, Wrangell, and St. Elias mountain ranges converge, producing the continent’s largest assemblage of glaciers and greatest collection of peaks above 16,000 feet (msl). These, in turn, spawn numerous fluvial systems at lower elevations. The park’s water resources are diverse and extensive, including wetlands, glaciers, icefields, marine coast, ground water, thermal springs, lakes, and large river systems.

Some of the more unique water-related issues captured in the scoping report are the hazards associated with natural hydrological processes. Lake outburst floods (jökulhlaups), landslides, snow avalanches, and advancing glacial systems are scattered throughout WRST and threaten property, transportation links, and human life.

In 2002, while flying in WRST with staff, we observed a flooded Tana River (Figure 1) when adjacent drainages were at relatively lower August-flow conditions. Flying upstream and over the glaciers that feed the drainage, we located the source; an empty Iceburg Lake that had just experienced a jökulhlaup, fueling the floodwaters of the Tana River. The lake is dammed by a glacier (Figure 3) with no historical record of draining prior to 1999. To witness this event from the air produced a new appreciation of the raw power, danger, and unpredictable nature of this particular hazard.



Figure 1. Tana River at flood stage (Weeks, 2002)



Enlargement of the survey airplane gives a sense of scale

Figure 2. An empty Iceberg Lake (looking upgradient), where stranded icebergs outline some of the original shoreline (Weeks, 2002)



Figure 3. Iceberg Lake looking down gradient toward the glacial ice dam (Weeks, 2002)

Another hazard that occurred during the 2002 field visit was the damming of Russell Fjord by the Hubbard Glacier along the coast of WRST. In the summer of 2002, the advancing glacier blocked the entrance to Russell Fjord from Disenchantment Bay, forming a 39-mile long lake. During the blockage, water continued to flow into the fjord, causing the water level to rise a half foot per day, accumulating to over 60 feet behind the ice wall. If the water had continued to rise, Russell Fjord would have begun draining southward into the Situk River drainage (outside of WRST's boundary), increasing the average river discharge tenfold, altering a world-class fishery, and inundating national forest and private lands. Fortunately, the ice dam broke in August 2002 before this could happen and released an estimated peak discharge of 1.8 million cfs into Disenchantment Bay.



Figure 4. Hubbard Glacier after ice-dammed waters are released from Russell Fjord into Disenchantment Bay (NPS, 2002)

The NPS objective is to develop a better understanding of these natural processes in order to better protect life and property. Studies and research are being conducted on several glacier-dammed lakes in WRST to better predict outburst events. The NPS is part of two interagency teams—one team (including the U.S. Geological Survey and the U.S. Forest Service) provides research and technical expertise for the Hubbard Glacier

hazard while a second team (including the U.S. Forest Service) provides ongoing monitoring. Sharing the latest knowledge with staff and visitors on potential hazards in WRST continues to be a high priority. ♥

Survey of Plankton in the Green River at Mammoth Cave National Park

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The Green River originates in south-central Kentucky and flows northwest to its confluence with the Ohio River, draining about one third of the total surface area of the State. About 27 miles (43 km) of the river channel are within the boundaries of Mammoth Cave National Park (MACA). Natural flow patterns have been modified by Green River Lake, an upstream impoundment, and Lock and Dam 6, a structure located near the downstream boundary of the park. The former stores high flows that historically inundated floodplains and maintained the channel; the latter impounds the river within the park, resulting in conditions that are lentic (lake-like) rather than lotic (river-like).

Despite these changes, the Green River within MACA supports a diverse aquatic community. Native mussels (Unionidae) are of particular interest because they exhibit a high degree of endemism and because their filter feeding is critical for maintenance of river ecosystem processes. Unfortunately,

native mussels are threatened by the invasion of the exotic zebra mussel (*Dreissena polymorpha*). The zebra mussel has already been found in the Green River upstream and downstream of the park and most experts believe that it is only a matter of time before it appears in park waters. To date, there are no methods that have proven to be effective for preventing zebra mussel invasion elsewhere in the United States. The zebra mussel has typically out-competes its native counterparts, stripping the water column of plankton and causing conditions to become more oligotrophic (nutrient poor).



Figure 1. Lock and Dam 6 is located on the Green River downstream of the boundary of Mammoth Cave National Park (Larry Wilson, 2002)

Faced with this threat, MACA natural resource managers have supported studies to document baseline conditions for aquatic organisms in the Green River. While it may not be possible to prevent the zebra mussel from becoming established within the park, it is hoped that this information will allow NPS to assess impacts and evaluate recovery once viable methods of control have been identified.

From September 2000 through June 2002, researchers from the University of Tennessee, Knoxville conducted a NRPP funded survey of plankton in the Green River (a survey of aquatic invertebrates including

mussels was reported by Schuster et al. 1996). Survey results are reported in a Masters Thesis (Laughlin 2003). Plankton were sampled at three sites, selected to coincide with sites from the earlier invertebrate survey and to represent the three “flow-zones” that exist within the park: the “free-flow” zone is located the farthest upstream; the impoundment-zone is the reach in which Lock and Dam 6 have created an on-channel reservoir; the transition zone is located between the free-flow and impoundment zones. Plankton samples were collected during six periods to characterize seasonal changes and the effects of dam operations on water level and flow.

Zooplankton were collected by making vertical and horizontal tows with 153-micron and 80-micron mesh plankton nets (Figure 2); phytoplankton were collected by filling a 1 liter bottle just above the Secchi-disk transparency level.



Figure 2. Sampling zooplankton in the Green River with a horizontally towed plankton net (Justin Laughlin, 2002)

Twenty taxa were identified from zooplankton samples. Many of these were not true zooplankton but benthic organisms subject to drift in rivers and streams. Density for all taxa combined ranged from 0.01 to 0.46 organisms per liter. Among the true plankton, the Cladoceran, *Bosmina*

longirostris, and the Copepod, *Mesocyclops edax* (Figure 3), were the most abundant. Twelve phytoplankton taxa were identified over the course of the study. The genus *Chorella* was the most abundant comprising over 95% of the cells in all samples. Density for all phytoplankton taxa combined varied several orders of magnitude from 1.3×10^3 to 1.6×10^6 . The most important factor affecting density was believed to be flow.



Figure 3. The Copepod *Mesocyclops edax* is one of the most common zooplankton found in the Green River in Mammoth Cave National Park (Justin Laughlin, 2002)

Relatively low densities and evidence of limited reproduction by zooplankton, support the hypothesis that the Green River within MACA does not exhibit a true river plankton community (potamoplankton); rather, the plankton community is transient (tachyplankton) and dependent upon inputs from upstream reaches and tributaries. Characterizing this community and assessing its response to zebra mussels will require frequent sampling, scheduled to reflect the effects of variation in flow and other factors. In addition it is recommended that the park establish and maintain a long-term plankton database to support future efforts to conserve and restore native mussels.

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WATER OPERATIONS BRANCH HIGHLIGHTS

*Bill Jackson, Ph.D., Chief
Water Operations Branch*

As recently as six years ago, the primary role of the Water Operations Branch (WOB) was to provide senior-level technical support to parks in the areas of water quality management, hydrology, and water resources data management. Subsequently, new resources substantially increased NPS's ability to address its water resources information and management needs, requiring WOB to assume ever greater responsibilities formulating and managing new Servicewide programs.

- In 1998 a new \$2.4 million water quality partnership was funded by the U.S. Geological Survey specifically to assist NPS with water quality assessment needs. WOB now co-administers that program with the U.S. Geological Survey.
- In 2001 an increase in the Natural Resource Challenge (NRC) enabled a new water quality monitoring program (\$1.75 million in FY 2003 funds) that currently is being administered by WOB through the NPS Vital Signs Monitoring Networks.
- In 2001 the Servicewide Inventory and Monitoring (I&M) Program began support through WOB of a "level 1" baseline water quality inventory program in parks which had poor information on water quality.
- In 2002 the I&M Program initiated a project within WOB to develop a complete water bodies inventory and water bodies designated use and impaired waters classification for all parks.
- In 2003 a new program supported by the I&M Program and administered by WOB provides for the acquisition, through agreement with the U.S. Geological Survey, of 1:24,000 scale National Hydrographic Datasets (NHD) for all NPS units.
- In FY 2003 an NRC increase was obtained to assess the condition of park watersheds, including wetlands, uplands, streams and riparian areas, and coastal and marine resources. In time this new program, to be administered by WOB, will not only enhance park-based planning and restoration programs, but will greatly enhance the Park Service's capabilities to address reporting requirements under the DOI strategic plan.



Yosemite National Park (NPS)

WOB's program leadership, management, accountability, and reporting responsibilities have increased substantially. These new programs and opportunities are exciting for all of us, and the changes are clearly for the better for the park units we serve.

Even with new program management responsibilities, WOB continued to provide high-quality technical assistance to parks on issues where our specialized expertise is especially relevant. A few noteworthy examples are:

- Issuance of a *Directors Order (72-2)* and Procedural Manual on Floodplain Management.
- Assistance in development of personal watercraft monitoring plan for Lake Mead NRA and Glen Canyon NRA.
- Technical review of studies to evaluate alternative discharge locations for the Las Vegas sewage treatment plant at Lake Mead.
- Analysis of water supply alternatives in remote areas of ten NPS units, including Dinosaur NM, Grand Teton NP, Buffalo NR, Big Bend NP, and Capitol Reef NP.
- Technical support to Yosemite Valley planning and Merced River restoration.
- Technical support to development of a sediment management monitoring program for Elwha River dam removal at Olympic NP.
- Participation on the ground water committee evaluating alternatives for management of a uranium tailings pile at Moab, UT.
- Technical review of a discharge permit for the Washington, DC, water supply aqueduct.
- Technical assessments in support of numerous aquatic resource restoration projects, including spring restoration (Big Bend NP, Death Valley NP), wetland restoration (Minuteman NHS, Saratoga NB, Rocky Mountain NP), playa restoration (Big Bend NP), disturbed land restoration (Golden Gate NRA), and stream restoration and stabilization (numerous parks).
- Evaluation of flood mitigation alternatives at Manzanar NHS.
- Support to development of a flood warning system at Haleakala NP.
- Participation in the development of the Colorado River Annual Operating Plan.
- Participation in the development of the DOI Strategic Plan Landscapes and Watersheds goal.

The short articles which follow elaborate on some WOB accomplishments in FY 2003. We hope you will continue to view WOB as a source of assistance in addressing your water quality, hydrology, watershed management, and water resources data management needs. And, as always, we value your feedback and suggestions. ♥

River Management on the Missouri

Richard Inglis, Hydrologist Water Operations Branch

Lewis and Clark would not recognize much of the modern day Missouri River. When they launched their “Corps of Discovery” in 1804 there were no lakes, dams, dikes, or revetments along the banks. One special surviving reach is managed by the National Park Service as the Missouri National Recreation River (MNRR), established under the Wild and Scenic Rivers Act in 1978 and 1991. Since then, the Park Service and its partners have been working with the U.S. Army Corps of Engineers to preserve the outstandingly remarkable values inherent in this distinctive portion of this otherwise ever disappearing national resource.

Part of the original character of the Missouri River was its multitudinous sandbars, snags, backwater areas, shifting channels, and extensive floodplains. Diverse habitats and unique species have adapted to those ecological niches. Further channelization in response to upstream dams and construction of streambank erosion control structures continue to impact the last remnant ecosystems. The river is no longer free to adjust laterally across its floodplain. Thus, old floodplain forests no longer erode freely into the river, and new floodplain sites for the establishment of new forests are no longer being created. The elimination of the fluvial processes that promote floodplain forest development, establish backwaters

and sloughs, create islands and sandbars, and deliver large organic debris to the river are no longer operating at anything close to pre-dam scales. These processes are the backbone to the diversity of habitats that provide for a rich and abundant assortment of wildlife.



Missouri River at Gavins Point Dam (Jackson, 2003)

A major challenge to river managers is to reconcile the MNRR's legislative mandates to provide for bank erosion control, but to do it in a way that preserves the river's outstandingly remarkable values. A significant effort to address the rip-rap issue is occurring in a process called the Cumulative Effects of Bank Stabilization EIS on Section 33 of the Water Resource Development Act. The Section 33 program is a Congressional effort to mitigate impacts downstream from dams. This EIS is led by the Corps of Engineers with NPS as a cooperative agency. Scoping sessions brought out a diverse array of issues from state and federal agencies concerned with the amount of bank stabilization continuing to be built in the river. WRD has participated from the beginning of this project by providing technical expertise in the field of hydrology and geomorphology and assisting park staff in reviewing and commenting on many proposals to modify the river environment.

Multiple mandates and expectations have been assigned to the Missouri River by Congress, including navigation, flow regulation, flood control, and hydropower production. In addition, property owners along the banks need to be redressed when the river shifts its course. The Missouri River is now a regulated river that is not likely to see floods like those of a century ago, but the MNRR is still a unique place with opportunities for recreation, preservation of cultural features, and river wildlife habitats.



Missouri National Recreational River (Jackson, 2003)

Preserving those features and processes that support the essence of the river as it was selected by Congress as part of the Wild and Scenic River system is an overriding goal and challenge shared by WRD and MNRR. Managing a component of the Wild and Scenic River system with so many conflicting purposes is a continuous, inordinately complex process that could not have been imagined by the original "Corps of Discovery." ♡

Sensitivity and Detection Limits For Field Measurements

*Roy Irwin, Ph.D.,
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Generic guidance for the NPS Vital Signs monitoring program appropriately specifies that “statistical detection limits, given typical sample variability and chosen sample sizes, shall be low enough to insure that such threshold values or trigger points can be detected” (Outline for Vital Signs Monitoring Plans, 2003, <http://science.nature.nps.gov/im/monitor/docs/monplan.doc>). However, accomplishing this goal typically requires controlling sensitivity on at least two levels:

1. Statistical/study design sensitivity of multiple measurements to detect a change and
2. Measurement sensitivity relevant to individual measurements.

This is true for water quality monitoring in general, not just for Vital Signs Monitoring.

In water quality assessment, measurement sensitivity has long been considered a basic quality control data quality indicator. In chemical labs, measurement sensitivity has historically been addressed by controlling semi-quantitative detection limits that were usually rigorously defined in the context of either “99% confidence that the analyte concentration is greater than zero,” or “three times the signal-to-noise ratio of baseline noise.” In chemical labs, detection limits are considered a special case of measurement sensitivity at the lowest end of the practical measurement range and quantitative limits are 2 to 10 times higher than semi-quantitative detection limits.

There are logical reasons why chemical lab

detection limits for very hazardous chemicals should be calculated differently and more rigorously than for other parameters. Some anthropogenic contaminants (such as dioxins, PCBs, etc.) can be hazardous even at extremely low levels. In the absence of contamination by man, there is often little or no signal that such contaminants are present. Accordingly, in relatively clean areas monitoring for these contaminants will often produce results of “less than” very low detection limits. Confidence that concentrations are really below these very low levels needs to be high for chemicals that are regulated at very low levels.

Field measurements of pH, dissolved oxygen, conductivity, and temperature, present a different situation in that such measurements do not usually produce “less than” (below detection limits) results. There is usually a measurable amount of pH, conductivity, or temperature present, whether or not contamination is present. Likewise, individual biological (or habitat condition) judgments usually result in a value rather than a result of “less than” a detection limit. Although it has not been consistently done in the past, quality control basics demand that we control measurement sensitivity in all scientific measurements (including field measures).

In water quality assessment, measurement sensitivity has long been considered a basic quality control data quality indicator.

For most field measures or observations, the more rigorous laboratory methods to determine detection limits are often not applicable or practical. In some cases, measurement uncertainty can be used to estimate how small a change in a measured result can be believed to be a true change of the value, rather than a reflection of

measurement errors or uncertainties. However, in other cases measurement uncertainty can also be difficult or impossible to estimate. In such cases, the only relatively simple options we have left to estimate measurement sensitivity include the following:

1. For a semi-quantitative detection limit, three times the sample standard deviation of at least seven replicate precision samples at the lowest measurable concentration (or other “signal”) to estimate measurement sensitivity as a Limit of Detection (LOD) and;
2. For a quantitative detection limit, ten times the sample standard deviation of at least seven replicate precision samples at the lowest measurable concentration (or other “signal”) to estimate measurement sensitivity as a Limit of Quantification (LOQ).

Since these two phrases sound a bit like the more sophisticated chemical lab detection limits, the monitoring or study plan should make it clear that these detection limits are based on precision replicates only.

Compared to lab analyses of hazardous chemicals, for most field measures it is less critical that technicians obtain the absolutely lowest signal value standard reference material before estimating LODs or LOQs. If all measurements are within the range of high and low calibration standards, the emphasis does not need to be on using the absolute lowest standard one might find, but rather on using one of the lower easily-available (and still practically useful for calibration) standards. So if it is too hard to determine which reference materials or environmental samples reflect the lowest concentrations or signals, just pick some that are relatively low or are typical of the range being measured. Perform replicate measures on those.

For example, in the case of specific conductance/conductivity one might accept a readily available calibration standard (say a calibration standard of 1413 uS/cm) as a readily obtainable and reasonably relevant calibration standard on the lower end of the scale (though not the absolute lowest standard that could be found). Due to cross-contamination issues, lower standards are typically not practical for calibration use. It is therefore reasonable to use the 1413 standard for estimations of LODs and LOQs. Using a readily available and practical calibration standard makes it more likely that field measurement sensitivity will be estimated.

Estimating LODs and LOQs from multiples of the standard deviation of precision samples is also possible for biological, ecological, and habitat measurements or observations, if one accepts the lower end of the range of observations as the “lowest measurable concentration” (or signal).

On the level of single measurements, consideration of detection limits or alternative forms of measurement sensitivity should be factored into detailed water quality monitoring plans. On the level of multiple measurements, statistical/study design sensitivity to detect a change should also be considered. More detailed discussions of monitoring statistical design concerns can be found at <http://science.nature.nps.gov/im/monitor/protocols/wqPartB.doc>. ♥

Project To Develop A Summary Compendium of Watershed Condition Assessment Methods

*Bill Jackson, Ph.D., Chief
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Team Leader
Rick Inglis, Hydrologist
Water Operations Branch*

Through the Natural Resource Challenge, the NPS Water Resources Division received in FY 2003 a base increase to conduct Watershed Condition Assessments on a system-wide basis. First year budget allocations and program accomplishments are discussed elsewhere in this report. A major project initiated in FY 2003 through cooperative agreement through the Chesapeake Watershed Cooperative Ecosystem Studies Unit and George Mason University is the development of a compendium and analysis of watershed condition assessment methods.

Watershed Condition Assessment (WCA) involves applying a set of descriptive and/or quantitative indicators to describe ecosystem health at the watershed scale. Typically, methods developed to do this integrate assessments of discrete ecosystem components (such as wetlands, streams, and riparian areas) and summarize this information at a variety of landscape scales to develop broader statements of watershed condition. Methods vary in such things as purpose and scale, indicator selection, information requirements (and technical rigor), and information synthesis. Some methods, such as the Habitat Evaluation Procedure (HEP), Index of Biological Integrity (IBI), Hydrogeomorphic Approach (HGM), and Riparian Proper Functioning Condition (PFC) are in fairly common use. However, many dozens of methods also exist in the literature and are advocated by

different agencies, states, etc. for evaluating such things as wetland condition, stream and riparian condition, upland watershed condition, forest and rangeland health, and water quality.

The compendium and analysis of condition assessment methods will be conducted by an interdisciplinary team organized by George Mason University and comprised of 5 principle investigators, each with expertise related to different watershed systems and representing different geographic regions. The team will conduct a thorough review of both the published literature and agency and foundation manuals to prepare a summary compendium of methods available to assess conditions both of specific watershed subsystems (such as wetlands, uplands, or riparian areas) and methods to develop a synthesis of watershed health at broader landscape scales. The compendium will not only summarize the methods and their appropriate use but will also contribute a professional assessment as to each method's strengths and weaknesses and to its applicability to the National Park Service. Guidance will be developed for NPS to help select appropriate methods to address specific assessment needs. Funding for the new watershed assessment program will then become available to conduct assessments of watershed conditions in parks.

Development of a program of watershed condition assessment is timely because NPS is contemplating revitalizing its resource management (stewardship) planning process. It is anticipated that a program that implements methods identified through the compendium project will contribute to higher quality plans, and enhanced condition information should assist parks in identifying priorities for resource protection and restoration. ♥

Assessing Flood Hazard in Channel Islands National Park

*Kim Johnson, Hydrologist
Water Operations Branch*



Santa Cruz Island's Central Valley (NPS, 2003)

In January 2003 Water Operations Branch staff traveled to Channel Islands National Park to perform flood hazard assessments at three development locations on Santa Cruz Island—Scorpion Creek, Prisoner's Cove, and Smugglers Creek. Flooding in the Channel Islands occurs periodically and is usually the result of a large synoptic scale winter storms that yield large amounts of rain over a period of several days. The runoff events associated with these rainstorms often carry a heavy sediment load that can exacerbate flooding. The geology of Channel Islands is quite unstable and naturally prone to flooding, mud and debris flows, and mass failure.

The Scorpion Creek basin is the most geomorphically unstable of the basins visited. As a result of unstable geology and years of heavy grazing, there are many small to medium-sized slumps on hillsides throughout the watershed. As a result of mass movements and subsequent fluvial sediment transport, floods in the watershed cause rapid aggradation of the channel and loss of flow capacity. The channel has been

excavated many times in the past to restore capacity after flood events. The area had received significant damage due to a large flood as recently as 1997.

Cross-sections of the channel and floodplain were surveyed at a historic adobe structure, the campground, and just below the confluence with a small creek. A longitudinal profile of Scorpion Creek was also surveyed.

Near the historic adobe the capacity of the channel is small relative to flood flows and the floodplain is relatively flat. As a result, the structure is well within the 100-year floodplain. Therefore, continued channel excavation after floods will likely be necessary to protect the structure and the park may have to periodically repair flood damage to the adobe.

The Scorpion Creek basin is the most geomorphically unstable of the basins visited.

The campground was also determined to be within the 100-year floodplain. However, risk to humans is low since floods occur in winter (when visitation is low) and heavy rainfall can be predicted fairly well. The park is developing a plan for warning and evacuating campers when flooding seems likely.

At Prisoner's Cove a visitor contact station, a campground, and a maintenance yard may be built near the pier. One site for the visitor contact station is a historic warehouse. The warehouse was determined to be within the 100-year floodplain. The maintenance yard may be constructed near an existing well house. This area is also within the 100-year floodplain. No one particular site was specified for the campground, so the WOB staff offered general guidelines for placing the campground in an area with relatively low flood hazard.

The Smugglers developed area is in a setting very similar to the Scorpion area. However, mass movements and channel sediment transport are much less prevalent here, leading to reduced risk of channel aggradation during flood events. The adobe structure in this area is not at great risk for flooding. However, a potential campground area is within the 100-year floodplain. The park will develop a plan for warning and evacuating campers when flooding seems likely if the area is indeed developed as a campground. ♥

Agency Collaboration in Support of Water Quality Monitoring

*Barry Long, Hydrologist
Water Operations Branch*

The National Water Quality Monitoring Council is a national oversight group of 35 representatives from federal, state, tribal, local and municipal governments, watershed groups, academic institutions, and the private sector, including volunteer monitoring organizations. The purpose of the Council is to provide a national forum for coordination of consistent and scientifically defensible methods and strategies to improve water quality monitoring, assessment, and reporting. The Council promotes partnerships primarily to foster collaboration, advance the science, and improve management within the water quality monitoring community and, secondly, to heighten awareness, public involvement, and stewardship of our national water resources. The Council was formed in 1997 as the permanent successor to the Intergovernmental Task Force on Monitoring Water Quality. The Council is chartered as a subgroup of the Advisory Committee on Water Information under the Federal Advisory Committee Act. The Advisory

Committee reports to the Secretary of the Interior. The National Park Service has been an active member of the Council since it was formed. For additional information about the Council and their activities see <http://water.usgs.gov/wicp/acwi/monitoring/>.

During the last several years the Council has promoted and supported the establishment of state and regional monitoring councils, funded and organized four national monitoring conferences (the 4th conference is scheduled for May 2004 in Chattanooga, TN), developed a National Environmental Methods Index for method selection and comparison of method parameters, developed a recommended set of Water Quality Data Elements for reporting and comparing water quality monitoring results, and developed and promoted a position on laboratory and field accreditation in coordination with the National Environmental Laboratory Accreditation Conference. In addition, the Council has published two technical reports—related to performance-based laboratory methods and data analysis considerations in producing comparable information for water quality management purposes—and adopted a resolution leading to an agreement between the Environmental Protection Agency and the U.S. Geological Survey on STORET/NWIS data exchange.

Recently, the Council has been involved in developing a framework for water quality monitoring from which consistent and comparable water quality information can be produced. To facilitate the communication of the concept of a “monitoring framework,” the Council developed a graphic to convey the extent and interconnectivity of the major components involved in a larger systems view of water quality monitoring. The monitoring framework focuses on the flow of information through a series of activities that build upon the earlier steps to produce and convey water information. Council

members and other water professionals developed a series of papers explaining these concepts that ultimately were published in the American Water Resources Association's IMPACT journal in September 2003. It is interesting to note the similarities between the Council's monitoring framework and the National Park Service's Natural Resources Challenge water quality monitoring program. Many of the same components exist in both programs—by design, not coincidence. ♥

WRD Completes Six Month Evaluation of Water Quality Monitoring Instruments

*Pete Penoyer, Hydrogeologist
Water Operations Branch*

The Water Resources Division (WRD) has completed a side-by-side demonstration and comparison of three of the leading vendor's multiparameter water quality instruments (called "sondes" when bundled sensors are integrated into a single instrument). The testing included:

- In-Situ MP Troll 8000 sonde
- YSI 6820 (6 Series) sonde and 650 MDS handheld display
- Hydrolab Datasonde 4a with Surveyor 4 handheld display

These tests occurred at four parks and at the Fort Collins, CO, office of WRD between August 2001 and May 2002. Testing of these higher-end, multiparameter, water quality monitoring instruments for application in continuous/synoptic monitoring modes reflected the existing technologies in widespread use at the time.

Additional follow-up instrument evaluations were performed by WRD in 2003 as new products were released or vendors made available other water quality monitoring

instruments in their product line. These included the Hydrolab Quanta and the YSI 600 XL, which are commonly used in synoptic monitoring, and the newly released In-Situ MP Troll 9000 with Pocket Situ hand-held display, which in 2003 replaced the MP Troll 8000 tested earlier.

The five test sites in the initial side-by-side comparisons were located in Indiana, Arkansas, California, and Colorado at:

- Indiana Dunes National Lakeshore (INDU) - Long Lake
- Buffalo National River (BUFF) - Bear Creek tributary
- Whiskeytown-Shasta-Trinity National Recreation Area (WHIS) - Whiskeytown Lake
- Rocky Mountain National Park (ROMO)
- Big Thompson River in Moraine Park
- Water Resources Division (FOCO) - water lab and adjacent storm water retention pond

The waterbody types and monitoring conditions found at the four parks are a small, yet representative subset of the freshwater monitoring environments that NPS networks will encounter when conducting either continuous or intermittent (synoptic) water quality monitoring of the "core parameters" under the Vital Signs Monitoring Program of the Natural Resource Challenge. Test conditions involved month long (or longer) continuous deployment periods under a variety of flowing and non-flowing natural water body conditions (reservoirs, lakes, streams, and ponds). Shorter time deployment intervals (days to a week or more) under conditions of the WRD lab (sink water bath) also provided a more controlled test. Testing under marine conditions was not done but may be considered in the future. However, much of the more general information already gathered about these monitoring systems should also apply in marine monitoring.

Instruments were evaluated for the purpose of assisting Vital Signs networks in future procurement decisions as they proceed through Phase III of the water quality component and begin to implement water quality monitoring in parks. The focus of these field evaluations was the instrument's measurement of temperature, specific conductance (conductivity), pH, and DO—the “core” water column parameters adopted by WRD for Servicewide implementation. Continuous turbidity and Chlorophyll measurements were also made at several test sites.

The purpose of the instrument evaluation was to provide a first hand qualitative to semi- quantitative assessment of several components of these monitoring systems with the help of park and cooperative agency staff prior to implementation of network-based monitoring programs. A primary goal was to determine each test participant's overall equipment preference based on a variety of factors. These included:

- 1) overall ease of use of each vendor's instrument and monitoring system package (hardware and software)— participant's likes and dislikes;
- 2) the apparent measurement accuracy (precision and bias) and sensitivity of sensors;
- 3) the durability, reliability, and utility of each sonde and individual sensor over time;
- 4) overall confidence in parameter measurements (agreement of values measured) when three (or sometimes more) instruments are measuring the same parameter at the same location and time;
- 5) sensor degradation and measurement repeatability after long periods of use; and
- 6) quality control (or measurement checking capabilities) offered by a vendor's software package in making each parameter measurement.

WRD anticipates compiling a list of “lessons learned” from these tests supplemented by the experiences of network staff as they deploy this equipment in their own monitoring programs. WRD continues to maintain contacts with these vendors to stay abreast of technological improvements. We hope to serve in the role of clearinghouse for a web-based sharing of the lessons learned by networks to avoid common pitfalls in the use of this equipment that can lead to lost or poor quality data, unnecessary instrument down time, or costs associated with sensor damage or shorter sensor life.

WRD acknowledges and thanks the park and cooperator participants who made this evaluation effort possible through their donation of time. In-Situ Inc., Hydrolab Corporation (Hach), and YSI Inc. also made generous loans of equipment and provide calibration standards, technical support, training (including onsite instruction), and follow up support (on-line services, emails, and phone calls) to make these evaluations possible.

For further information on these tests, examples of test data, copies of instrument use summaries equipment/vendor ranking results, and to obtain/share information on lessons learned in deployment of these water quality monitoring devices, please contact Pete Penoyer at 970-225-3535 or pete_penoyer@nps.gov. ♥

WRD Developing Database to Track Water Quality Performance Management for NPS and DOI Strategic Plans

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*John Christiansen, Research Associate
Water Operations Branch*

The Government Performance and Results Act (GPRA) seeks to make the federal government more accountable to the American people for the tax dollars it spends and the results it achieves in attaining mission-critical work requirements of the agency. The act is implemented by federal agencies through the development of goal-based strategic plans and annual performance plans, and attainment of the goals is tracked largely through requirements for annual performance reporting. The Department of the Interior (DOI) is complying with GPRA by developing a performance management system that provides useful information to managers and promotes accountability for results. DOI and its bureaus have developed several strategic goals related to the Department's mission-critical natural resource management responsibilities. One water resources management goal requires its bureaus to track the percent of DOI managed surface waters that are meeting Clean Water Act (CWA) water quality standards. Tracking and reporting on the performance in attaining the target for this goal requires an accurate inventory that spatially quantifies the surface water hydrography that each bureau manages and a procedure to determine and track which waterbodies are or are not meeting water quality standards.

To facilitate Servicewide performance management tracking and reporting for the DOI and the NPS strategic plans, the Water Resources Division (WRD) is constructing

a Servicewide database that contains the results of park-specific inventories of surface-water hydrography and water quality impairments. The inventory is based on the U.S. Geological Survey 1:100,000 and 1:24,000 scale (when available) National Hydrography Dataset (NHD). NHD is a comprehensive set of digital spatial data representing surface water features. In addition to yielding such information as miles of streams, NHD also provides a framework for linking water-related data to its reaches. WRD is using this framework to house the water quality impairment portion of the water resources inventory. Section 303(d) of the CWA is currently serving as the criterion for defining water quality impairments in the inventory. Section 303(d) requires States, territories and authorized tribes to develop a list of water quality limited segments, commonly referred to as the "303(d) list." The 303(d) impairment information in the water resources inventory is continually being updated and is mostly current through the 2002 303(d) listing cycle. As high resolution and Alaska NHD become available, WRD anticipates incorporating this data into the water resources inventory in 2004. WRD also anticipates attributing the water resources inventory for water quality standard State designated uses in 2004 as the EPA progresses with their geo-referencing efforts and to utilize data collected through the Natural Resource Challenge Water Quality Monitoring Program for tracking attainment of the water quality goal. The water resources inventory will be made available for viewing and feedback on the WRD website in early 2004. Feedback from the inventory will be used in determining the best available hydrographic statistics for inclusion in the Natural Resources Management Assessment Program (NR-MAP). ♡

Development of a River Bank Management Program Cuyahoga Valley National Park

*Gary M. Smillie,
Hydrology Program Team Leader
Water Operations Branch*

WOB has provided consultation and review in the development of a programmatic environmental assessment that evaluates the potential environmental impacts of a proposed river bank erosion management program at Cuyahoga Valley National Park (CUVA). Initially established as Cuyahoga Valley National Recreation Area in 1974 with redesignation to National Park status in 2000, CUVA was established to preserve and protect the historic, scenic, natural, and recreational values of the river and adjacent lands. Given this mandate, park management is tasked with balancing the need to protect cultural resources located near eroding stream banks while, at the same time, promoting natural processes and functions related to the river and floodplain.

The Cuyahoga Valley was important to commerce in early American history because it provided a transportation corridor vital for the movement of products to market. However, the river itself was too swift and shallow to be passable by large boats or barges. In the 1820's the Ohio and Erie Canal was constructed adjacent to the banks of the Cuyahoga River and provided the needed transportation conduit. Canal boats were pulled by horses or mules which walked along a towpath between the river and canal. The usefulness of the canal was short-lived, however, as a railroad was introduced to the valley in 1880. The rail line ran, for the most part, on the opposite bank of the river from the canal. Rail service in the valley continued into the twentieth century with passenger service ending in 1963 and freight service ending in 1985. The rails are still in

place today and are used by the Cuyahoga Valley Line Railroad in the summer and fall for scenic, recreational service. Both the towpath and railway are listed on the National Register of Historic Places and, as such, require preservation and protection.

*...park management is tasked
with balancing the need to protect
cultural resources...
while ...promoting natural
processes and functions related to
the river and floodplain.*

The Cuyahoga River within the park flows in a relatively narrow valley and is generally bounded on one side by train tracks and the other by the tow path. The river is alluvial in nature, meaning the river bank and bed are largely comprised of particles that can be mobile during high flows. As with any alluvial river, the Cuyahoga is inherently dynamic with its natural behavior characterized by migration within the confines of the valley bottom. The tendency for the river to erode banks, particularly in the outside of bends, may have been accelerated by human activities but is a natural component of river function in this environment. Unfortunately, the processes of lateral migration of the river come into conflict with the historic infrastructure located on adjacent over bank areas. Traditionally (before NPS ownership), bank hardening and stabilization were performed to protect the towpath and rail line. In recent years, the NPS has been reluctant to continue the bank stabilization process but has needed to continue this activity on a case by case basis to protect cultural resources. As a part of this effort, CUVA staff has monitored eroding portions of the bank for about ten years, resulting in a valuable record of relative rates of erosion in proximity to cultural resources.

The intent of the programmatic

environmental assessment (currently undergoing public review) is to provide a comprehensive framework by which decisions regarding bank stabilization can be made. The overriding tenet to the river bank management program is to take actions that disrupt natural river processes only when there is no other, river-sensitive alternative available. Additionally, when such actions are deemed essential, a step by step process is provided to ensure that the most minimal acceptable solution is determined and ultimately implemented. When finalized, this approach will provide a rational method to arrive at erosion solutions consistent with the balance required by park management mandates and, perhaps just as importantly, may provide a template which other NPS river parks may utilize to guide similar decisions. ♥

Servicewide Water Quality Information Management Program Update

*Dean Tucker, Ph.D.,
Information Management
Program Leader
Water Operations Branch*

Ensuring the integrity of park water quality, due to its importance in sustaining natural, aquatic park ecosystems and supporting human consumptive and recreational use, is fundamental to the mission of the National Park Service. An important element in this protection strategy is tracking water quality status and trends through an active program of data collection, management, and analysis. The foundation for such a program has been established by the Natural Resource Challenge and the implementation of Vital Signs Networks to collect data on key waterbodies in parks and the adoption of the Environmental Protection Agency's (EPA) STORET national water quality

database (<http://www.epa.gov/storet/>) as the Servicewide data archive. To further support the development of this database infrastructure, the Water Resources Division's (WRD) Water Quality Information Management Program has undertaken several projects which will be briefly discussed below.

STORET Data Migration

In cooperation with the Servicewide Inventory and Monitoring (I&M) Program, the WRD has uploaded historical water quality data collected by parks, contractors, or cooperators to STORET so the data can be summarized in Baseline Water Quality Data Inventory and Analysis Reports. This created a large repository of over 2.5 million water quality observations from more than 17,000 locations in or near national park units. When EPA modernized STORET in 2000, the architecture of the database changed completely, rendering it somewhat incompatible with old (now called legacy) STORET. Although users of new STORET are now able to fully document the entire sampling process, from collection to analysis, that underlies each water quality result stored in the system, the EPA made the strategic decision not to convert the data in old STORET (which houses data collected up through 1998) to new STORET because of the significant metadata required to store results in the new system and other issues. Agencies with data in old STORET could convert their data to the new system if they provided the metadata and did the significant conversion themselves. In late 2001, the Water Resources Division (WRD) decided to convert its legacy data to new STORET and engaged the services of Gold Systems Inc., which had already successfully migrated legacy data from several states to new STORET. To support the technical aspects of the data migration, WRD provided information about projects, programs, sample collection procedures, analytical methods, parameters/ characteristics, and other information.

Gold Systems had never undertaken such a complicated migration. After many fits and starts, the data are finally in STORET version 2 and WRD staff is reviewing the accuracy of the migration. If the migration is successful, the data should be available in new STORET (http://www.epa.gov/storet/dw_home.html) in early 2004. At this time WRD will commence uploading to new STORET a large quantity of water quality data compiled since legacy STORET stopped supporting data entry. ♥

Baseline Water Quality Data Inventory and Analysis Report Procedures Redevelopment

***Dean Tucker, Ph.D., Information Management Program Leader
Water Operations Branch***

When EPA adopted the new STORET architecture, the software and procedures that had been developed to download, format, and analyze data from old STORET and produce Baseline Data Inventory and Analysis (“Horizon”) Reports were rendered obsolete. New software and procedures were needed to download, format, and analyze data from modernized STORET, legacy STORET, the U.S. Geological Survey’s National Water Information System, and other sources in order to produce Baseline Water Quality Data Inventory and Analysis Reports for approximately 40 parks that have yet to receive a report and to update previously issued reports as desired. These reports are one aspect of the joint Servicewide I&M Program and WRD effort under NPS-75 to ensure parks have water quality data for key waterbodies. In 2002, the WRD, in cooperation with the EPA, initiated a contract with Horizon Systems, Inc. and Research Triangle Institute to redevelop the report software and procedures. Unfortunately, progress has been slowed by

budgetary and technical issues. In FY 2003, additional resources were allocated to this effort and the contractors have completed some of the software and procedures. With the additional resources, all the software and procedures should be completed in FY 2004, enabling production of the remaining reports.

Base Water Quality Data Inventory and Analysis Reports Available on Internet

All Baseline Water Quality Data Inventory and Analysis (“Horizon”) Reports that have been completed to date are now available in Adobe Acrobat Portable Document Format (PDF) at <http://www.nature.nps.gov/water/horizon.htm>. The old report procedures resulted only in an analog document and Printer Control Language files of the tables and graphics that were included on disk with each report. Through significant programming and conversion, these files have been used to assemble the PDF version of the report which includes some features, such as color maps, that weren’t in the original analog documents.

Vital Signs Water Quality Database Templates and Software

Vital Signs Networks will soon be collecting water quality data on impaired, outstanding, and/or other key waterbodies in parks. The implementation plan requires that these data be entered into STORET. To support this process, WRD is developing Microsoft Access based templates to be used by the networks to enter the data in a STORET compatible format before transmitting the data to the WRD for final QA/QC and upload to new STORET. The project, station, and metadata templates are almost complete. Work will continue on these and the results template in FY 2004. During FY 2003, a software tool/utility, NPSCol2Row, was created. NPSCol2Row will be used to reformat historic/legacy database and spreadsheet tables from column-major to row-major format and to insert required

metadata in order to facilitate upload into STORET via the STORET Interface Module developed by Gold Systems for the EPA. ♥

NPS Partners to Create the High-Resolution National Hydrography Dataset

*Dean Tucker, Ph.D., Information Management Program Leader
Water Operations Branch*

The National Park Service's Water Resources Division and Servicewide Inventory and Monitoring Program began partnering with the U.S. Geological Survey (USGS) and others in FY 2003 to create the National Hydrography Dataset (NHD) for parks with significant resources. NHD (<http://nhd.usgs.gov/>) is a geographic database that interconnects and uniquely identifies all the stream segments (or "reaches") that comprise the nation's surface water drainage system. Included in NHD are hydrographic features such as streams, rivers, canals, lakes, ponds, reservoirs, springs, wells, and other hydrologic phenomena. NHD sports several features that render it superior to other standard hydrographic databases for cartographic applications, modeling, and data exchange. These features include:

- NHD assigns every reach (generally a stretch of stream or river from confluence to confluence) in the nation's surface water network a unique/unchanging 14 digit reach ID that enables users to link attribute data to their hydrography. These unique reach IDs (or "addresses") allow users to exchange their attribute data with other users and to perform reach addressing of point and linear events.
- NHD is a feature based dataset.
- NHD is watershed based (based on the 8-digit, 4th level USGS subbasins), seamless, and nationally consistent.

- All hydrologic features contain their federally recognized name from the USGS Geographic Names Information System.
- NHD includes centerlines for two-dimensional streams (those streams that have left bank and right bank representations) to facilitate network/hydrological routing. Also, two-dimensional streams can be colored/hatched to make a more cartographically appealing map.
- Every reach in NHD knows into which reach it flows. As a consequence, using the NHD toolkit, users can readily navigate the surface water network, selecting, for example, all reaches and/or tributaries above (or below) a certain point on the network.
- NHD is the new national hydrographic standard.

...high-resolution NHD already exists for more than 115 national park units.

Initially, NHD was created at 1:100,000 scale by the USGS and Environmental Protection Agency because source data existed nationally only at that scale. Users of this medium-resolution NHD data were quick to clamor for higher-resolution NHD, and the USGS launched an effort to create 1:24,000 scale (or even larger) NHD. The Water Resources Division and Servicewide Inventory and Monitoring recognized the benefits of NHD for use in managing aquatic park resources and the close fit between NHD and the NPS-75 Natural Resources Inventory and Monitoring Guideline's recommendation that parks should have water resources inventories that, among other things, include the locations and classifications of streams, lakes, springs, and wetlands.

During late spring 2003 NPS Regional GIS Coordinators were queried about priorities

for creating NHD for parks in their regions and whether any edits had been made to their standard hydrographic coverages (typically DLG files) that should be incorporated into NHD. A national priority list was subsequently compiled from the regional lists. During the summer the USGS began working from the list to create NHD for parks. As a result NHD is now complete at Point Reyes National Seashore, Golden Gate National Recreation Area, John Muir National Historic Site, and Bighorn Canyon National Recreation Area. Work has been initiated at Saguaro National Park, Organ Pipe Cactus National Monument, and several other areas. The NPS also contributed resources to facilitate the completion of NHD for all Alaskan parks.

Through the combined efforts of the U.S. Geological Survey, the U.S. Forest Service, and many states, high-resolution NHD already exists for more than 115 national park units. For the remaining parks, NHD exists in various stages of completion. These parks will be targeted for funding in FY 2004 and beyond to complete NHD for their subbasins based on the national priority list and opportunities to leverage funding with states and other agencies. In addition to standard coverage format, NHD will be available in geodatabase format in early 2004. ♥

WATER RIGHTS BRANCH HIGHLIGHTS

*Chuck Pettee, Chief
Water Rights Branch*

In 2003 the Water Rights Branch (WRB) saw milestones achieved which have strengthened partnerships and moved us closer to the resolution of contentious issues in three areas. In other parks the National Park Service (NPS) is exploring new ways to protect park stream-side riparian resources using mechanisms of State law.

In Nevada hearings have given way to implementation of monitoring, management, and mitigation plans which have been developed cooperatively with water development interests. Rulings issued by the Nevada State Engineer have confirmed his support for this approach to resolving issues which are created by the insufficiency of available technical data. In Colorado the NPS entered into an agreement with the Colorado Water Conservation Board, Bureau of Reclamation, and U.S. Fish and Wildlife Service which sets a path to resolve the reserved water right for the Black Canyon of the Gunnison National Park. An article that follows explains the complicated tangle of issues being scrutinized in the process. In Oklahoma the State has modified the requirements for exporting water from the Arbuckle-Simpson aquifer in a way that clarifies the intent to protect existing water uses and enhances their reliance on sound science. An article that follows describes water rights activities in the Arbuckle-Simpson aquifer which supplies water to the springs and streams at Chickasaw National Recreation Area.

As a part of the Black Canyon of the Gunnison National Park settlement mentioned above, the Colorado Water Conservation Board has filed for an in-

stream flow water right that would protect high peak flows that are reasonably expected due to the operation of the Aspinall Unit reservoirs on the Gunnison River. In North Dakota, the WRB is collecting data to protect riparian resources along the Little Missouri River in Theodore Roosevelt National Park, a State-designated Scenic River. Read about this study in an article that follows.

...any successes accrued by the WRB would not be possible without the professional work of park management and staff.

In Arizona, the NPS has, for the first time, filed an in-stream flow water right application under State law. One of the following articles describes NPS efforts at Saguaro National Park to protect base flows in Rincon Creek under Arizona law.

The NPS continues to participate in general water rights adjudications. We added a settlement agreement for Coronado National Memorial (San Pedro River Adjudication) to the growing list of resolved adjudication issues.

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

Pending Water Right Application Chickasaw National Recreation Area

*Jennifer Back, Hydrologist
Water Rights Branch*

On September 17, 2002, Carolyn Sparks submitted an application for a permit to use 3,191 acre-ft of ground water from the Arbuckle Simpson aquifer in Johnston County, Oklahoma. The application identifies eleven proposed wells that will be used to irrigate a pecan orchard. The location of the proposed wells is about 6 miles east of the historic Travertine District of Chickasaw National Recreation Area. Two freshwater springs, Buffalo and Antelope Springs, are located near the eastern boundary of the park. The source of the water discharging at the springs is the Arbuckle Simpson aquifer.

The National Park Service (NPS) is concerned about proposed development of the Arbuckle Simpson aquifer. The park was created to protect springs on lands once owned by the Chickasaw Nation. Past studies have indicated that withdrawals from the aquifer may affect spring flow at the park. Therefore, NPS protested the granting of the permit.

This is the first water right application to come before the Oklahoma Water Resources Board (OWRB) under the authority of Senate Bill 288, which was passed by the State Legislature in June 2003. Senate Bill 288 is the first legislation in Oklahoma to recognize the connection between ground water and surface water. Under this bill, the applicant for a permit to use ground water must demonstrate that the proposed withdrawal will not reduce the natural flow of water from springs or streams that emanate from a sensitive sole source aquifer. This designation is made by the EPA for aquifers that provide the primary water supply to a

community where there is no other viable source or supply.

A hearing on the permit application was held in October 2003 and continued in January 2004. NPS presented evidence demonstrating that withdrawals from the Arbuckle Simpson aquifer could cause reductions in water levels in the vicinity of Buffalo and Antelope Springs. NPS hopes that the permit will not be granted until a five year study initiated by the OWRB in cooperation with the U.S. Geological Survey is completed. A ruling on the permit application by the OWRB is not expected until March 2004. ♡

Paired Basin Study within Obed Wild and Scenic River Watershed to Assist in Determining the Impacts of Small Impoundments on Flow

*Jeff Hughes, Hydrologist
Water Rights Branch
Brad Bryan, Hydrologist
U.S. Geological Survey*

A proliferation of over 2,500 small to medium sized impoundments in the headwaters of Obed Wild and Scenic River (OBRI) has prompted park staff to request assistance from the Water Rights Branch (WRB) to determine the effects of these impoundments on the flow regime of OBRI's rivers and streams. While the effects of these impoundments are largely unknown, it is possible that streamflow and OBRI's Outstandingly Remarkable Values (ORVs) have been impacted.

OBRI is located on the Cumberland Plateau of East Tennessee in an area that averages over 50 inches of precipitation per year and has abundant water resources. As the population increases on the Cumberland Plateau, so too has the number of surface

water impoundments. Most of the impoundments constructed in this area are created for water supply purposes or for recreation and aesthetics and do not have the capability of controlling the release of water.

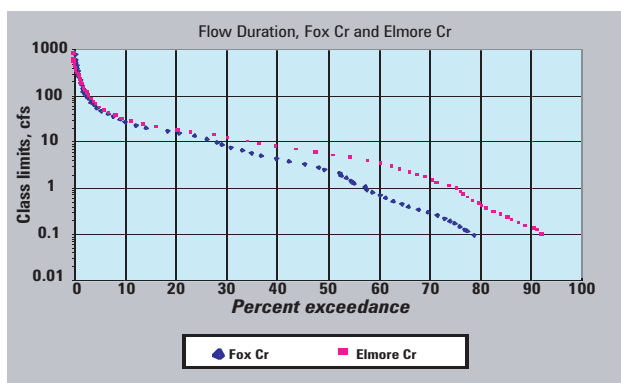
Little information exists in the scientific literature documenting the effects of numerous small impoundments on the hydrologic characteristics of streams. Therefore, NPS contracted with the U.S. Geological Survey to conduct a paired basin project designed to isolate the affects of impoundments on streamflow. This project, entitled "An investigation into the affect of impoundments on flow from headwater areas of the Obed River system," studies stream discharge characteristics of two small headwaters basins. These basins, both in the Obed River watershed, were selected because the Fox Creek basin comprises several small to medium-sized impoundments and the Elmore Creek basin contains so few and small impoundments that they are deemed inconsequential (and therefore assumed to have no effect). The basins are otherwise very similar in definitive characteristics such as geology, vegetation, soils, topography and elevation.



Brad Bryan of the USGS collecting discharge measurement on Fox Creek, Obed Wild & Scenic River (Hughes, 2002)

Instantaneous stream discharge and precipitation data were collected at monitoring stations in Fox and Elmore Creeks for two years. The stream gages measured runoff from 7.38 mi² of the Fox Creek basin and 7.82 mi² of the Elmore Creek basin. One rain gage was centrally located in each basin. The preliminary results show that during the late spring to early fall months the impoundments may affect flows significantly. The late spring to early fall period generally receives less precipitation than during the rest of the year, and therefore flow is usually low. It is thought that evaporation from water surfaces and transpiration from riparian vegetation is greater than the amount of water flowing into the impoundments, thereby causing outflow from the impoundments to cease. This theory is depicted in the attached flow duration curve which shows the difference in frequency of occurrence of discharge values recorded at the two gages. About 70% of the time Fox Creek has less water flowing than Elmore Creek. This divergence in flow usually occurs during the late spring to early fall low flow period.

These results have yet to be finalized by the U.S. Geological Survey and more analysis will be completed to verify this hypothesis. If the impoundments are found to significantly reduce low flows, then flora and fauna dependent on flow that are identified as park ORV could be adversely affected.



WRB plans to initiate other studies to determine the relationship between flow and specific OBRI ORV dependent on streamflow. This information will then be used to inform and influence State and Federal regulators responsible for regulating the construction of impoundments. If ORVs are already impacted, this information could be used to work with the regulators and impoundment owners to mitigate impacts to the park. ♥

Instream Flow Water Right for Rincon Creek at Saguaro National Park

*Paul Christensen, Hydrologist, and
Bill Hansen, Supervisory Hydrologist
Water Rights Branch*

In December 2002, the National Park Service (NPS) filed an application with the State of Arizona for an instream flow water right. The application is for Rincon Creek at Saguaro National Park and seeks to keep natural flows in the creek for the purpose of preserving and protecting riparian and aquatic ecosystems and recreational opportunities (Figure 1). The stream reach of interest to the NPS is located on recently acquired lands.

A riparian ecosystem is an ecological community associated with a water body, including both physical and biological components. The riparian ecosystem along Rincon Creek contains the only example of riparian forest within the park. The canopy associated with the forest is one of the rarest habitat types in Arizona, and more wildlife species utilize this habitat than any other in Arizona.

During the twentieth century, much of the riparian ecosystems in southern Arizona disappeared due to ground-water pumping and floodplain development. The riparian forest along Rincon Creek, which includes

wetlands and associated wildlife, depends on the intermittent flow of Rincon Creek and a shallow water table.

Private landowners and the Rincon Water Company withdraw ground water near the creek. The Company recently received permission to deliver a large amount of ground water out of the basin to a new subdivision. Nearby state lands could also be sold and developments constructed, thus requiring additional water supplies derived from local aquifers. It is unknown at this time if ground-water withdrawals have adversely affected or will adversely affect riparian and aquatic ecosystems and recreational opportunities.

To perpetuate the waters along Rincon Creek, the NPS chose to pursue a water right for instream flow maintenance through the Arizona Department of Water Resources (ADWR), which administers water rights in Arizona. If obtained and sufficient, such a water right (along with a monitoring program) would protect and preserve the water-related resources along the creek as well as ensure a water supply for local residents and downstream water users. The application was filed for “wildlife, including fish” and recreation purposes as authorized by state law. Arizona does not recognize water rights for riparian vegetation. Because wildlife depends on riparian vegetation and riparian vegetation has recreational value, riparian vegetation can be tied to both wildlife and recreational purposes. ADWR has formulated rules for obtaining instream flow rights. The rules require that the applicant collect streamflow data and submit a report that supports the discharge rates requested in the application.

The NPS has initiated a cooperative study to collect information and conduct investigations to support the instream-flow application. Cooperators include the Rincon Institute, private landowners and

consultants, the University of Arizona, Saguaro National Park, the Water Resources Division, and the Intermountain Region. The Rincon Institute located in Tucson, Arizona, supports the NPS’s proposed appropriation. The Institute strives to preserve and protect the natural resources of the east unit of Saguaro National Park and the Rincon Valley and was instrumental in obtaining legislation for the recent boundary expansion.

Cooperators and NPS staff are conducting studies to relate biota to the occurrence of water in Rincon Creek. Biota of interest includes herpetofauna (reptiles and amphibians), riparian woody vegetation, riparian emergent vegetation, and aquatic macroinvertebrates.



Figure 1. Pool in Rincon Creek, Saguaro National Park (NPS, June 2003)



Figure 2. Staff gages at pool in Rincon Creek, Saguaro National Park (NPS, June 2003)

Ground-water hydrology and ground-water/surface-water relations are also being investigated. The NPS installed two gaging stations in the spring of 2003 on Rincon Creek where pool levels are measured and recorded. Figure 1 shows the pool at Site A along Rincon Creek where stage levels are measured, and Figure 2 shows staff gages at the pool. ♥

Collaborative Watershed Management in Progress at Sleeping Bear Dunes NL

*Jeff Albright, Hydrologist
Water Rights Branch*

The Glen Lake/Crystal River Watershed is a small watershed (36 mi²) tributary to Lake Michigan and located in the northwest part of Michigan's Lower Peninsula. Forty percent of this watershed is managed as part of Sleeping Bear Dunes National Lakeshore (SLBE). The watershed includes lake, stream, and wetland features that are presently of high water quality and which support a diverse variety of ecological habitats. Substantial increases in

development and recreational use in recent years have generated concern about the continued ability to protect the health of water-dependent resources in this system. In addition, water management issues associated with Glen Lake and the Crystal River resulted in a lawsuit and subsequent 2003 court order that specified seasonal targets for Glen Lake water levels and Crystal River flows. The court order directed that an adaptive management approach, including monitoring and resource studies, be used to evaluate and modify those targets to achieve balanced protection of lake and river resources.

Four townships have jurisdictions overlying portions of the watershed, and a diverse community of citizens and stakeholder groups are actively involved in local environmental education and resource management issues. NPS is working with those entities to increase our knowledge base regarding lake and river resources—and the water quantity/quality characteristics important for their continued health. For example, NPS is participating in a technical committee established by the court to examine Glen Lake and Crystal River water needs. A three year, U.S. Geological Survey funded study (initiated in FY 2004) will improve knowledge of Crystal River hydrology and habitat conditions. Also in FY 2004, NPS will work with others on an annotated bibliography of historic lake and watershed data to identify additional research needs related to watershed health. Collaboration between NPS and other Glen Lake/Crystal River stakeholders is still in a formative stage. NPS is hopeful that scientific studies and continued cooperation among stakeholders will allow a range of community interests and concerns to be addressed and will contribute to balanced protection of watershed resources. ♥

*Floodplain Decay Study on the
Little Missouri River
Theodore Roosevelt National Park*

*Jeff Hughes, Hydrologist
Jennifer Miller, SCEP Hydrologist Trainee
Water Rights Branch*

A water right application filed in 2001 to withdraw water from the Little Missouri River to water a golf course initiated technical assistance from the Water Rights Branch (WRB). The proposed diversion is located less than three miles upstream of Theodore Roosevelt National Park (THRO) and would divert up to 11 cubic feet per second of surface water from the river. The NPS communicated concerns over the size of the proposed diversion, but the State granted the permit without satisfying the NPS concerns. Park and WRB staff met with the North Dakota State Engineer and his staff and discussed NPS water rights and the information needed by the State to protect NPS rights and water-dependent resources.

THRO staff identified the extensive riparian forests dominated by cottonwoods as an important THRO water-dependent resource, especially in the park's North Unit. These forests are located along the Little Missouri River where the river provides water for the trees to survive and periodic flooding plays a key role in the establishment of young cottonwoods and the development of floodplains they inhabit.

Cottonwoods require a bare, sandy surface to become established and grow. Floods large enough to erode existing banks and create new floodplains have occurred periodically throughout time along the river in the North Unit. The NPS wishes to gather information on the magnitude of flow and the frequency of occurrence of such flows that create new floodplains for cottonwood establishment in order to continue natural ecological

processes. The State will use this information to protect the park against future water development that could alter these processes.

Objectives: To determine the relationship between flow in the Little Missouri River and floodplain evolution and riparian vegetation dependent on flow, the NPS initiated a study with the U.S. Geological Survey that examines how past flow regimes have affected the floodplain habitat for the large, cottonwood dominated forests located in the North Unit of THRO. NPS will then compare the results at this site to similar data collected in other systems across the western United States (e.g., Scott et al. 1997; Friedman and Lee 2002; Shafroth et al. 2002).

Methods: A reach of stream was chosen that includes a 2 km reach studied previously by Everitt (1968). Aerial photos were acquired in 9"x 9" format with stereo coverage of the reach for each decade since the 1930's. Copies of the General Land Office survey notes with precise descriptions of the location of channel boundaries have also been acquired. The photos and maps will be scan-digitized, the channel boundary will be delineated on each photo and map, and these will be rectified to orthophoto quad maps using ARC/INFO. The rectified images will be combined to create a map showing ages of different portions of the floodplain. This product will be complimented by the map of tree ages prepared by Everitt (1968).

From these maps NPS will determine the historic variation in the rates of channel change and forest establishment (Friedman and Lee 2002). NPS will calculate the floodplain area/decay curve and document deviations from steady state. The area/decay curve shows that the amount of area occupied by a certain age class of floodplain decreases over time (Figure 1).

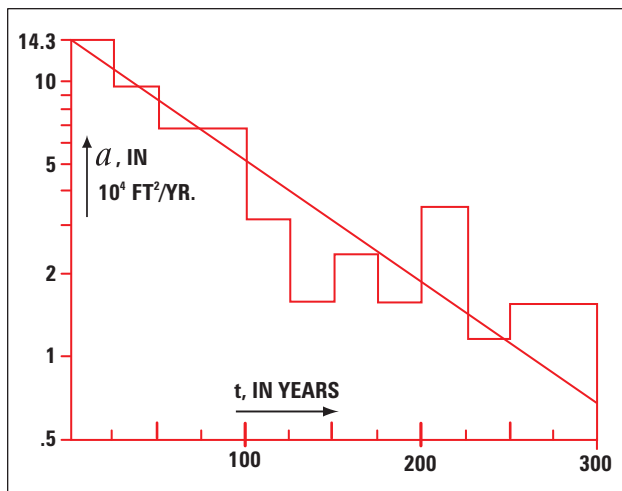


Figure 1. Area decay curve for the Little Missouri River in North Unit of Theodore Roosevelt National Park, ND (Everitt, 1968)

According to Everitt, the area/decay curve of the Little Missouri River floodplain can be expressed as an exponential decay model. Assuming constant channel migration over time, the model shows that older cottonwoods make up less of the floodplain area than younger cottonwoods. Studies have shown that forest density decreases

with stand age and that young and old cottonwoods are not mixed in the riparian forest structure (Friedman and Lee 2002). The rate of floodplain change calculated by Everitt shows that channel migration causing floodplain area destruction is offset by the creation of new floodplain areas in the form of point bars (Everitt 1968). This will enable NPS to relate historic variation in rate of channel movement and tree establishment to the flow regime. Results will document those aspects of the flow regime most important for maintaining channel migration and cottonwood establishment along the Little Missouri River. The study will also become part of a regional dataset that will assist the NPS in identifying flow needs for riparian ecosystems in the western United States.

In addition to the study described above for the U.S. Geological Survey work, the NPS has selected representative cross sections and will make a topographic survey of the cross sections to determine a more precise indication of channel movement and floodplain aggradation and degradation.



Figure 2. Young Cottonwoods growing on a bare floodplain along the Little Missouri River in Theodore Roosevelt National Park (J. Miller, 2003)

This survey will be completed once a year for a period of at least 10 years, and the cross sections will be compared. Information derived from the annual survey will be used to corroborate the results derived from aerial photography.

References:

Everitt, B.L., 1968. Use of the cottonwood in an investigation of the recent history of a flood plain. *American Journal of Science*. 266:417-439.

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Scott, M.L., G.T. Auble, and J.M. Friedman. 1997. Flood dependency of cottonwood establishment along the Missouri River, Montana, USA. *Ecological Applications* 7: 677-690.

Shafroth, P.B., J.C. Stromberg, and D.T. Patten. 2002. Riparian vegetation response to altered disturbance and stress regimes. *Ecological Applications* 12:107-123. ♥



Black Canyon of the Gunnison National Park (NPS, 1995)

Status of the Black Canyon Water Right

***Chuck Pettee, Chief,
Mark Wondzell, Hydrologist
Water Rights Branch***

The Black Canyon of the Gunnison, formed by the Gunnison River, is one of the most spectacular gorges in the world. No other canyon in North America combines the narrowness, sheer walls, and startling depths offered by the Black Canyon and associated Gunnison Gorge. The river drops an average of 43 feet per mile, with local drops as great as 240 feet per mile.

The unique geologic features of the Black Canyon and Gunnison Gorge attract hundreds of thousands of visitors each year. In addition to the excellent recreational opportunities for sight-seeing, hiking, camping, climbing, and wilderness solitude, the river provides outstanding opportunities for angling and whitewater boating. It is home to one of the finest trout fisheries in the world and is designated Gold Medal Water and Wild Trout Water by the Colorado Division of Wildlife.

In 1982 the Colorado Supreme Court confirmed a decision by Colorado's Division 4 Water Court (Water Court) to grant the United States (US) an unquantified Federal reserved water right, with a 1933 priority date, for instream flows in the Gunnison River for

the reservation purposes of Black Canyon of the Gunnison National Monument, now Black Canyon of the Gunnison National Park (BLCA). On January 18, 2001, the Department of Justice (DOJ), on behalf of the National Park Service (NPS) filed an application in Water Court to quantify the water right for the Gunnison River. This application (1) asserted the 1933 priority date; (2) claimed a year-round base flow and annual peak and shoulder flows (as a function of annual snow pack conditions); and (3) extended authority to the Secretary of the Department of the Interior (DOI) to exercise the right with full consideration of other federal bureau mandates, river management issues, and the interests of the State of Colorado (State) and other water users. The claimed flow amounts, which mimicked the ramping rates and timing, magnitude, and duration of a natural snowmelt hydrograph, are necessary to protect, maintain, and preserve the unique riverine environment, biological habitats, and the natural processes and ecosystem components of the Gunnison River.



Black Canyon of the Gunnison National Park (NPS, 1995)

Three hundred eighty-three parties responded to the US application with all but one filing statements of opposition to the NPS quantification. The US subsequently filed (and was granted) a motion by the Water Court to stay litigation proceedings to allow the US opportunity to pursue a negotiated

settlement with all interested parties. DOI instructed the federal bureaus to resolve differences internally prior to entering formal negotiations with the State and other water users. Over the next two years the U.S. Bureau of Reclamation (BOR), Western Area Power Administration (WAPA), U.S. Bureau of Land Management (BLM), and U.S. Fish and Wildlife Service (FWS) engaged in modeling efforts to assess the effects of NPS (and FWS) flow recommendations on water users and respective bureau mandates (e.g., hydropower, flood control, water development, threatened and endangered fish, recreational boating, angling, etc.). Unable to resolve differences among bureau missions (BOR and WAPA contended that NPS-requested peak and shoulder flows would jeopardize flood control, power generation, and future water development) and in response to concerns raised by the State and other water users, the DOI decided to amend the original water right application filed on behalf of the NPS.

On April 2, 2003, the NPS, Colorado Water Conservation Board (CWCB), BOR, and FWS signed an agreement to change the quantification claim for the reserved right to a year round base flow of 300 cubic feet per second (cfs) or the natural inflow, whichever is less, thereby excluding peak and shoulder flows from the federal reserved right application. This agreement relied instead on peak and shoulder flows that could be “reasonably expected” to occur as a result of operations of upstream reservoirs (i.e., BOR’s Aspinall Unit). The agreement also subordinated all but the 300 cfs base flow to full development of the Aspinall Unit. The CWCB agreed to appropriate instream flows for BLCA under state law with a 2003 priority date to protect the peak and shoulder flows that are released by the Aspinall Unit during the May through July period. This protection, however, would occur only in years that Aspinall Unit reservoirs are projected to “fill and spill.” Additionally,

the parties agreed to create an Enforcement Agreement that allows the US to enforce the conditions of the CWCB instream flow appropriation if the CWCB fails to do so.

Also on April 2, 2003, the United States filed with the Water Court a motion to amend its original quantification to reflect the terms and conditions set forth in the April 2, 2003, agreement (i.e., to amend its claim to set the reserved water right at 300 cfs). Opposers filed responses requesting that the US motion to amend its claim be denied, or at least held in abeyance, until the Court can conduct a hearing, preceded by discovery, to determine “the fairness, reasonableness and prejudicial effect of the proposed amendment and settlement agreement it embodies.” The US subsequently filed a reply to those responses, arguing that the proposed “motion to amend” is not to be construed as a settlement agreement and that issues raised are beyond the Water Court’s jurisdiction. Simply put, the US position was that the Secretary was acting fully within her discretion by balancing the needs and priorities of the different federal bureaus within the basin.

At the same time, and before the Water Court could rule, the environmental community filed a complaint in federal court alleging that by signing the April 2, 2003, Agreement the Secretary, the DOI, the NPS, and the Director of the NPS violated and/or failed to comply with numerous federal laws (e.g., National Park Service Act, Administrative Procedures Act, and National Environmental Policy Act), unlawfully disposed of Federal property, and unlawfully delegated authority and responsibility for protecting BLCA to the State. The Water Court then stayed proceedings pending the outcome of the Federal Court’s decision. The US filed a motion to dismiss the Federal case on the grounds that it is fully within the Secretary’s authorized discretion to amend the original NPS quantification. A decision is expected in Spring 2004.

Meanwhile, principal water users opposed to the original NPS quantification claim filed a complaint in Colorado Supreme Court alleging that the Water Court abused its discretionary authority by staying the Water Court case until the Federal Court has had opportunity to rule. The Colorado Supreme Court decision is also expected sometime in early 2004.

Finally, the CWCB is proceeding to implement the April 2, 2003, Agreement and voted on November 19, 2003, to file a water rights application in Water Court for an instream flow right for peak and shoulder flows through the BLCA. The actual application was reportedly filed with the Water Court on December 23, 2003; thus the right will hold a 2003 priority date. In summary, the water rights saga is proceeding on four fronts: (1) in Federal Court – where the environmental community has brought suit against the United States alleging failure to comply with federal laws and to adequately protect the resources of BLCA; (2) in Colorado Water Court – where the US motion to amend its original claim is officially stayed until the Federal Court issue (#1 above) is resolved; (3) in Colorado Supreme Court – where the water users are challenging the Water Court’s authority to stay the proceedings and hold the US motion to amend its claim in abeyance; and (4) the State of Colorado’s filing with the Water Court for an 2003 instream flow right. Stay tuned for further developments as 2004 will prove to be another exciting year for the Black Canyon. ♥

APPENDIX A TECHNICAL ASSISTANCE

TECHNICAL ASSISTANCE SERVICEWIDE

Assisted the NPS Budget Office in responding to requests from the Office of Management and Budget (OMB) and the General Accounting Office (GAO) relating to budget information pertaining to NPS.

Prepared NPS water-related program information and funding tables for the Office of Management and Budget OMB showing funding trends over time.

Prepared NPS water data tables and narratives for the General Accounting Office for a national water data survey report requested by Congress.

Provided a response to a request from the Commission on Ocean Policy, including detailed information on budgets, staffing, and physical assets (vessels, aircraft, and facilities) of the 40 ocean parks that contain submerged lands identified on the National Marine Managed Area Inventory.

Prepared the water-related sections of the Servicewide Comprehensive Call for FY 2004 projects. Planned and coordinated work group meeting to review, rank, and select project proposals for funding in FY 2004.

Revised *Director's Order #77-1: Wetland Protection* and submitted the new version to the Director for signature. The Director re-issued the Order on October 30, 2002.

Developed *Director's Order #77-2 : Floodplain Management* and submitted to the Director for signature. Authored the accompanying DO #77-2 procedural manual.

Participated in drafting the NPS guidance document "*Interim Technical Guidance on Assessing Impacts and Impairment to Natural Resources.*"

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

Assisted in the development of the new DOI Strategic Plan for Watersheds and Landscapes.

Assisted in the development of wetland and riparian elements of the Department of the Interior Strategic Plan "End and Intermediate Outcome Goals and Measures."

Assisted in the development of fisheries and marine resources elements of the Department of the Interior Strategic Plan "End and Intermediate Outcome Goals and Measures."

Supported the implementation of Servicewide Goal 1a4 of the NPS Strategic Plan by continuing to provide NPS input to the Department of Interior task force working to develop a water quality goal for the Department's Strategic Plan.

Assisted AS/FWP Craig Manson's office in developing the program and speakers for February and October 2003 meetings of U.S. Coral Reef Task Force.

Developed a Servicewide Watershed Condition Assessment Program Plan and initiated a cooperative project to review watershed condition assessment methods.

Developed a pilot coastal watershed assessment strategy and project plan as part of the Water Resources Division Servicewide strategy to assess watershed health in the National Park System and determine priorities for assessment, protection, and restoration.

Developed an Access-based NHD Tracking Database for monitoring the status of high-resolution NHD creation for parks and initiated a Task Order with the U.S. Geological Survey to begin creating NHD data for park catalog units/subbasins.

Coordinated with the U.S. Geological Survey, U.S. Forest Service, and individual parks to establish priorities and incorporate NPS hydrographic edits into NHD and provide source data.

Oversaw detailed Scope of Work for contracting the redevelopment of the software procedures employed to produce Baseline Water Quality Data Inventory and Analysis Reports for parks.

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

Provided overview of I&M water quality and water resource inventory themes and a tutorial at the Natural Resource Data Management Workshop in Fort Collins and provided materials for a surrogate presenter at a similar workshop in Hawaii.

Continued to coordinate the NPS – U.S. Geological Survey Water Quality Assessment and Monitoring (WQAM) Partnership Program. Reviewed proposals and final work plans for 15 project proposals selected for funding in FY 2003. Facilitated communication between U.S. Geological Survey districts and parks on planned project activities.

Served as official member of the National Water Quality Monitoring Council, representing NPS. Attended council meeting in Baltimore, MD, and ACWI meeting in Reston, VA.

Provided guidance regarding application of Floodplains Executive Order and Directors Order to Park, Region, and WASO representatives regarding directional drilling operations for oil and gas management adjacent to park lands.

Extensively revised, simplified, shortened, and improved Water Quality Vital Signs monitoring guidance for detailed study plans with QA/QC documentation.

Provided programmatic oversight and technical review of draft products of the WRD-I&M effort to prepare Water Quality Designated Uses and Impairment Status Reports for parks.

Participated on Colorado River Technical Work Group and in the development of the Colorado River Annual Operating Plan; assisted in briefing the Deputy Director and Assistant Secretary for Fish, Wildlife, and Parks on Colorado River management issues.

Continued advising NPS pesticide use/ IPM approval staff on various pesticide and chemical product issues and updating related handouts (ready to send to the parks upon request) on the subjects of deicers, dust suppressants, wood preservatives, and ammonia fate and effects.

Co-authored a case study describing the impact assessment process and impairment determinations for riparian/wetland ecosystems in the Middle Salt Creek Access Plan, Canyonlands National Park, for the Servicewide Resource Impairment Guideline.

Developed draft response for the Director of the Department of the Interior to Phillips Environmental Products on the introduction of exotic fungus for decontamination and deodorization of human waste in pit toilets.

Conducted numerous policy and technical reviews of construction projects for the Development Advisory Board.

Collated and synthesized WRD comments on proposed Department of Interior Code of Scientific Ethics.

Provided NPS peer review comments on NOAA climate and global change program proposal GC-03-397 entitled “Improving Management of Urban Water and Environmental Systems in the NE USA through Focused Analysis of Climate Variability and Change.”

Provided a policy review of the NPS Park Planning Program Standards (Reference Manual for DO-2).

Prepared NPS comments on a proposal by the Army Corps of Engineers and the Environmental Protection Agency to narrow the regulatory definition of “waters of the United States.”

Provided review and comment on draft DOI testimony on Senate Bill 525 dealing with aquatic nuisance species.

Served Contracting Officer’s Technical Representative for the investigation entitled “Use of semipermeable membrane devices to assess the presence and potential impacts of Polycyclic Aromatic Hydrocarbons Resulting from Recreational Snowmobile Use in National Parks”.

Developed, rebuilt, and maintained the Water Resources Division Nrintra Net Web Site.

Managed and maintained Water Resources Division Inside NPS Web Site.

Participated on the Natural Resources Web Team and in the redesign of the collaborative NatureNet Web Site.

Created Adobe Acrobat PDF-formatted versions of all 234 Baseline Water Quality Data Inventory and Analysis Reports

completed to date. The reports are available on the Internet at: <ftp://gisoi.nature.nps.gov/abli/data/nrdata/water/wq/docs/abliwqaa.pdf>.

Continued development of water quality database templates to facilitate entry of physical, chemical, and biological monitoring data at parks, networks, and WASO for upload to the US Environmental Protection Agency STORET database.

Created custom software to reconstruct a local Oracle-based version of STORET’s Legacy Data System from EPA provided CDs with county level water quality data to facilitate our own national queries.

Prepared documentation of water resource related data systems for the Natural Resource Data and Information Systems Handbook and several other national computer system inventories.

Continued the work required to migrate the NPS water quality data in legacy STORET to new STORET by supplying estuary and ocean names for stations occurring in those environments, time zones for all sampling results with recorded times, additional remark code interpretations, and other metadata to Gold Systems, Inc.

Compiled updated fish and shellfish species list from NPSpecies and began incorporating into NPS Fisheries Database.

Maintained “NPS Water Right Dockets” filing system and distributed docket files in CD-ROM format to Parks, Regions, and the Office of the Solicitor on an as-requested basis.

Presented Baseline Water Quality Data Inventory and Analysis Report effort at the 7th Missouri River Natural Resource Conference in Atchison, Kansas.

Represented the Water Resources Division at the Servicewide Inventory and Monitoring Program's semi-annual Inventory and Monitoring Advisory Committee Meeting in Port Angeles, Washington.

Attended ArcGIS and NHD Training hosted by the U.S. Geological Survey's National Mapping Division.

Attended meeting of the U.S. Geological Survey Central Colorado Assessment Project, a multi-year effort to provide comprehensive earth resource data and interpretations to allow Federal, state, and local land management entities to make informed land use decisions in central Colorado.

Toured the site of Colorado's largest wildfire with members of GRD and BMRD to view rehabilitation techniques and discussed the appropriateness of these methods for Park Service lands.

Provided outreach to a local high school by assisting teacher in class demonstration of water quality instrumentation and assisting students in making field measurements.

Represented NPS at the U.S. Geological Survey Hard-Rock Abandoned Mined Lands Workshop.

Continued to participate on the State Of Wyoming Total Maximum Daily Load Implementation Advisory Board and on the Federal Family Coordination Committee.

Represented the NPS in an interagency effort to develop common measures for wetland restoration costs across Federal agencies.

Represented the NPS on the Marine Managed Area (MMA) interagency technical committee in response to Executive Order 13158.

Represented the NPS in an interagency meeting of state and NOAA/NMSP staff to discuss coral reef and seagrass damage assessment and restoration techniques.

Developed cooperative plans with NOAA National Marine Sanctuary Program (NMSP) and organized a meeting on cooperative enforcement between NPS Law Enforcement personnel and adjacent NOAA National Marine Sanctuary managers.

Participated in NPS Coral Reef Restoration Advisory Team efforts to develop a guideline for coral reef restoration actions and a programmatic Environmental Impact Statement for reef restoration work.

Participated in Coral Reef Task Force Steering Committee meetings and provided input to the Ecosystem and Science, Monitoring, and Education and Outreach working groups.

Represented the NPS at an International Symposium on the management of tarpon and bonefish.

Provided oversight and logistics for NPS co-sponsorship of two interagency workshops: "Coral Reefs, Climate Change & Coral Bleaching" held from June 18-20, 2003, in Honolulu and "Caribbean Workshop on Managing Visitor Uses" held August 21-22, 2003, in St. Croix, USVI.

Organized two panels pertaining to the "Recreational Uses of Coral Reefs" and "Science and Coral Reef Management" convened at the February 2003 meeting of the U.S. Coral Reef Task Force.

Drafted project plan for NPS co-sponsorship of Caribbean Marine Protected Area Science Strategy Workshop with NPS Office of International Affairs and NOAA Marine Protected Areas Science Center.

Drafted national press release “Serious Fun in Ocean Parks in July” distributed by NPS Office of Communications to major daily newspapers nationwide, highlighting marine volunteer opportunities and programs in ocean parks.

Participated on WASO panel to screen Cooperative Conservation Initiative proposals for adherence to CCI criteria prior to submitting to Department of Interior, AS/ PMB Lynn Scarlett.

Facilitated the Servicewide Panel for the selection of the Director’s Award for Superintendent of the Year and Resource Protection through Facility Management Awards.

Supported the Western Division of the American Fisheries Society by serving as co-chair of the Western Native Fish Committee. This committee is undertaking a project to review the status of all native fish within the western regions of the United States and Canada, including NPS areas.

Represented the NPS at a Western Division of the American Fisheries Society meeting by participating in the Division’s Executive Committee meeting and holding a meeting of the Native Fish Committee.

Organized and chaired meetings of NPS wetland professionals at the George Wright Society conference, San Diego, CA.

Participated in organizing four NPS marine resources planning meetings at the George Wright Society conference.

Convened a round table meeting of NPS Fishery and Aquatic Biologists in attendance at the George Wright Society biennial meeting.

Presented talk on water right related approaches to quantify instream flows at

the National Wild and Scenic Rivers Act Interagency Training Course.

Gave presentation “Understanding and Protecting the Thermal Resource” at the January 2003 NPS Energy Summit.

Developed a priority list of water-related park focused volunteer opportunities for evaluation by the EASI partnership.

Developed and implemented a new General Cooperative Agreement with the American Fisheries Society to foster cooperative work and assistance within units of the National Park System.

Reviewed and commented upon the “Scope of Work and Request for Interest/Qualifications for the Assessment of Estuarine Nutrient Enrichment in NPS Coastal Park Watersheds - Southeast Atlantic and Gulf Coast” and the draft “Coastal Watershed Assessment RFP.”

Completed draft of a brochure that could be used by all parks to help educate the fishing public with regards to NPS native fish management and catch & release fishing techniques.

Developed outreach display for describing and interpreting coral reef Parks and coral reef science and management issues, with Natural Resource Information Division.

Worked with the Washington Office and Jean Lafitte National Historic Park and Preserve staff to have the NPS become a cooperating organization in “America’s Campaign to Save Coastal Louisiana.”

Participated on an organizing committee for an “Aquatic Protected Area Symposium” at the 2003 Annual Meeting of the American Fisheries Society.

Worked with the Isaac Walton League to co-sponsor “American Wetlands Month.”

Provided a presentation to the American Sport Fishing Association’s annual agency budget review on the NPS fishery program and FY 2004 funding initiatives.

TECHNICAL ASSISTANCE VITAL SIGNS MONITORING NETWORKS

GENERAL

Participated in the Meeting of the Networks at Washington D.C. and provided two presentations: Update on the Natural Resource Challenge Water Quality Monitoring Program and Level I Water Quality Inventory Update.

Investigated recurring Alaska park problems in obtaining stable pH measurements with multiparameter instruments in their low conductivity natural waters and coordinated response of instrument vendor.

Helped finalize Marine Work Group’s recommendations for set of marine/estuarine core monitoring parameters. See <http://science.nature.nps.gov/im/monitor/COREparamMarine.doc>.

Continued development of draft technical guidance for water quality monitoring protocols, recommended core parameters, detailed monitoring plans (including QA/QC), and water quality data management.

Continued testing of multiparameter instruments to support networks in their equipment procurement decisions. Summarized multi-parameter instrument testing results from four parks (INDU, BUFF, WHIS, and ROMO) and WRD demonstration participants. Conducted internet search to identify an

exemplary state water quality monitoring protocol for network guidance. Evaluated web sites and other pertinent sources of information that may be used as key references/guidance and handy calculators to facilitate network monitoring, data gathering, and reporting to WRD.

Appalachian Highlands Network

Reviewed Annual Administrative Report and Work Plan and Phase I Report.

Reviewed Phase II report and network annual administrative report and work plan.

Reviewed and commented on Annual Administrative Report and Work Plan. Prepared Report to Congress for the network. Provided fiscal oversight and management of network funds.

Central Alaska Network

Reviewed and provided comments to network and region on Central Alaska Network’s Phase I Vital Signs report.

Reviewed and commented on Annual Administrative Report and Work Plan. Prepared Report to Congress for network. Provided fiscal oversight and management of network funds.

Cumberland/Piedmont Network

Provided 4th level 8 digit subbasin shapefile for North Carolina and South Carolina, Natural Resource Conservation Service 14 digit subwatershed shapefile for South Carolina, and advice on hydrologic unit mapping.

Reviewed and commented on Annual Administrative Report and Work Plan. Prepared Report to Congress for network. Provided fiscal oversight and management of network funds.

Assisted other WRD staff in the review of the both Phase I report and Phase II monitoring plan.

Great Lakes Network

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

Provided national Baseline Water Quality Data Inventory and Analysis Report water quality metadata summary spreadsheet.

Reviewed and commented on Annual Administrative Report and Work Plan. Prepared Report to Congress for network. Provided fiscal oversight and management of network funds.

Reviewed Phase I report and served provided guidance on how to assess the quality of older data.

Greater Yellowstone Network

Provided Adobe Acrobat PDF versions of the Baseline Water Quality Data Inventory and Analysis Reports.

Provided a Powerpoint presentation for use by network staff on STORET and documenting water quality data as per the National Water Quality Monitoring Council's recommended guidelines.

Assisted the network by reviewing statistical and other aspects of University of Wyoming document entitled "Water Quality Monitoring in the Greater Yellowstone Network."

Reviewed GRYN draft Phase II water quality monitoring plan and reviewed and commented on GRYN Annual Administrative Report and work plan.

Gulf Coast Network

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

Heartland Network

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

Reviewed and commented on Annual Administrative Report and Work Plan. Prepared Report to Congress for the network. Provided fiscal oversight and management of network funds.

Reviewed Phase I report and assisted the network with planning for Vital Signs monitoring.

Reviewed, evaluated, and recommended changes to the model monitoring report "Inventory and Monitoring Model for the Heartland Inventory & Monitoring Network."

Mediterranean Coast Network

Reviewed and commented on Annual Administrative Report and Work Plan. Prepared Report to Congress for the network. Provided fiscal oversight and management of network funds.

Reviewed Phase I report and assisted in Vital Signs monitoring planning.

National Capital Region Network

Provided digital water quality data, station locations, and Adobe Acrobat PDF versions of the Baseline Water Quality Data Inventory and Analysis Reports. Provided feedback on a proposal to create water quality data input screens and analytical tools.

Reviewed and commented on Annual Administrative Report and Work Plan.

Prepared Report to Congress for the network. Provided fiscal oversight and management of network funds.

Participated in network water quality workshop to determine the most important/ appropriate/ feasible Vital Signs to be monitored in the network.

Reviewed Maryland Biological Stream Survey (MBSS) random sampling survey study design/statistical power basics and QA/QC basics and provided peer review comments.

North Coast and Cascades Network

Attended network meeting in Olympia, WA, to scope aquatic resource Vital Signs monitoring program.

Reviewed Phase II report and network annual administrative report and work plan.

Reviewed and commented on Annual Administrative Report and Work Plan. Prepared Report to Congress for the network. Provided fiscal oversight and management of network funds.

Reviewed progress report on WRD funded project entitled “Development of Stream Benthic Macroinvertebrate Biomonitoring Protocols for North Cascades National Park Service Complex and Adjacent USFS Lands.”

Northeast Coastal and Barrier Network

Reviewed and commented on Annual Administrative Report and Work Plan. Prepared Report to Congress for the network. Provided fiscal oversight and management of network funds.

Reviewed some proposed conceptual models and provided comments.

Participated in Northeast Coastal & Barrier Network Conference on Marine Protected Areas and edited a white paper on NPS

marine authorities for eight NPS units located within the Northeast Region.

Northeast Temperate Network

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

Reviewed and commented on Annual Administrative Report and Work Plan. Prepared Report to Congress for the network. Provided fiscal oversight and management of network funds.

Northern Colorado Plateau Network

Presented the Servicewide perspective at network water quality monitoring workshop.

Reviewed and provided comments to network and region on the network’s Phase I report and conceptual models related to Vital Signs monitoring. Provided the network with pertinent information on diurnal changes in metals concentrations in both water and sediment.

Provided digital water quality data, station locations, and Adobe Acrobat PDF and/or Microsoft Word versions of the Baseline Water Quality Data Inventory and Analysis Reports as well as a file of report references.

Provided Water Quality Designated Use and Impairment Reports for Colorado parks. Reviewed WRD task order for U.S. Geological Survey data synthesis and water quality monitoring plan development.

Reviewed and commented on Annual Administrative Report and Work Plan. Prepared Report to Congress for the network. Provided fiscal oversight and management of network funds.

Reviewed elements of contract proposal between NCPN and U. S. Geological Survey WRD Phase III Vital Signs activities.

Participated in the Northern Colorado Plateau I&M Network process to identify wetland and riparian indicators for Vital Signs monitoring.

Northern Great Plains Network

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

Served as WRD contact and assisted the network in planning for Phase I report and coordinating Level I inventories.

Pacific Island Network

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

Provided ArcView shapefiles of the study areas used in the Baseline Water Quality Data Inventory and Analysis Reports.

Reviewed the network's FY 2003 draft work plan. Met with EPA-EMAP staff in Florida in preparation for their helping the network and standardizing marine monitoring when possible.

Reviewed the lengthy document entitled "Quality Management Plan for Surface Water Quality Monitoring, Appendix A, Section II: Quality Assurance Project Plan Water Quality Assays of Hawaiian Coastal Waters" and provided interpretive comments useful to the network, as well as to all Hawaii coastal parks.

San Francisco Bay Area Network

Provided technical peer review comments on network plan Phase I report and additional comments on plans to redo Phase I report.

Sierra Nevada Network

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

Sonoran Desert Network

Reviewed and commented on Annual Administrative Report and Work Plan. Prepared Report to Congress for the network. Provided fiscal oversight and management of network funds.

Southern Colorado Plateau Network

Reviewed Annual Administrative Report and Work Plan. Reviewed WRD task order for U.S. Geological Survey water quality data synthesis.

Reviewed Phase II report and network annual administrative reports and work plan.

Southwest Alaska Network

Reviewed Annual Administrative Report and Work Plan.

Reviewed Phase II report and network annual administrative report and work plan.

TECHNICAL ASSISTANCE REGIONS AND PARKS

ALASKA REGION

Provided ARO technical assistance on water quality issues related to floatplanes.

Provided review and comments for EIS for DES-02/0049: Proposed Outer Continental Shelf Oil & Gas Lease Sales 191 and 199 in Cook Inlet, Alaska.

Cape Krusenstern National Monument

Reviewed and commented on Corps of Engineers Draft Interim Feasibility Report

addressing proposed port expansion options and navigation improvements to the Delong Mountain Harbor (Port Site).

Reviewed U.S. Geological Survey progress on study to determine impacts to various media (snow, water and stream sediment) related to metals contamination from activities in the Delong Mountain Transportation System haul road corridor.

Assisted in negotiations between the park and U.S. Geological Survey to facilitate progress on the Red Dog haul road project, including recommending additional sampling and reporting.

Assisted in the technical review of a risk assessment for the contamination of a road to Red Dog Mine.

Denali National Park and Preserve

Provided technical review and comment on a draft Floodplain and Wetland Statements of Findings for the park's Gravel Acquisition Plan.

Glacier Bay National Park and Preserve

Provided policy review and technical advice on the Glacier Bay National Park General Management Plan / Environmental Impact Statement Project Agreement.

Provided policy review and comment on the final EIS for the Falls Creek Hydropower Station development.

Provided technical assistance with park fishery issues and NRPC funded resource studies.

Katmai National Park and Preserve

Provided programmatic oversight and technical review of the draft Katmai National Park & Preserve Water Resources Management Plan.

Kenai Fjords National Park

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

Klondike Gold Rush National Historic Site

Surveyed 12 cross-sections of the Taiya River near Dyea in support of a project to design engineered logjams for bank protection.

Provided technical review and field inspection of a private bank stabilization project within park boundaries.

Reviewed Floodplain Statements of Findings for Sheep Camp Campground.

Lake Clark National Park and Preserve

Assisted in review and design of project titled "Characterize Water Quality, Hydrology and Aquatic Biology in the Kijik River Basin" (PMIS# 46782).

Sitka National Historic Park

Provided funding and other assistance for a water rights appraisal related to the Indian River.

Provided comments to park regarding Sheldon Jackson College's FERC license and 404 dredging permit.

Western Arctic National Parklands

Reviewed and approved a wetland Statements of Findings for "Improvements to the NPS Fifth Avenue and Mission Street Property, Kotzebue, Alaska." WRD's signature certified the technical adequacy of the wetland analyses and consistency of the project with *Director's Order #77-1: Wetland Protection*.

Wrangell-St. Elias National Park and Preserve

Provided water quality data retrievals and information.

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

Provided programmatic oversight and approved the detailed implementation plan for the WRD funded investigation of Tanada Lake limnology.

Completed and published the Wrangell-St. Elias National Park and Preserve Water Resources Scoping Report (Technical Report NPS/NRWRD/NRTR-2003/315).

Visited the Nabesna Mine area and Kennecott Mill area to provide assistance on stream stability and drainage issues.

Reviewed and approved the final “Wetland Statement of Findings, Ellis Special Use Permit for Inholding Access Route Realignments: Mile 35.7 Nabesna Road to Jack Lake.” WRD’s signature certified the technical adequacy of the wetland analyses and consistency of the project with *Director’s Order #77-1: Wetland Protection*.

Provided technical review and evaluation of the Environmental Assessment and the Wetland Statement of Findings for the “Relocation of Seasonal Bunkhouse and Overnight Quarters from Slana Ranger Station.” WRD’s signature certified the technical adequacy of the wetlands analyses and consistency of the project with *Director’s Order #77-1: Wetland Protection*.

INTERMOUNTAIN REGION

Assisted Region with recruitment of a Natural Resource Challenge position (groundwater hydrologist) for the Southern Plains/Heartland Network.

Provided policy and technical review on a number of Upper Colorado River Recovery

Implementation Program (UCRRIP) technical reports and program documents.

Supported IMR staff in negotiations with other Upper Colorado River Recovery Implementation Program (UCRRIP) members to reach agreement on flow recommendations for endangered fish in the Gunnison River.

Provided policy review and technical advice on the Yampa Basin Management Plan.

Continued to track the Flaming Gorge Dam EIS process by maintaining contact with Bureau of Reclamation staff.

Served as a member of the Colorado River technical committee.

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

Provided technical review and comment on multiple documents related to the Moab Mill (UMTRA) Site, methods used in the site characterization and groundwater investigation, interim actions, and long-term cleanup alternatives.

Served on the Moab Mill Site Groundwater Subcommittee and in stakeholder workgroups, attended Moab Site meetings, and assisted in the preparation of meeting minutes.

Reviewed DOE Environmental Impact Statement and participated in NEPA process to determine best disposal alternatives for Moab Mill tailings.

Assisted in assessing potential effects of leachate from the Atlas Mine tailings on downstream resources in the Colorado River.

Arches NP / Canyonlands NP / Natural Bridges NM / Capitol Reef NP

Provided technical review and comments on the Canyonlands NP, Arches NP, Natural Bridges NM, and Capitol Reef NP Long-Term Monitoring of Geoindicators report prepared by the NPS Geological Resources Division Southeast Utah Group

Amistad National Recreation Area

Researched water well records for park staff.

Provided policy review and comment on the Amistad National Recreation Area General Management Plan / EIS.

Provided policy review and guidance and assisted the park in the development of a three-party Fisheries Management Plan which included Mexico, Texas, and the NPS.

Arches National Park

Developed water right settlement concepts for review by the State of Utah.

Provided oversight for a hydrogeology report prepared by the Utah Geologic Survey to assist in the quantification of state and Federal reserved water rights.

Provided funding and coordination for park measurement of flow at springs in Sevenmile and Courthouse Washes to assist in the quantification of state and Federal reserved water rights.

Aztec Ruins National Monument

Provided detailed review of a storm water management plan for a proposed development adjacent to Monument lands.

Bent's Old Fort National Historic Site

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

Big Bend National Park

Conducted technical research and

provided guidance to park staff regarding rehabilitation/ reconstruction of endangered fish pond system.

Participated in technical discussions and conference calls to determine technical concerns the park might have related to a proposed drinking water treatment plant in Lajitas.

Evaluated draft Texas General Land Office lease template to identify opportunities to protect NPS water resources and water rights.

Big Horn Canyon National Recreation Area

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

Black Canyon of the Gunnison National Park

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

Assisted park, Region and Deputy Director with negotiations on Federal reserved water rights to protect park resources.

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

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

Assisted Department of Interior, in coordination with the State of Colorado, with development of a draft instream flow claim for the Gunnison River to protect park resources.

Prepared draft synthesis report for NPS water right studies related to quantification of state and Federal reserved water rights.

Assisted the Department of Justice with expert witness selection and coordination of their work related to water rights litigation.

Bryce Canyon National Park

Provided on-site technical assistance and recommended mitigation and compliance alternatives associated with the “Road Project, Bryce Canyon National Park Wetland Statement of Findings.” Reviewed and approved the final Statement of Findings. WRD’s signature certified the technical adequacy of the wetlands analyses and consistency of the project with *Director’s Order #77-1: Wetland Protection*.

Canyon de Chelly National Monument

Assisted the park in identifying potential water rights actions to protect riparian resources along stream channels.

Canyonlands National Park

Obtained extension of time from State of Utah in order to assess change of well location for Squaw Well water right.

Capitol Reef National Park

Identified potential issues related to restoration of a meander of the Fremont River that was cut off from flow by the construction of a highway.

Assessed water rights and use associated with a well at Sleeping Rainbow Ranch and reviewed new well construction at Sleeping Rainbow Ranch.

Participated in joint EPA-State of Utah-NPS effort to develop and implement a set of prototype sampling protocols for abandoned uranium mine lands using the Rainy Day and Duchess Mine sites.

Provided programmatic oversight and technical review in the development of the Capitol Reef National Park Water Resources Management Plan.

Completed change of ownership applications to initiate water rights transfer.

Continued project work related to quantification of state and Federal reserved water rights.

Reviewed a dam proposal on Caneville Wash to evaluate potential impacts to park resources and water rights.

Carlsbad Caverns National Park

Provided recommendations for monitoring spring discharge and restoring natural flow at Rattlesnake Springs and funded installation of a discharge gage at the springs for the purpose of protecting park resources and water rights.

Installed stage gages in Sulphur Springs and Lake of the White Roses in Lechugilla Cave to collect data in support of park water rights.

Cedar Breaks National Monument

Reviewed construction of a test well and provided advice on upgrading water collection system from Blowhard Spring.

Chaco Culture National Historical Park

Prepared sections of a draft completion report for water-rights related flow and water level studies.

Chickasaw National Recreation Area

Provided advice to Intermountain Region staff on methods to assess the impacts of a sewage spill on the fish community.

Provided technical advice and comment on the Chickasaw National Recreation Area General Management Plan / Environmental Impact Statement Project Agreement.

Evaluated potential impacts to park resources from water right applications in the Arbuckle-Simpson Aquifer.

Prepared and submitted exhibits for two Oklahoma state administrative hearings on water right applications in the Arbuckle-Simpson Aquifer.

Testified on potential impacts to park resources at an Oklahoma state administrative hearing on water right applications.

Presented a poster display on park water resources dependent on the Arbuckle-Simpson Aquifer at a public meeting of ground-water development stakeholders.

Completed a water quality study of springs and wells in the vicinity of the park.

Participated with Office of the Solicitor in exploratory discussions with water right applicant to determine opportunity for settlement of NPS protest.

Installed gages to monitor water level in two wells in the Arbuckle-Simpson Aquifer and provided oversight for park operation of these gages to assist protection of park water rights.

Colorado National Monument

Evaluated flooding and debris flows near park boundaries with private lands and made recommendations to park management.

Provided Level 1 water quality inventory oversight, review, and comment on U.S. Geological Survey draft final report “Results of the Level-1 Water-Quality Inventory and Monitoring Program at the Colorado National Monument November 2000 to November 2001.”

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

Coronado National Memorial

Assisted Office of the Solicitor and

Department of Justice on negotiations to resolve a contested case in the San Pedro River Adjudication.

Assisted Office of the Solicitor with preparation of responses to requests and motions received from the Special Master in the San Pedro River Adjudication.

Assisted park with transfer of U.S. Forest Service water rights to the NPS.

Completed a determination of need for the Richard’s wells and prepared claim amendments and withdrawals for the San Pedro River Adjudication.

Curecanti National Recreation Area

Assisted in review and design of project titled “Data Collection and Analysis of Required Water Quality Parameters; Outstanding waters designation” (PMIS# 72769).

Dinosaur National Monument

Participated in discussions between Northern Colorado Plateau Network staff and the park to address water quality monitoring issues, historical monitoring program, and stressors at DINO.

Evaluated alternative water supplies for campground at Deerlodge Park.

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

Provided policy and technical review on a U.S. Fish and Wildlife Service implementation plan to study interactions between nonnative channel catfish (*Ictalurus punctatus*), native humpback (*Gila cypha*), and roundtail chub (*Gila elegans*) in the Yampa River.

Participated in a raft trip with park staff and scientists to identify research needs and priorities for the Green and Yampa Rivers.

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

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

El Malpais National Monument

Provided coordination and review for a Colorado State University cooperative agreement contactor for the development of an environmental assessment for the restoration Aqua Fria Creek.

Initiated water resources inventories for monument water use and rights.

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

El Morro National Monument

Provided assessment of hydrogeologic conditions and potential for groundwater seepage to affect inscriptions.

Initiated water resources inventories related to monument water use and rights.

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

Florissant Fossil Beds National Monument

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

Prepared documents for Department of Justice to support a water rights application to change the point of diversion for A-Frame well.

Fort Bowie National Historic Site

Conducted analysis of flow data for Apache Spring.

Fort Laramie National Historic Site

Provided technical advice in the interpretation of a previously completed floodplain analysis.

Glacier National Park

Provided technical assistance related to water supplies at Granite Chalet and Walton Ranger Station and mitigation of high water table conditions at Many Glacier sewage lagoons.

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

Provided information on and contacts for the U.S. Geological Survey's Hydrologic Benchmark Network Program.

Provided flood hazard information to park planners involved with developing new park GMP.

Reviewed Floodplain Statements of Findings related to Commercial Services Plan.

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

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

Glen Canyon National Recreation Area

Reviewed project proposal for developing a plan for monitoring effects of Personal Watercraft (PWC) in recreational reservoirs. Attended meeting with U.S. Geological Survey to review progress on PWC "Bridge Plan."

Coordinated a technical assistance request for representation on the Upper Colorado River Recovery Implementation Program and San Juan River Recovery Implementation Program; assistance will be provided by the Upper Colorado River fishery biologist.

Grand Canyon National Park

Provided technical assistance in evaluating potential effect of developing regional water supplies on South Rim springs.

Reviewed U.S. Geological Survey Investigators Annual Report for WRD funded project assessing baseline water quality parameters/land use characteristics of five Snake River headwater tributaries.

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

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

Provided funding to U.S. Geological Survey to map the geology for the Cameron Quad.

Provided funding to U.S. Geological Survey to complete the geology map for the Valle Quad.

Provided funding and review comments for the U.S. Geological Survey study “Identifications of Possible Deep Penetrative Fractures on the Southwestern Colorado Plateau.”

Provided review comments for the U.S. Geological Survey publication “Chemical Characteristics of Ground-water Discharge at Selected Springs, South Rim Grand Canyon National Park, Arizona.”

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

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

Assisted park and Office of the Solicitor in responding to a proposal to divert water from Jackass Canyon.

Grand Teton National Park

Provided technical assistance regarding redevelopment of the spring supplying potable water for Triangle X Ranch and provided technical review of the wetland evaluation and adverse impacts associated with the replacement of the well pump infrastructure at the Triangle X spring area.

Reviewed U.S. Geological Survey Investigators Annual Report for WRD funded project, which assessed baseline water quality parameters/land use characteristics of five Snake River headwater tributaries.

Assisted park staff in developing a PMIS project statement describing the potential changes in the morphology of the Snake River due to the operation of Jackson Lake Dam.

Provided advice related to protecting a well from high flows in Pilgrim Creek.

Co-supervised the revegetation phase of the Snake River Gravel Mine reclamation. This phase involved planting over 35,000 willow stakes and approximately 580,000 sedges, grasses, and spikerushes to establish willow habitats, marshes, and wet meadows. Installed monitoring wells to evaluate project success, identified areas in need of supplemental grading work, and arranged for irrigation of new plantings.

Assessed legal relationship between the park and the Teton Valley Ranch regarding water use within the park boundary.

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

Grant-Kohrs Ranch National Historic Site

Advised staff on potential issue related to arsenic mobilization associated with upstream liming efforts, Arsenic concentrations vs. liming, and metals variations with pH.

Evaluated a water right application to determine impacts to park water rights.

Great Sand Dunes National Monument and Preserve

Provided technical advice and comment on the Great Sand Dunes National Park General Management Plan / Environmental Impact Statement Project Agreement.

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

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

Guadalupe Mountains National Park

Provided advice regarding potential for impact to park resources from groundwater withdrawals in the Dell City area.

Hovenweep National Monument

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

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

Hubbell Trading Post National Historic Site

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

Monitored groundwater levels to protect park water rights.

Assisted Office of the Solicitor and Department of Justice in preparing a general agreement with non-industrial water users in the Little Colorado River Adjudication.

Lake Meredith National Recreation Area

Provided technical review of wetland impacts, made recommendations, and identified the compliance requirements for a “Plan of Operations” for the maintenance of 44 gas wells, the re-entry horizontal drilling of 24 wells, and drilling of one new well.

Little Bighorn Battlefield National Monument

Provided Baseline Water Quality Data Inventory and Analysis Report and advice to the National Parks Conservation Association’s State of the Parks Program.

Provided oversight for park operation of a stream gage on the Little Bighorn River to protect park water rights.

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

Mesa Verde National Park

Evaluated hydrogeologic conditions at Spring House spring.

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

Provided oversight for park operation of a stream gage on the Mancos River to protect park water rights.

Prepared draft implementation plan for water rights decree.

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

Montezuma Castle National Monument

Provided policy review and comment on the draft Montezuma Castle National Monument / Tuzigoot National Monument General Management Plan Project Agreement.

Conducted second seepage run on Beaver Creek and provided oversight for park operation of a stream gage on swallet at Montezuma Well to assist in the quantification of state and Federal reserved water rights.

Compiled database of water rights claimed for Verde River Adjudication.

Initiated and funded investigation to determine vulnerability of park water resources to ground-water withdrawals in the region.

Completed research on administrative history at the Montezuma Well unit to support water right claims.

Compiled water right records from the Arizona Department of Water Resources.

Provided recommendations regarding water-monitoring system to protect park resources and water rights.

Prepared draft project plan to quantify Federal reserved rights for the Verde River Adjudication.

Navajo National Monument

Conducted hydrogeologic assessment and provided recommendations for construction of a backup well.

Provided Level 1 water quality inventory oversight and review and comment on U.S. Geological Survey prepared draft final report "Water Quality Data for Navajo National Monument, Northeastern Arizona-2001-02."

Organ Pipe Cactus National Monument

Conducted assessment of hydrology and hydrogeology of Aquajita Spring.

Provided advice to park staff on the construction of a park boundary fence and how it may affect arroyo processes.

Assisted park staff in assessing potential wetland and riparian impacts of a proposed vehicle barrier along the U.S.-Mexico border that would pass within 100 feet of Aguajita Springs.

Padre Island National Seashore

Assisted park in the evaluation of Electrical Resistance Tomography as a pre- and post- site development environmental characterization tool for oil and gas sites.

Reviewed Floodplain Statements of Findings for the proposed Lemon/Lemon Seed Unit Wells No. 1-1000S and No. 1-1008S and for the proposed Dunn-Peach #1 Well.

Provided technical advice and comment on the Padre Island National Seashore General Management Plan / Environmental Impact Statement Project Agreement.

Reviewed and approved a wetland Statement of Findings for the project "BNP Petroleum Corporation Lemon/Lemonseed Wells Pipeline." WRD's signature certified the technical adequacy of the wetland analyses and the project's consistency with *Director's Order #77-1: Wetland Protection*.

Provided technical review of wetland impacts associated with the installation of the "BNP Peach" gas pipeline and 3,700-foot access road and identified the NPS wetland policy and compliance requirements for the project.

Provided technical review and approval of the task order entitled "Assessment of Coastal Water Resources and Watershed Conditions in Padre Island National

Seashore” to be conducted by Texas A & M University.

Provided technical assistance to park staff in evaluating potential management actions with regards to juvenile redfish caught in overflow ponds within the park.

Parashant National Monument

Conducted assessment of water supply alternatives at Shivwits Fire Camp.

Petrified Forest National Park

Prepared draft report on hydrogeology and groundwater resources at the park.

Assisted Petrified Forest National Park in the completion and publication of the Petrified Forest National Park Water Resources Scoping Report (Technical Report NPS/NRWRD/NRTR-2003/313).

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

Monitored groundwater levels to protect park water rights.

Assisted Office of the Solicitor and Department of Justice in preparing a general agreement with non-industrial water users in the Little Colorado River Adjudication.

Pipe Spring National Monument

Investigated hydrogeology related to springflow reduction.

Consulted with park management on a U. S. Geological Survey geophysical investigation to determine the source of spring flow in and around the Monument.

Provided input to Intermountain Region staff on alternatives for controlling nuisance aquatic vegetation using common carp (*Cyprinus carpio*) or grass carp (*Ctenopharyngodon idella*).

Rocky Mountain National Park

Assisted in the process of removal of the remaining portions of the parking lot at Hidden Valley by providing guidance in designing a storm water and sediment control plan. Assisted a wetlands restoration project in the location of the old parking lot by collecting runoff data from snow melt.

Assisted in the 19jj assessment of impacts to geomorphic conditions and processes related to the failure of the Grand Ditch.

Researched well permits in the Glacier Basin area and reviewed courthouse records to determine if Glacier Basin Campground well is supported by a water right.

Provided water quality station location maps to Colorado River Watch and the Big Thompson Watershed Forum during the implementation phase of the volunteer water quality monitoring program.

Provided technical review and comment on the final report for the WRD funded project “Investigate Potential Willow Habitat and Restoration Needs” (research conducted by Colorado State University in Moraine and Horseshoe Parks).

Provided programmatic oversight and field assistance on the WRD funded Poudre Creek Fish Barrier Project.

Provided programmatic oversight for a BRMD funded project to restore a population of greenback cutthroat trout (*Oncorhynchus clarki stomias*) in Hidden Valley Creek.

Provided programmatic oversight for a project to establish a population of Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) in Pettingell Lake.

Provided technical assistance to park staff for the Glacier Creek Livery wetland restoration

project. Assistance included analyzing 2002 monitoring data, establishing a wetland “reference area” as a model for restoration, and developing plans for 2003 monitoring and preliminary restoration activities.

Tested water supply wells at Hidden Valley.

Provided assistance to park staff regarding hydrologic data analysis and restoration of wetland habitat as part of the “Hidden Valley Creek Wetland Restoration” project.

Provided on-site technical assistance and evaluated the engineering solutions and their effects on downstream riverine and palustrine wetlands from the proposed Trail Ridge Road renovation project.

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

Researched re-use of foreign water in an Augmentation Plan.

Prepared petition for reinstatement of water use from the Kawuneeche Visitor Center well.

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

Saguaro National Park

Provided assistance regarding potential for groundwater pumping in Avra Valley to affect the water supply well at SAGU West.

Provided policy review and comment of the draft Saguaro National Park General Management Plan Project Agreement.

Prepared draft project plan for instream-flow water right applications.

Compiled supporting documentation for park water rights.

Assisted Office of the Solicitor in responding to a protest filed against an NPS instream-flow water right application.

Provided funding and oversight for hydrologic and biologic studies and a stream gage on Rincon Creek to support the instream-flow water right application.

Assessed legal status of alien water right claims within the park.

Compiled database of water rights claimed for the Verde River Adjudication.

Coordinated posting of notices and the affidavit of posting for water rights on Rincon Creek.

Sand Creek Massacre National Historic Site

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

Sunset Crater Volcano National Monument

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

Monitored groundwater levels to protect park water rights.

Assisted Office of the Solicitor and Department of Justice in preparing a general agreement with non-industrial water users in the Little Colorado River Adjudication.

Assisted park with development of a Governmental Agreement and a Technical Advisory Committee to implement the water rights agreement between the United States and the City of Flagstaff.

Timpanogos Cave National Monument

Revised draft settlement agreement with State of Utah for Federal reserved and state appropriative water rights.

Coordinated review of draft water-rights settlement agreement with the U.S. Forest Service.

Tumacacori National Monument

Conducted assessment of “spring” in Santa Cruz River channel.

Assisted Office of the Solicitor in water right negotiations for the Upper Santa Cruz River Adjudication.

Prepared consumptive use estimate for the restoration of the historical orchard to assist in the quantification of water rights to protect park resources.

Tuzigoot National Monument

Conducted field review of water right issues associated with the acquisition of Shea Springs.

Walnut Canyon National Monument

Provided Level I water quality inventory oversight and review and comment on U.S. Geological Survey prepared draft final report “Water Quality Data for Walnut Canyon and Wupatki National Monuments, Arizona-2001-02.”

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

Monitored groundwater levels to protect park water rights.

Assisted park with development of a Governmental Agreement and a Technical Advisory Committee to implement the water rights agreement between the United States and the City of Flagstaff.

Assisted Office of the Solicitor and Department of Justice in preparing a general agreement with non-industrial water users in the Little Colorado River Adjudication.

Washita Battlefield National Historic Site

Assisted in coordinating a geomorphic investigation to determine the potential in restoring Washita Creek to a condition similar to the historic period.

Wupatki National Monument

Provided Level I water quality inventory oversight and review and comment on U.S. Geological Survey prepared draft final report “Water Quality Data for Walnut Canyon and Wupatki National Monuments, Arizona-2001-02.”

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

Monitored groundwater levels to protect park water rights.

Assisted with the development of a General Agreement and Technical Advisory Committee to implement the water rights agreement between the United States and the City of Flagstaff.

Assisted Office of the Solicitor and Department of Justice in preparing a general agreement with non-industrial water users in the Little Colorado River Adjudication.

Yellowstone National Park

Performed a park-wide floodplain assessment of developed areas to complete overall floodplain compliance.

Conducted a detailed assessment of a road deconstruction and river restoration project in the Gibbon River Canyon.

Evaluated resource threats at an area of extreme bank erosion adjacent to Gibbon Meadows picnic area.

Reviewed documents generated by the U.S. Forest Service and participated in multiple meetings to address surface water and

ground water contamination and the long-term cleanup and restoration of the New World Mining District.

Assessed the State of Montana's plans for an on-site repository for McLaren Mine tailings and proposed water table monitoring to ensure repository design was appropriate under site groundwater conditions.

Participated in meetings with representatives of the State of Montana and other stakeholders to discuss the final McLaren tailings Engineering Evaluation/Cost Assessment (EE/CA) and evaluate proposed alternatives.

Participated in a New World Mining District geohydrologic work group and attended a technical meeting to discuss and formulate long term monitoring and groundwater and surface water remediation approaches.

Reviewed and commented on the Miller Creek EE/CA as part of the New World Mining District restoration.

Provided park and Washington Office staff with technical review of proposal to use a Latin American fungus, *Muscodor albus*, in pit and vault toilets in the park.

Provided programmatic oversight and technical review in the completion of a Natural Resource Preservation Program (NRPP) funded project entitled "Protection of native Yellowstone Cutthroat Trout in Yellowstone Lake – Yellowstone National Park (Wyoming)."

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

Assisted U.S. Forest Service legal counsel with proposed water rights transfers from Royal Teton Ranch to the United States.

Provided oversight to contractors responsible for recalibrating the upper flume on Reese Creek to measure supercritical flows.

Participated in public meeting of the Cooke City-Park County Water District to discuss water supply development options available under the Montana Water Rights Compact.

Transferred operation of Soda Butte Creek stream gage, used to protect park water rights, from NPS to the U.S. Geological Survey.

Zion National Park

Provided on-site technical assistance and recommended mitigation and compliance alternatives associated with wetland impacts from the proposed Zion Canyon Scenic Drive Road renovation project.

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

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

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

MIDWEST REGION

Agate Fossil Beds National Monument

Conducted hydrologic inventory and developed monitoring plan.

Buffalo National River

Conducted assessment of source of sulfur in water from well at Erbie and investigated treatment alternatives and alternative water supply sources.

Fulfilled annual report review and work plan approval responsibilities as Project Coordinator for NRPP funded project to determine "Ground- and Surface-Water

Interactions of the Buffalo National River.”
Reviewed WRD funded project to “Delineate and characterize karst ground water recharge zones.”

Reviewed WRD funded project proposal related to water quality assessment and inventory of springs and perennial streams.

Provided park with technical comments related to bioassessment protocols.

Assisted park with request from Congressman Barry’s office regarding the NPS position on Searcy County Regional Water District’s proposal to build a dam on Bear Creek, a tributary to Buffalo River.

Assisted the park, Office of the Solicitor, and Department of Justice with development of technical information and responses to the Bear Creek Dam 404 permit application by Searcy County.

Provided programmatic oversight and renewed and approved the detailed implementation plan for a WRD funded study of invertebrate drift in a reach of Bear Creek that would be affected by a proposed dam.

Assisted park with establishment of a Technical Group for the Bear Creek dam proposal.

Provided funding and technical oversight in support of hydrologic and biologic studies on Bear Creek.

Provided review comments for the U.S. Geological Survey report “Physical Stream Habitat Dynamics on Lower Bear Creek, Northern Arkansas.”

Provided programmatic oversight and approved continued funding of an NRPP funded assessment of fish communities and their relation to water quality and other environmental factors.

Assisted the park, Office of the Solicitor, and Department of Justice in responding to the Ozark, et al. lawsuit filed against the Corp of Engineers.

Assisted the park with preparation of a draft secretarial determination for a proposed project on Brush Creek.

Cuyahoga Valley National Recreation Area

Provided assistance in the development of a programmatic environmental assessment that addresses the need to provide bank protection along the Cuyahoga River.

Facilitated a Water Resources Scoping Workshop at Cuyahoga Valley National Park as part of the initial efforts in the development of a Water Resources Scoping Report.

Advised park staff regarding wetland compliance issues for the Riverbank Management Environmental Assessment and Wetland Statement of Findings.

Provided technical review of a proposal titled “Developing Indicators for the Assessment of Wetland Health in the Cuyahoga Valley National Park” using the Peer Review Guidelines from the Inventory and Monitoring Program.

Effigy Mounds National Monument

Helped assess the need for a stream gage to monitor discharge in the Yellow River as part of Vital Signs Monitoring.

Fort Union Trading Post National Historic Site

Assisted with addressing issues related to a bio-engineered bank protection on the Missouri River.

George Washington Carver National Monument

Obtained, entered, reformatted, and QA/QCed additional water quality data for

upload to new STORET in preparation for producing a Baseline Water Quality Data Inventory and Analysis Report.

Herbert Hoover National Historic Site

Reviewed an environmental assessment for a stream restoration plan for Hoover Creek for riparian and geomorphic resources.

Homestead National Monument of America

Provided technical summary regarding the erosion of a hiking trail and the evolution of channel entrenchment along Cub Creek.

Hot Springs National Park

Investigated potential for contaminated groundwater from the Magcobar Mine pit to affect water resources of the park.

Provided policy and technical review for the Hot Springs National Park Water Resources Scoping Report (Technical Report NPS/NRWRD/NRTR-2003/301).

Isle Royale National Park

Served as project officer on WRD funded project entitled “Assess Hydrocarbon Threats to Park Waters.”

Reviewed proposal generated outside the NPS for watershed research in the park.

Provided programmatic oversight and technical review of the Isle Royale National Park Water Resources Management Plan, including the coordination of an organizational meeting among the principal authors.

Provided programmatic oversight and participated in Working Group Meetings for development of the Isle Royale Fish Management Plan.

Knife River Indian Villages National Historic Site

Assessed the risk of bank erosion to the

integrity of cultural resources at the Elbee Site.

Quantified bank retreat over time from maps and survey data.

Mississippi National River and Recreation Area

Assisted in evaluating appropriate bank protection alternatives for Brooklyn Park and reviewed the use of a HEC-2 model to evaluate a dike near the St. Paul Airport.

Missouri National Recreational River

Evaluated bank stabilization issues and provided extensive technical comments on the preparation of an EIS on the cumulative impacts of bank stabilization projects.

Participated in a Regional Office meeting to discuss bank erosion management alternatives.

Reviewed the detailed project report and design plans for the Ponca State Park Habitat Restoration Plan proposed by the Corps of Engineers.

Reviewed and commented on plans for Lewis and Clark Rural Water System.

Ozark National Scenic Riverways

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

Assisted with the interpretation of State of Missouri Water Quality Standards and Regulations and reviewed and provided comments on state developed Total Maximum Daily Load for the reduction of fecal coliform concentrations on the Jacks Fork of the Current River.

Reviewed and provided technical comment on project proposal entitled “Develop monitoring protocol for assessing freshwater spring conditions utilizing aquatic

macroinvertebrate within the Ozark National Scenic Riverways, Missouri.”

Visited park and provided advice related to several bank erosion issues along the Current River.

Pea Ridge National Military Park

Provided technical advice and comment on the Pea Ridge National Military Park General Management Plan / Environmental Impact Statement Project Agreement.

Pictured Rocks National Lakeshore

Provided programmatic oversight and approved the detailed implementation plan for a BRMD funded study of coaster brook trout (*Salvelinus fontinalis*) migration between Pictured Rocks National Lakeshore streams and Lake Superior.

Pipestone National Monument

Delineated floodplain, using data from park utility maps.

Provided advice to park staff regarding flood hazard at the existing visitor center.

Saint Croix National Scenic Riverway

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

Reviewed initial study plan, helped craft a quality assurance project plan, and led a small group pre-project peer review planning session for new WRD funded project “Development of an Index for Mercury in fish tissues of St. Croix River Basin.”

Scott’s Bluff National Monument

Completed process to relinquish Gering-Ft. Laramie Irrigation District irrigation right.

Sleeping Bear Dunes National Lakeshore

Completed and published the Sleeping Bear

Dunes National Lakeshore Water Resources Management Plan.

Provided technical support on water rights and watershed management associated with Glen Lake and the Crystal River.

Theodore Roosevelt National Park

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

Provided policy review and comment of the Theodore Roosevelt National Park Boundary Expansion Environmental Assessment.

Provided water right comments for Environmental Assessment for proposed Elkhorn Unit expansion.

Initiated a study to assist determination of water and water rights needed to protect resources along the Little Missouri River.

Voyageurs National Park

Reviewed progress reports and continued to serve as WRD project officer on NRPP project “Document changes in reservoir management on mercury accumulation in fish and other components of the aquatic ecosystem of Voyageurs National Park.”

Provided programmatic oversight and technical review of the draft Voyageurs National Park Water Resources Management Plan.

Provided technical review and comment on a draft report entitled “Synthesis of Aquatic Resources for Voyageurs National Park” by Larry Kallemeyn.

Continued to track progress on a Cooperative Agreement for fishery management with the State of Minnesota.

NATIONAL CAPITAL REGION

Reviewed various draft documents and led QA/QC discussion that resulted in a detailed plan for a study entitled “Baseline water resource inventory to support aquatic and watershed management activities in National Capital Region parks.”

Assisted in review and design of project titled “Assess condition and identify stressors of aquatic resources in NCR” (PMIS# 89314).

Catoctin Mountain Park

Provided data interpretation review concerning the aluminum concentrations in Owens Creek.

Assisted in review and design of project titled “Evaluate Water Quality for All Park Streams.”

Reviewed Floodplain Statements of Findings for Wireless Telecommunications Facility.

Conducted a literature review and completed a scoping meeting/site visit in preparation for the development of a water resources scoping report.

Chesapeake & Ohio Canal National Historic Park

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

Constitution Gardens

Provided policy and technical assistance in evaluating a proposal by U.S. Fish and Wildlife Service proposal to stock Constitution Gardens Lake for a National Fishing Week kick off event and Kid’s Day fishing.

Provided policy and technical review of the draft Constitution Gardens Lake Management Plan.

George Washington Memorial Parkway

Provided technical review and approved the detailed study plan for the NRPP funded Dyke Marsh restoration feasibility study.

Provided technical advice and comment for the Great Falls Park Unit General Management Plan/ Environmental Impact Statement Project Agreement.

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

Harpers Ferry National Historical Park

Provided technical advice and comment on the Harpers Ferry National Historical Park General Management Plan / Environmental Impact Statement Project Agreement.

National Capital Parks East

Reviewed and approved a wetland Statement of Findings for the project “Management of Flight Obstructions to Preserve Safety at Andrews Air Force Base” at Suitland Parkway. WRD’s signature certified the technical adequacy of the wetland analyses and the project’s consistency with *Director’s Order #77-1: Wetland Protection*.

NORTHEAST REGION

Provided review and comment on the Chesapeake Bay Special Resources Study EIS for possible designation of new NPS management unit.

Provided review and comment on draft Harriet Tubman Special Resource Study.

Acadia National Park

Reviewed WRD funded project to “Assess current and historic atmospheric depositions of toxic contaminants.”

Reviewed draft sediment sampling plan for

the Otter Creek Wastewater Treatment Plant outfall.

Continued to provide advice and consultation on fishery management issues pertaining to the Acadia National Park's great ponds.

Allegheny Portage Railroad National Historic Site

Provided technical advice to park staff on the use of volunteers for water quality monitoring and the selection of monitoring locations.

Assisted park staff with "Best Management Practices" for protecting wetlands during construction projects.

Assateague Island National Seashore

Reviewed NRPP funded project proposal related to evaluation of water quality relative to episodic events within coastal bays.

Provided technical review and comment on a draft "Wetlands Delineation Report for the Assateague Island Headquarters Area Site Development Assessment" and on a draft "Wetland Statement of Findings for Facility Improvements to the Headquarters Complex."

Boston Harbor Islands National Recreation Area

Completed and published the Boston Harbor Islands National Recreation Area Water Resources Scoping Report (Technical Report NPS/NRWRD/NRTR-2002/300).

Developed a poster presentation entitled "Water Resources Management Issues for the Boston Harbor Islands National Recreation Area."

Cape Cod National Seashore

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

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

Provided programmatic oversight and approved the detailed implementation plan for "Management of Dune Slack Wetlands at Cape Cod National Seashore" project.

Colonial National Historical Park

Provided advice, guidance, and contacts on hydrologic unit mapping.

Reviewed Jamestown 400 Long Term Ecological Monitoring Plan and reviewed and approved a Wetland Statement of Findings for "The Jamestown Project."

Reviewed and approved the Wetland and Floodplain Statements of Findings for Jamestown Island Shoreline Management Project.

Provided technical assistance on best ways to minimize adverse impacts to wetlands while completing emergency bridge repairs and road restorations. Identified the compliance activities necessary to satisfy requirements in the *NPS Executive Order 77-1* for emergency activities.

Delaware Water Gap National Recreation Area

Assisted the park in evaluating the possibility that a leaking underground storage tank from a site adjacent (down gradient) to the park could be source of groundwater impact.

Assisted in review and design of project titled "Regional Point Source Management to Support Special Protection Water Quality Regulations" (PMIS# 87936).

Assisted in review and design of project titled "Define Existing Water Quality for Development of Special Protection Waters Regulations" (PMIS # 97320).

Provided review and comments on proposals to conduct a native fish inventory.

Eisenhower National Historic Site

Provided policy and technical review of the draft final report of a study to assess potential biological impacts of increased flow depletions and groundwater augmentation in Marsh Creek.

Fort McHenry National Monument

Assisted park staff and consultants in determining wetland compliance requirements for rehabilitating a historic seawall.

Fredericksburg & Spotsylvania County Battlefields Memorial National Military Park

Provided technical advice to park staff regarding water quality metadata and the format of project, station, metadata, and result files to facilitate uploading data from their ongoing monitoring program to STORET.

Gateway National Recreation Area

Provided programmatic oversight and approved the detailed implementation plan for “Investigation and Restoration of the Jamaica Bay Saltmarsh Ecosystem” project.

Gettysburg National Military Park

Provided on-site technical assistance to refine the draft Wetland Statement of Findings for a vegetation clearing project titled “Landscape Rehabilitation, First 5-Year Plan.” WRD’s signature certified the technical adequacy of the wetlands analyses and consistency of the project with *Director’s Order #77-1: Wetland Protection*.

Provided on-site technical assistance and recommended compensatory mitigation options for wetland impacts that will result from the proposed Gettysburg Museum and Visitor Center project.

Provided on-site technical assistance by identifying and evaluating wetland impacts resulting from the proposed vegetation clearing project titled: “The Defense of the Round Tops Rehabilitation.” WRD’s signature certified the technical adequacy of the wetlands analyses and consistency of the project with *Director’s Order #77-1: Wetland Protection*.

Hopewell Furnace National Historic Site

Provided technical advice and comment on the Hopewell Furnace National Historic Site General Management Plan / Environmental Impact Statement Project Agreement.

Minute Man National Historical Park

Evaluated the feasibility and scope of restoring both a culverted stream and the hydrology of a six-acre affected wetland area with overall objective to restore a fourteen acre parcel in the Battle Road unit to historic conditions.

Morristown National Historical Park

Helped review potential for groundwater contamination from the Delbarton School site.

Provided policy review and comment on the Morristown National Historical Park General Management Plan / Environmental Impact Statement.

New River Gorge National River

Reviewed NRPP funded project proposal related to determining sources of fecal bacteria.

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

Completed and published the New River Gorge National River/Gauley River National Recreation Area/Bluestone National River Water Resources Management Plan.

Richmond National Battlefield Park

Assisted on a ground water seepage issue at an acquired property that formerly was a landfill.

Participated in renewed efforts to assess effects and plan Park Service strategy to remediate effects of Chesterfield County municipal landfill on water resources in Fort Darling Unit.

Completed and published the Richmond National Battlefield Park Water Resources Management Plan.

Saratoga National Historical Park

Performed a hydraulic assessment of a short reach of the historic Old Champlain Canal to identify factors that may have contributed to breaching of the canal wall.

Reviewed interagency documents related to General Electric Company cleanup of PCBs in the Hudson River.

Provided policy review and comment on the Saratoga National Historical Park draft General Management Plan / Environmental Impact Statement.

Saugus Iron Works National Historic Site

Provided on-site technical assistance and assessed the feasibility of restoring the four-acre area of estuarine emergent invasive and non-native vegetation to the historic mud flat habitat.

Evaluated the condition of a stone revetment which lines portions of the Saugus River and offered suggestions regarding a proposed stabilization plan.

Shenandoah National Park

Provided technical portion of a professional presentation for a stream restoration project.

Provided review and comments for the park's "Assessment of Air Quality and Related

Values in Shenandoah National Park."

Reviewed University of Virginia report on air quality impacts to water quality.

Facilitated a Water Resources Scoping Workshop at Shenandoah National Park as part of the initial Water Resources Scoping Report (WRSR) efforts.

Provided technical review and comment on two project proposals for the park. The proposals included an inventory and characterization of the park's springs and seeps and a project titled "Assessment of Vegetation Communities in Relation to Ecological Units within Shenandoah National Park."

Provided technical/policy review and comments on the "Draft Wetland Statement of Findings for the Hazel River Stream Crossing."

Upper Delaware Scenic and Recreation River

Provided review and comments on proposals to conduct a native fish inventory at Upper Delaware Scenic and Recreational River.

Provided review and comment on the first draft of Upper Delaware Scenic and Recreational River's NRPP Study Implementation Plan for a study of the endangered dwarf wedge mussels.

Valley Forge National Historical Park

Reviewed draft Valley Creek watershed restoration plan and environmental assessment.

Provided technical advice and comment on the Valley Forge National Historical Park General Management Plan / Environmental Impact Statement Project Agreement.

PACIFIC WEST REGION

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

Submitted Reports of Licensee and Progress Reports for California parks.

Continued work on draft maps of California park units outlining the area of concern for new water right applications.

American Memorial Park

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

Big Hole National Battlefield

Monitored flow on the North Fork Big Hole River to protect park water rights and submitted annual water use report as required by the Montana Water Rights Compact.

Cabrillo National Monument

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

Channel Islands National Park

Assisted with floodplain survey and carried out hydraulic modeling to delineate floodplain at several locations on Santa Cruz Island.

Provided on-site technical assistance and evaluated the existing conditions and restoration opportunities in three wetland ecosystems on Santa Cruz Island. WRD's signature certified the technical adequacy of the wetlands analyses and consistency of the project with *Director's Order #77-1: Wetland Protection*.

City of Rocks National Reserve

Created affidavits and assembled documents for Department of Justice to submit to Court in support of Federal reserved water right claim.

Received partial decree from the Court granting a Federal reserved water right for the Emery Canyon Well.

Crater Lake National Park

Assisted with preparation of a water rights acquisition plan, a water rights appraisal contract, and water rights acquisition discussions with a downstream landowner.

Assisted park with evaluation of risk associated with a 1902 priority date for out-of-stream uses.

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

Craters of the Moon National Monument and Preserve

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

Death Valley National Park

Provided on-site technical assistance and recommendations regarding wetland restoration opportunities at Texas Spring.

Conducted a hydrologic and geomorphic assessment and provided specific proposals for improvement of the hydrologic conditions of Racetrack Playa.

Updated park on technical issues related to ostracods and other spring resources.

Evaluated Nevada water right applications for potential to impact park resources and water rights and filed protests when needed.

Assisted with identification of appropriate monitoring equipment for sensitive springs.

Provided oversight for park operation of monitoring gages at Devil's Hole and spring flow sites, which related to protection of park water rights.

Met with the Nevada State Engineer to discuss NPS concerns for the number of change applications in the Amargosa Valley, and the movement of the pumping center closer to Devil's Hole.

Met with representatives of Rockview Dairies to discuss the NPS concern for the increase in pumping in the vicinity of the dairy and in proximity to Devil's Hole; discussed the possibility of a monitoring and management program to alleviate the concerns of the NPS.

Attended the Devil's Hole Workshop and participated in discussions of increased ground water development in the Death Valley Regional Ground-water Flow System (DVGWFS).

Initiated discussions with Southern Nevada Water Authority concerning its request for issuance of ground-water permits in four hydrographic basins in the DVGWFS.

Presented talk at Devil's Hole Workshop summarizing NPS activities regarding declines of pool level and pupfish population numbers in Devil's Hole.

Participated in meetings between the NPS and U.S. Fish and Wildlife Service to coordinate Devil's Hole pupfish recovery activities.

Evaluated the recent status of the Devils Hole pupfish (*Cyprinodon diabolis*) issue by reviewing past fish counts and evaluation of data collected.

Attended the first Amargosa Summit in Pahrump, Nevada, to coordinate with other federal agencies with land management and

related responsibilities in the Amargosa River drainage area.

Compiled and exchanged monitoring data with the U.S. Department of Energy and evaluated possible changes to the cooperative monitoring program, to assist protection of park water rights.

Participated in a Nevada State Engineer hearing on the U.S. Department of Energy's application for groundwater for the Yucca Mountain Project.

Monitored progress of multi-year study of evapotranspiration at Grapevine Springs Area.

Provided expert hydrogeology oversight to the U.S. Geological Survey Death Valley Regional Ground-water Flow Model Project to assist protection of park water rights.

Continued study of regional flow potential and ground-water contributions to Death Valley from California basins to assist protection of park water rights.

Golden Gate National Recreation Area

Provided onsite technical assistance for a number of watershed and wetland restoration projects at the Presidio of San Francisco, Stinson Beach, and several other disturbed land sites.

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

Provided technical advice to park staff regarding water quality metadata and the format of project, station, metadata, and result files to facilitate uploading data from their ongoing monitoring program to STORET.

Provided technical advice and comment on the Golden Gate National Recreation Area General Management Plan / Environmental Impact Statement Project Agreement.

Provided comments on an Environmental Assessment for proposed new visitor facility.

Provided programmatic oversight and approved the detailed implementation plan for the WRD funded project “Plan Rodeo Lagoon Watershed and Wetland/Riparian Restoration.”

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

Provided comments on a draft Water Management Plan for a local water district.

Great Basin National Park

Reviewed detailed study plan, provided programmatic oversight, and approved funding for a WRD funded inventory of aquatic resources.

Provided programmatic oversight and approved continued funding for an NRPP funded project to restore several populations of Bonneville cutthroat trout (*Oncorhynchus clarki utah*).

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

Conducted field tour of park water resources and briefed management and staff on water rights issues affecting the park, status of a U.S. Geological Survey study to determine susceptibility of park resources to effects of ground-water pumping, and results of the Lehman and Baker Creek water rights analyses.

Reviewed various proposed agreements to settle the Garrett Family Trust water right issue.

Monitored progress of U.S. Geological Survey multi-year study to determine areas of susceptibility to groundwater pumping impacts, and participated in seepage runs on selected park streams.

Hagerman Fossil Beds National Monument

Assisted in the review and publication of the Hagerman Fossil Beds National Monument Water Resources Management Plan.

Haleakala National Park

Conducted site review and provided advice related to flood hazard at the Kipahulu Stream area.

Advised park staff on wetland delineation methods and compliance requirements related to proposed construction projects.

John Day Fossil Beds National Monument

Completed field survey and water rights assessment for the park.

John Muir National Historic Site

Assisted with the review of a storm water drainage design near Mount Wanda with the county public works agency.

Collected cross-section monitoring data evaluating the stability of John Muir’s gravesite near Alhambra Creek.

Kaloko-Honokohau National Historical Park

Provided detailed review of the plan for a new project to study nutrient sources and fluxes.

Reviewed generic Hawaii coastal monitoring Quality Assurance Project Plan’s requirements for QC sampling frequencies and performance standards in light of needs of park projects.

Reviewed technical paper by Karen Kle of Aecos Labs that related to park resources.

Advised park on miscellaneous contaminants and eutrophication studies.

Reviewed technical documents related to a new development uphill of the park and provided the park with detailed technical comments.

Provided advice on laboratories that can analyze groundwater for pharmaceutical and other endocrine active/emerging issue contaminants.

Assessed the legal framework of Hawaii water law and legislation that established the park.

Kalaupapa National Historical Park

Researched and compiled well information for park engineer.

Lake Mead National Recreation Area

Reviewed plan for monitoring effects of PWCs in recreational reservoirs. Attended meeting at the park with U.S. Geological Survey to review progress on PWC “Bridge Plan.”

Provided technical advice and comment on the Lake Mead National Recreation Area General Management Plan / Environmental Impact Statement Project Agreement.

Reviewed and advised park on the results of modeled predictions of the impacts of Las Vegas wastewater discharge alternatives into Lake Mead being developed by the Clean Water Coalition Systems Conveyance and Operations Program.

Provided assistance with the interpretation of literature discussing the impacts on water quality of hydrocarbon emissions from personal watercraft.

Advised park on findings of U. S. Geological Survey related to endocrine impacts and the ability of sewage treatment plants to remove endocrine disrupting compounds.

Provided park staff with comments on potential environmental effects of dust palliative (Evirontec II) and other options for controlling dust.

Continued discharge monitoring of Rogers and Blue Point Springs.

Initiated discharge monitoring on the Virgin River and developed a cost-sharing agreement with other entities to accomplish ongoing gage operation and maintenance.

Participated in seepage run on the Virgin River with the U.S. Geological Survey and parties representing water development interests in the basin.

Evaluated Nevada water right applications and filed protests as needed to protect park rights and resources.

Reviewed aquifer stress test study plan, presented comments and concerns for the study with Nevada State Engineer and study participants and recommended well sites for monitoring effects of aquifer test.

Presented briefings to Department of the Interior bureau managers in Southern Nevada concerning regional ground-water development plans and the need for increased coordination among the bureaus to develop analytical tools to assess potential impacts.

Presented a series of briefings to park management and staff on ground-water development near the park, discharge and water chemistry characteristics of park springs, hydrologic and geologic setting of the Lower Colorado Ground-water Flow System of Nevada (LCFS), status of analytical tools being developed, and recommendations for future work.

Completed a regional geologic map of the LCFS and continued a geophysics study, both

to assist protection of park water rights.

Monitored progress of a U.S. Geological Survey evapotranspiration study and a LCFS numerical ground-water flow model to assist protection of park water rights.

Participated in initial meeting of the Technical Review Panel for the LCFS.

Presented talks at Annual Conference of Nevada Water Resources Association regarding NPS analysis of precipitation patterns and spring discharge and the effects of increased ground-water pumping in the Muddy River Springs Area.

Monitored progress of chemical and isotopic composition study of aquifers in the immediate region of Rogers and Blue Point Springs and conducted regional water-quality sampling for stable isotopes.

Participated in a meeting with Nevada State Engineer and representatives from Lincoln County, Vidler Water Company, and Virgin Valley Water District to initiate implementation of monitoring plan to detect effects of ground-water pumping in Tule Desert basin.

Evaluated alternative locations for a Tule Desert area monitoring well and provided recommendations to the U.S. Bureau of Land Management.

Lake Roosevelt National Recreation Area

Reviewed project proposal related to evaluating effects of trace elements on water quality and biological health in Lake Roosevelt.

Manzanar National Historic Site

Evaluated conditions of drainage, past flooding, and related erosion as related to several proposed remedies to alleviate destructive conditions.

Mojave National Preserve

Provided programmatic oversight and approved the detailed implementation plan for Perform Baseline Hydrologic and Biologic Inventory of Wetlands, MOJA.

Participated in a Mojave tui chub (*Salvelinus bicolor mohavensis*) workshop hosted by Mojave National Preserve and the Desert Studies Institute in Zzyzx, California.

National Park of American Samoa

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

North Cascades National Park

Compiled information on wells in the Stehekin area.

Reviewed progress on project entitled “Development of Stream Benthic Macroinvertebrate Biomonitoring Protocols for North Cascades National Park Service Complex and Adjacent USFS Lands.”

Served on the Technical Advisory Committee for the North Cascades Lakes Management EIS; provided technical and policy input on EIS documents.

Olympic National Park

Created actual and simulated flow duration curves for the purpose of extending period of record at stream gages.

Provided continuing assistance related to the proposed removal of two dams on the Elwha River.

Provided hydrologic assistance to the park on the Hoh and Quinault River basins.

Participated in a value engineering analysis of dam demolition alternatives.

Provided programmatic oversight and approved continued funding for a study of bull trout (*Salvelinus confluentus*) distribution in the Hoh River Basin.

Oregon Caves National Monument

Completed field survey and water assessment for the park.

Pinnacles National Monument

Assessed “conversion” to groundwater pursuant to a State of California conjunctive use statute.

Point Reyes National Seashore

Provided technical review and comment on a draft “Request for Proposals: Hydrologic Analysis, Giacomini Wetlands Restoration Project.”

Participated in a value engineering analysis of multiple stream restoration projects.

Provided programmatic oversight and approved the detailed implementation plan for the “Tomales Bay Watershed Enhanced Wetlands Inventory and Mapping Project.”

Provided programmatic oversight and second year funding request for “Assessment of Oyster Farming in Drakes Estero: Ecological Impacts of Commercial Oyster Farming on the Biota of Drakes Estero.”

Provided programmatic oversight and approved the detailed implementation plan for “Restoration of Horseshoe Pond to a Coastal Lagoon/Tidal Estuary” project.

Provided technical assistance in the development of an implementation plan for the WRD funded Point Reyes National Seashore Water Resources Management Plan.

Provided policy and technical review and approved the “Enhanced Wetlands Inventory and Mapping Project, Final Report.” The

project provided inventory and mapped data for use in assessing, prioritizing, protecting, and restoring wetlands in the National Seashore.

Initiated investigations to determine if NPS state appropriate water rights could be changed to instream flow use.

Pu’uhonau O Honaunau National Historical Park

Discussed water quality monitoring issues with park staff. Evaluated park coral reef resources for possible future technical assistance issues.

Redwood National Park

Coordinated a WRD funded project investigating habitat conditions for Coho Salmon in Mill Creek.

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

Rosie the Riveter Historical Park

Provided technical advice and comment on the Rosie the Riveter Historical Park General Management Plan / Environmental Impact Statement Project Agreement.

San Juan Island National Historical Park

Provided comments on adequacy of park’s approach to conceptual models.

Prepared assessment of legal framework regarding park water resources and water rights and reviewed the water rights section of the draft General Management Plan.

Sequoia and Kings Canyon National Parks

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

War in the Pacific National Historical Park

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

Whiskeytown-Shasta-Trinity National Recreation Area

Provided funding source guidance for new projects related to the assessment of contaminants in Whiskey Creek and Clear Creek.

Reviewed a water monitoring project for Willow Creek and provided technical advice on various contaminants and monitoring issues related to Willow Creek project.

Coordinated initial U.S. Geological Survey Columbia Lab assistance and helped interpret initial results of sediment contaminants analyses.

Assisted park in early stages of Watershed Assessment add-on project to find metals contamination hotspots from mining outside of park boundaries.

Reviewed proposal for project entitled “Sampling Water & Sediments for Contaminants: Supplemental Assistance for a Cooperative Project.”

Helped review final report entitled “Trace Metals in Sediments from Mine-impacted Rivers, Clear Creek, California, Project.”

Yosemite National Park

Provided assistance to the planning process for the new trails and bridges in the Yosemite Falls area.

Participated in a workshop in the park dealing with establishing ecological restoration goals in the east end of Yosemite Valley.

Provided advice related to the proposed removal of Cascade Dam.

Provided technical review and approval of the Bear Creek Streambank Protection Wetland Statement of Findings. WRD’s signature certified the technical adequacy of the wetlands analyses and consistency of the project with *Director’s Order #77-1: Wetland Protection*.

Provided on-site technical assistance and reviewed engineering strategies for the South Fork Merced River Bridge Replacement Project. WRD’s signature certified the technical adequacy of the wetlands analyses and consistency of the project with *Director’s Order #77-1: Wetland Protection*.

Provided policy guidance and technical assistance on resolution of discrepancies in Yosemite Valley wetland delineation work being done by a contractor.

Provided technical assistance in the review of several wetland restoration opportunities in Yosemite Valley.

Provided policy and technical review of the draft Wetland Statement of Findings for the East Yosemite Valley Utilities Improvement Plan.

Provided policy and technical review of the draft Floodplain and Wetland Statement of Findings for the Yosemite Lodge Area Redevelopment.

SOUTHEAST REGION

Provided a draft memorandum to Assistant Secretary/Fish, Wildlife and Parks Craig Manson regarding current NPS strategies to protect manatees in several SER Parks (Everglades National Park, Biscayne National Park, Canaveral National Seashore, and Timucuan Ecological and Historic Preserve).

Provided policy review of a proposal for the use of Rotenone for biological sampling in mangrove habitats.

Canaveral National Seashore / Gulf Islands National Seashore / Timucuan Ecological and Historic Preserve

Provided technical review and approval of the task order entitled: “Assessment of Coastal Water Resources and Watershed Conditions in Selected National Park Units on the Southeast Atlantic and Gulf Coast (CANA, GUIIS, TIMU)” to be conducted by the University of Florida.

Cape Hatteras National Seashore / Cape Lookout National Seashore / Cumberland Island National Seashore

Provided technical review and approval of the task order entitled: “Assessment of Coastal Water Resources and Watershed Conditions in Selected National Park Units on the Southeast Atlantic and Gulf Coast (CAHA, CALO, CUIS)” to be conducted jointly by the University of North Carolina and University of Georgia.

Virgin Islands NP, Virgin Islands Coral Reef NM, Buck Island Reef NM

Worked closely with the NPS Office of Policy and Regulation and DOI Solicitor on developing interim regulations and Notices of Intent for new general management plans for Virgin Islands Parks. On February 27th DOI Secretary Gale A. Norton announced that critical changes for management and protection of coral reefs would go forward, including full protection from extractive uses in BUIS and most of VICR.

Abraham Lincoln Birthplace NHS

Provided technical advice and comment of the Abraham Lincoln National Birthplace General Management Plan / Environmental Impact Statement Project Agreement.

Big Cypress National Preserve

Provided peer review for 2003 U.S.

Geological Survey report, “Water quality in Big Cypress National Preserve and Everglades National Park --- trends and spatial characteristics of selected constituents.”

Big South Fork National River and Recreation Area

Developed scope-of-work for completing final assessments of contaminated mine drainage.

Biscayne National Park

Provided review and approval of the implementation plan for the WRD funded project “Develop Waterflow Needs in Biscayne NP Using Adjacent Coastal Wetlands as Indicators.”

Provided advice to park staff in review of wastewater reuse plan which would provide additional water to the park.

Provided advice to park staff on using remote sensing to determine areas of the bay bottom where freshwater is entering the bay.

Assisted in development of a State of Florida – Biscayne National Park Cooperative Fisheries Management Plan.

Continued to assist park with General Management Planning issues and draft management alternatives development.

Assisted the park in developing a joint funding proposal with Dr. Jerry Ault, University of Miami, Rosenstiel School of Marine and Atmospheric Sciences, for additional tarpon and bonefish studies with the park.

Assisted the park with coral reef restoration planning in response to several major shipwrecks that have damaged park reefs.

Blue Ridge Parkway

Assisted park in considering Roanoke County's request for monitoring well installation on park lands and with follow-up technical review of landfill closure and monitoring documents.

Completed review of North Carolina water right studies for municipal water supplies.

Completed review and comments for a special use permit and water supply alternatives for a town reservoir on the Moses Cone Estate.

Buck Island Reef National Monument

Assisted Park staff in developing survey strategy and NRPP proposal to assess condition and recovery of coral reef fish and invertebrates in no-take marine reserve in newly expanded marine area.

Canaveral National Seashore

Visited park and reviewed WRD funded project proposal related to developing a coordinated monitoring network in Mosquito Lagoon.

Cape Hatteras National Seashore

Provided information for EA to modify network of drainage ditches in the vicinity of the Cape Point Campground.

Chattahoochee River National Recreation Area

Assisted the park, the region, and the Environmental Quality Division in determining appropriate mitigation for sediment deposition in a wetland area (a 19jj case).

Provided technical assistance in developing instream flow studies to evaluate habitat availability related to water flow through the park and in assessing potential impacts of a Tri-State Water Compact that is being negotiated.

Assisted park with preparation of comments and attendance at technical meetings related to ACF Negotiations.

Assisted park with preparation of research needs to develop supporting data for ACF Allocation Formula Negotiations.

Reviewed and provided comments for Office of the Solicitor Opinion regarding the park's regulation of water withdrawals within its boundaries

Congaree Swamp National Monument

Provided programmatic oversight and review of the completion report for an NRPP funded study to inventory and determine distribution and abundance of fish species.

Cumberland Gap National Historical Park

Provided technical advice and comment on the Cumberland Gap National Historical Park General Management Plan / Environmental Impact Statement Project Agreement.

Dry Tortugas National Park

Assisted Park staff in developing Marine Resource Management Plan and monitoring of newly established Research Natural Area with Park staff.

Everglades National Park

Attended mercury issue meeting and advised the park on new findings related to the key role of sulfate in worsening methyl mercury problems. Advised park staff on the role of pH change in moving mercury between periphyton and the water column.

Reviewed Vital Signs monitoring conceptual model.

Reviewed Floodplain Statements of Findings for Pine Island Wastewater System Improvements and Flamingo Wastewater System Improvements.

Fort Donelson National Battlefield

Provided policy review and comment of the Fort Donelson National Battlefield draft Environmental Assessment for boundary expansion.

Fort Pulaski National Monument

Provided technical advice and comment of the Fort Pulaski National Monument General Management Plan / Environmental Impact Statement Project Agreement.

Fort Raleigh National Historic Site

Provided technical advice and comment on the Fort Raleigh General Management Plan / Environmental Impact Statement Project Agreement.

Great Smoky Mountains National Park

Provided detailed review and technical comments for a floodplain Statement of Findings.

Provided final technical review and comment on the Draft Wetland and Floodplain Statements of Findings for a Proposed Land Exchange between the National Park Service and the Eastern Band of Cherokee Indians at the Great Smoky Mountains National Park.

Assisted in finding appropriate statistical analyses to detect trends in streamwater chemistry related to air pollution.

Assisted with field work on a native brook trout restoration project on Bear Creek.

Gulf Islands National Seashore

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

Met with staff at park and consulted on monitoring issues and technical assistance request on disposal of dredge spoil.

Provided technical advice and comment on the Gulf Islands National Seashore General Management Plan / Environmental Impact Statement Project Agreement.

Jean Lafitte

National Historical Park & Preserve

Reviewed U.S. Geological Survey Water Resource Investigations report related to water quality in the Barataria Preserve.

Provided technical advice and comment on the Chalmette Battlefield and National Cemetery General Management Plan / Environmental Impact Statement Project Agreement.

Provided technical evaluation of the adverse impacts associated with the production of four new oil and gas wells adjacent to the Barataria Wetland Preserve. Reviewed and commented on the draft Environmental Assessment.

Coordinated with park staff to identify an opportunity to restore marsh area in the Barataria Preserve that would serve as compensation for the wetland impacts from the Natchez Trace Parkway (Stream Bank Stabilization at Big Bayou Pierre and North Fork of Coles Creek) project.

Mammoth Cave National Park

Provided programmatic oversight and technical support, as needed, for the initiation of the Mammoth Cave National Park Water Resources Management Plan.

Provided technical advice to park staff regarding water quality metadata and the format of project, station, metadata, and result files to facilitate uploading data from their ongoing monitoring program to STORET.

Reviewed the final report for an NRPP funded study to collect baseline data on the plankton community of the Green River.

Moores Creek National Battlefield

Provided technical specifications for a contract to reintroduce native wetland grasses at the battlefield. The revegetation work is part of an ongoing effort to restore the cultural landscape (including wet, mesic, and dry pine savanna habitats) that existed at the time of the 1776 Battle of Moores Creek Bridge.

Natchez Trace Parkway

Provided technical evaluation of the “Wetland Statement of Findings: Stream Bank Stabilization at Big Bayou Pierre and North Fork of Coles Creek.” WRD’s signature certified the technical adequacy of the wetlands analyses and consistency of the project with *Director’s Order #77-1: Wetland Protection*.

Obed Wild and Scenic River

Coordinated presentation by the U.S. Geological Survey for park management on Obed River watershed hydrology and briefed park management and staff on feasible strategies to protect park water rights.

Provided oversight on a multi-year paired-basin study by the U.S. Geological Survey to investigate the effects of small and medium-sized impoundments on streamflow.

Assisted with evaluation of a proposal to raise the height of a small dam impoundment that is used for water supply purposes.

Shiloh National Military Park

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

Timucuan Ecological and Historic Preserve

Provided background on the State of Florida’s water quality data access policy and contact information for the state’s STORET coordinators.

Vicksburg National Military Park

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

Virgin Islands National Park

Provided equipment logistics, data management, and downloading capability for erosion monitoring using WRD equipment.

TECHNICAL ASSISTANCE PROVIDED BY NATURAL RESOURCE CHALLENGE AQUATIC RESOURCE FIELD PROFESSIONALS

SERVICEWIDE

Assisted the Water Resources Division the initial planning for a Servicewide Watershed Condition Assessment Program.

Consulted with WASO regarding NPS involvement in the National Ecological Observatory Network (NEON) proposal.

Worked with Air Resources Division on a mercury vulnerability analysis using GIS based analysis.

Participated on a committee to help draft Servicewide electro-fishing safety guidelines.

REGION, NETWORK, AND PARK SUPPORT

ALASKA REGION

Arctic Network

Met with the Arctic Network technical committee to discuss network needs and to begin “scoping” efforts pertaining to freshwater resources and the need for a scoping workshop.

NRC field professionals, continued

Participated in discussions regarding methodologies for efficient and effective water-related data “mining.”

Central Alaska Network

Worked with an interdisciplinary team to develop a conceptual model for the network’s long-term monitoring program.

Assisted in editing the Central Alaska Network Phase 2 Inventory and Monitoring Report.

Developed a study plan for a pilot project for aquatic resources monitoring for the Central Alaska Network.

Planned and conducted a pilot study to test the field sampling protocols for aquatic monitoring in the Central Arctic Network.

Gates of the Arctic National Park and Preserve

Developed two PMIS project proposals to conduct water-related baseline research. Monitored the progress of a large NPS – U.S. Geological Survey project to monitor groundwater quality at Anaktuvuk Pass.

Reviewed literature on past work in Gates of the Arctic National Park and Preserve and edited various documents.

Lake Clark National Park and Preserve

Provided project oversight for the Lake Clark sockeye salmon escapement study; installed remote field camp, supervised field crew, and provided logistical support.

Developed PMIS project statement submitted to the FY05-09 Servicewide Comprehensive Call (BRMD) a proposal for northern pike research in the Lake Clark watershed.

Coordinated with U.S. Geological Survey – BRD Alaska Science Center staff to submit

a NRPP – BRD proposal for research on humpback whitefish in the Lake Clark watershed.

Established a CESU agreement with the University of Idaho under which a graduate student will study the growth rate of resident fish populations within Lake Clark National Park and Preserve.

Sampled nine sockeye salmon spawning areas within the Lake Clark drainage for age and size data.

Coordinated with U.S. Geological Survey WRD staff and NPS regional hydrologist concerning the Crescent River water quality study (PMIS # 45179).

Wrote and submitted the study plan for the Kijik River watershed study (PMIS # 46782).

Assisted Dr. Gordon Haas (University of Alaska) with an inventory of resident fish species in the Lake Iliamna area.

Worked cooperatively with the Alaska Department of Fish and Game (ADF&G) to collect sockeye salmon genetic samples from Telaquana Lake in the northern portion of the park.

Wrangell-St. Elias National Park and Preserve

Worked on the vascular plant inventory by helping the park botanist and inventory coordinator select and visit wetland sites along the coastal zone near Yakutat Bay.

Yukon-Charley Rivers National Preserve

Wrote two PMIS proposals to conduct water-related baseline research.

Managed a cooperative agreement to dismantle the Kandik River gauge and maintain the Nation River gauge.

INTERMOUNTAIN REGION

Represented NPS on the Biology Committee of the Upper Colorado River Endangered Fish Recovery Implementation Program.

Participated in Biology Committee and Biology Committee Subgroup meetings of the San Juan River Basin Recovery Implementation Program.

Participated in a meeting of the Virgin River Recovery Program Technical Committee.

Sonoran Desert Network

Participated in meetings to discuss tinaja monitoring and hydrologic studies at Saguaro National Park.

Participated in vital signs selection groups for hydrology and air quality.

Reviewed and commented on the Sonoran Desert Network Phase II Inventory and Monitoring Report.

Southern Colorado Plateau Network

Reviewed, edited, and rewrote parts of the Phase I Water Resources appendix.

Coronado National Memorial

Initiated a hydrologic investigation and monitoring program.

Dinosaur National Monument

Assisted BOR and CSU researchers with fish surveys in on the Green River in Canyon of Lodore.

Fort Bowie National Historic Site

Initiated a monitoring program for flow from Apache Spring.

Fossil Butte National Monument

Cooperated with park staff and the Wyoming Game and Fish in conducting a fish community survey.

Glen Canyon National Recreation Area

Submitted a CCI proposal to evaluate Colorado pikeminnow stocking in the lower San Juan River in cooperation with the Utah Division of Wildlife Resources.

Organ Pipe Cactus National Monument

Investigated the need and methods for monitoring Quitobaquito Spring.

Pipe Spring National Monument

Provided recommendations to the park regarding options for controlling algae in ponds using fish and other methods.

Saguaro National Park

Investigated alternative water supply sources for the Tucson Mountain Unit.

Assisted with hydrologic evaluation and monitoring of the Rincon Creek watershed in support of water right application for instream flow.

Tumacacori National Monument

Investigated hydrology and source of water for a spring/seep area.

Yellowstone National Park

Assisted park fisheries staff with removal of nonnative lake trout (*Savelinus namaycush*) from Yellowstone Lake.

Zion National Park

Provided input to park staff on restoration of habitat in the Virgin River.

MIDWEST REGION

Represented NPS at meetings of the Lake Superior Technical Committee of the Great Lakes Fishery Commission.

Visited and collected fisheries reports for Voyageurs National Park, Grand Portage National Monument, Apostle Islands National Lakeshore, Isle Royale National Park, Pictured Rocks National Lakeshore,

NRC field professionals, continued

Sleeping Bear Dunes National Lakeshore and St. Croix National Scenic River.

Compiled reports for two additional NPS units (Mississippi National River and Recreation Area and Indiana Dunes National Lakeshore).

Participated in Midwest regional review for the Servicewide Comprehensive Call.

Isle Royale National Park

Participated in the development of the Isle Royale Fisheries Management Plan by 1) summarizing the historic and current fisheries investigations and creel survey data; 2) authoring sections on fisheries management and impacts of contaminants; 3) assisting in writing a section on aquatic nuisance species; and 4) leading initial discussions pertaining to desired future conditions.

Assisted the U.S. Fish and Wildlife Service in conducting annual coaster brook trout sampling.

Pictured Rocks National Lakeshore

Participated in the annual coaster brook trout planning meeting with Michigan Department of Natural Resources, and the U.S. Fish and Wildlife Service.

Assisted with fish collection from Beaver and Miner's lakes for contaminant analysis.

Saint Croix National Scenic River

Participated by phone in the annual meeting with entities concerned with St. Croix River fisheries, including the states of Wisconsin and Minnesota and the Great Lakes Indian Fish and Wildlife Commission.

Sleeping Bear Dunes National Lakeshore

Assisted with development of study plan and sampling protocol for fisheries investigations.

Voyageurs National Park

Participated in planning meetings for long term program to monitor lake levels monitoring and effects on fisheries resources.

NATIONAL CAPITAL REGION

Developed custom watershed delineations for National Capital Region (NCR) parks using GIS and GIS hydrological modeling software.

Created and administered the Center for Urban Ecology (CUE) WWW site. Acted as network administrator and provided technical assistance in information technology.

Participated in five year review and strategic planning for the MD/DC district office of the U.S. Geological Survey.

National Capital Region Network

Participated in I&M bi-monthly planning meetings as science advisor for water resources.

Made 75m stream reach maps for use with MBSS monitoring.

Began discussions with MBSS personnel, the data manager at Shenandoah National Park, and Dean Tucker of WRD regarding the creation of a database front-end for entering biological and physical/chemical sampling results.

National Capital Parks – East

Consulted on Fort Dupont hydrology.

Reviewed compliance documents with the Washington Aqueduct NPDES permitting process.

Catoctin Mountain Park

Reviewed the environmental monitoring program, including advanced statistical trend analysis of existing data.

NRC field professionals, continued

Assisted WRD in initiating a Water Resources Scoping Report.

**Chesapeake & Ohio Canal
National Historic Park**

Assisted in the planning for research projects regarding the Washington Aqueduct issue.

Consulted on landslides on Canal Road and on wetlands on MacArthur Blvd.

Clara Barton National Historic Site

Consulted on bug infestations and stream water quality.

George Washington Memorial Parkway

Attended a meeting on Dyke Marsh restoration.

Monocacy National Battlefield

Consulted on a polluted farm pond and polluted visitor's center pond and analyzed water samples.

Prince William Forest Park

Consulted on water quality monitoring efforts.

Rock Creek Park

Consulted regarding the aquatic status of lands scheduled for land swap near Whitehaven Parkway.

**Wolf Trap Farm Park for the
Performing Arts**

Consulted regarding erosion problems and possible stream restoration projects.

NORTHEAST REGION

Northeast Coastal and Barrier Network

Provided technical review and comment of the draft estuarine nutrient enrichment report.

Northeast Temperate Network

Provided assistance to the U.S. Geological Survey for preparation of the network water quality monitoring plan.

**Allegheny Portage Railroad
National Historic Site**

Reviewed mountain acid mine drainage treatment options.

Participated in the preparation of a NPS – U.S. Geological Survey cooperative plan to procure funding to initiate background data analyses, evaluation of mitigation options, and development of a mitigation plan pertaining to acid mine drainage issues.

Appalachian National Scenic Trail

Provided verbal consultation regarding water resource issues.

**Booker T. Washington
National Monument**

Discussed external development effects to surface waters within the park and provided a recommended course of action to the superintendent.

Colonial National Historical Park

Provided technical review and comment on five water-related PMIS proposals.

**Delaware Water Gap
National Recreation Area**

Provided technical assistance for water quality model development and bathymetric analyses related to point source management.

Developed alternative water monitoring strategies for evaluating Bog Turtle habitat.

Provided technical review and comment on the Delaware River Basin Commission Special Protection Waters document.

Eleanor Roosevelt National Historic Site

Provided a written assessment of park water issues and a technical review of a proposal for future pond dredging.

NRC field professionals, continued

**Fredericksburg & Spotsylvania
County Battlefields Memorial
National Military Park**

Consulted regarding stream restoration efforts.

**George Washington Birthplace
National Monument**

Prepared a synthesis of natural resource issues for inclusion in the draft George Washington Birthplace NM General Management Plan.

Hampton National Historic Site

Provided guidance on the potential impacts of road construction to wetlands.

Hopewell Furnace National Historic Site

Attended a GMP planning session involving the identification of a flooding issue.

Lowell National Historical Park

Provided consultation regarding park concerns with a minor fish kill.

**Marsh-Billings-Rockefeller
National Historical Park**

Evaluated the need for water resources related assistance in the FY 2004 development of a forest management plan.

Minute Man National Historical Park

Assisted with the development of potential strategies for daylighting a culverted stream and reestablishing altered wetlands.

Morristown National Historical Park

Developed custom watershed delineations for the park, using GIS and GIS hydrological modeling software.

Reviewed the environmental monitoring program with the goal of recommending park-based monitoring efforts and integrating those efforts into future I&M programs.

Reviewed potential UST contamination issues associated with the DelBarton site.

**New River Gorge National River /
Gauley River National Recreation Area**

Advised park regarding the construction of a new coal facility.

Richmond National Battlefield Park

Provided an assessment of a flooding complaint on lands adjacent to the park.

Sagamore Hill National Historic Site

Evaluated a parking lot reconstruction project to identify potential impacts to a nearby kettle hole pond.

Saint-Gaudens National Historical Park

Reviewed water-related resource management needs and assisted with preparation of a technical assistance request for a water resources scoping report.

Saugus Iron Works National Historic Site

Assisted in a site evaluation and project needs assessment for Turning Basin restoration.

Shenandoah National Park

Maintained liaison with the Water Resources Division throughout the development of the Shenandoah National Park Water Resources Scoping Report.

Provided technical advice and review regarding the restructuring of the long term water quality monitoring plan.

Initiated contact with the U.S. EPA and VADEP regarding impaired water listing requirements for the waters within the park.

Participated in a ten-year review of the park's prototype monitoring program.

**Upper Delaware
Scenic and Recreation River**

Assisted the park in the development of a cooperative funding proposal for flow

NRC field professionals, continued

characterization and management along the Delaware River.

Worked with the Nature Conservancy and Trout Unlimited to solicit matching funding agreements for flow characterization studies within the park.

Provided technical comments pertaining to the Delaware River Basin Commission Special Protection Waters document.

Attended New York City reservoir release workshop to become familiar with water control system and operators.

Attended DOI planning meetings for a FERC re-licensing proposal, which included requests for water quality monitoring associated with reservoir releases.

Valley Forge National Historical Park

Reviewed water-related management issues within the park; assisted with the analysis of these issues within the context of the preparation of a new draft General Management Plan.

Reviewed PMIS funded proposal to examine sediment load in Valley Creek; identified university cooperator to fulfill project needs and assisted with study plan development.

PACIFIC WEST REGION

Met with other Pacific West Region (PWR) water resource personnel who have multi-park responsibilities to begin developing an understanding of major issues related to fluvial geomorphology the Region.

Began assembling, as an on-going project, river and stream related information on select region parks with significant water resource concerns.

Reviewed regional water resources and U.S. Geological Survey Water Quality proposals for the Servicewide Comprehensive Call.

Reviewed and helped prioritize, as a subject matter expert, regional requests for technical assistance.

Started coordinating with outside parties (Federal and state agencies, Indian Tribes, universities, and non-profit organizations) to strengthen research alliances.

North Coast and Cascades Network

Participated regularly in several technical committees and work groups.

Assisted in field measurements of glacier mass-balance for NCCN glacier monitoring.

Participated in landform mapping, documenting certain landforms to provide information on disturbance events and the history of watersheds.

Provided technical oversight in multiyear project to estimate stream flow of ungauged streams.

Participated in monitoring priority setting for the network.

Devil's Postpile National Monument

Provided technical information in anticipation of later site visit.

Prepared a vegetation monitoring report for the Soda Springs Meadows Restoration Project.

Lake Roosevelt National Recreation Area

Supplied technical support at a special Lake Roosevelt Water Council meeting,

Mojave National Preserve

Participated in a workshop to assess the status and efforts to recover the threatened Mojave tui chub (*Gila bicolor mohavensis*).

NRC field professionals, continued

Drafted and submitted a Mohave tui chub story suggestion for National Public Radio Earth and Sky Radio program.

Reviewed and provided comments on a proposal to assess the effects of Asian tapeworm on the Mojave tui chub

Mount Rainier National Park

Initiated and provided project coordination for borrow pit, spoils, and sand and gravel management plan to reduce impacts to aquatic resources.

Managed and assisted in field work surveying lateral surface profiles of the Nisqually glacier for glacier monitoring.

Initiated a river reach analysis of the lower Carbon River to inform management options after recent flooding and damage to park infrastructure.

Conducted field investigations of recent glacier outburst floods (*jökulhaups*) in Tahoma Creek and debris flows in Kautz Creek.

Assisted in floodplain and hazard assessment for site-specific park proposals.

Started a rapid assessment of the adequacy of the levee at Longmire.

Participated in field inspection of underground mines in the park.

Started collaboration with park archeologist to estimate the spatial extent of past glaciation to aid locating cultural sites.

Served on the Volcano Hazards Work Group.

Olympic National Park

Collaborated with park, region, and national staff to develop road options for Finley Creek.

Assisted in developing road options after flood damage in Graves Creek.

Provided technical assistance and wrote the scope of work for a funded sediment study to determine restoration options to reverse the decline of sockeye salmon, a threatened species under the Endangered Species Act.

Point Reyes National Seashore

Participated in red-legged frog survey conducted by USGS BRD.

Whiskeytown-Shasta-Trinity National Recreation Area

Advised personnel on a road failure at Mill Creek and potential wetland restoration at Upper and Lower Clear Creek.

Yosemite National Park

Consulted with park staff regarding ongoing restoration projects.

SOUTHEAST REGION

Acted as SERO management coordinator for NPS Strategic Plan Goal Ib5 Aquatic Resources. Became familiar with goal and performance management data system (PMDS) and interacted with other regional contacts.

Represented NPS on Gulf States Regional Panel on Aquatic Invasive Species.

Help coordinate activities between the Division of Science and Natural Resources and the Division of Rivers, Trails and Conservation Assistance regarding dam relicensing.

Attended meetings of the American Fisheries Society and Cohutta Chapter Trout Unlimited.

Became a member of the Southeastern Imperiled Fishes working group.

NRC field professionals, continued

Drafted manuscript on shoal bass age and growth to be submitted to North American Journal of Aquaculture.

Acted as regional contact for manatee issues.

Big South Fork National River and Recreation Area

Provided technical assistance on white bass stocking.

Biscayne National Park

Provided review and comment on future desired conditions, attended public scoping workshops, and participated in workgroup teleconference calls for the Biscayne National Park Fisheries Management Plan.

Chattahoochee River National Recreation Area

Represented NPS on FERC re-licensing issues.

Represented NPS on U.S. Geological Survey Instream Flow study.

Provided technical assistance on fisheries project proposals.

Submitted project proposal and provided project oversight for shoal bass restoration. This project has involved a coordinated effort with the Georgia Department of Natural Resources.

Conducted project on shoal bass age and growth.

Coordinated and provided project oversight on joint project with U.S. Fish and Wildlife Service concerning the Asian rice eel invasion.

Initiated Memorandum of Understanding between CHAT and the State of Georgia Department of Natural Resources for natural resource management.

Congaree Swamp National Monument

Represented NPS on seismic dam remediation. Coordinated work on this project with the U.S. Fish and Wildlife Service and the South Carolina Department of Natural Resources.

Submitted project proposal examining effects of flooding on fisheries.

Everglades National Park

Presented workshop on multivariate statistics.

APPENDIX B

SUMMARY OF WATER RESOURCES DIVISION FUNDING: PROJECT AND PROGRAM ALLOCATIONS

FY 2003 base funding for the Water Resources Division was \$11,613,000 (Table 1). These funds were distributed among five principal categories: Water Resource Projects (Water Resource Protection; Competitive Projects; and Other); Water Quality Monitoring; Water Resource Protection – Aquatic Resource Professionals; Watershed Condition Assessment Program (including projects); and Water Resource Technical Assistance (Table 2).

Table 1. Water Resources Program FY 2003 Funding

Funding available in FY 2002	\$ 7,905,000
Across-the-board travel reduction	-41,000
Pay increase	26,000
Natural Resource Challenge increases in FY 2003	
Monitor water quality	497,000
Watershed assessment	3,080,000
Expand water resource protection and restoration	200,000
Across-the-board reduction	<u>-53,000</u>
Total allocation in FY 2003	\$ 11,614,000
Reprogramming of travel reduction	<u>-1,000</u>
Total funding available in FY 2003 Financial Plan	\$ 11,613,000
Reprogrammed funds	<u>-366,400</u>
Total funding available in FY 2003	\$ 11,246,600

Table 2. Water Resources Program - FY 2003 Base Funding by Category

Water Resource Projects	
Water Resource Protection	\$ 1,329,000
Competitive Projects ¹	380,300
Other Projects	15,000
Water Quality Monitoring	1,775,000
Water Resource Protection – Aquatic Resource Professionals²	1,170,100
Watershed Condition Assessment Program³	1,263,000
Competitive Projects	1,102,700
Critical Projects	500,000
Water Resource Technical Assistance	<u>3,711,500</u>
Total	\$11,246,600

¹ Base funding for the Water Resources Division Competitive Projects was \$471,400; a one-time rescission occurred in the middle of fiscal year 2003.

² Base funding for the Aquatic Resource Professionals was \$1,200,000; a one-time rescission occurred in the middle of fiscal year 2003.

³ Base funding for the Watershed Condition Assessment Program (including projects) was \$3,024,000; a one-time rescission occurred in the middle of fiscal year 2003.

A summary of accomplishments derived from the FY 2003 base budget and the FY 2003 increase is provided below.

WATER RESOURCE PROJECTS

The projects category includes three areas: Water Resource Protection Projects, WRD Competitive Projects, and Other Projects which are non-competitive. Water resource projects are funded in the areas of general water resources, water quality, wetlands protection, and water rights. In addition, the U.S. Geological Survey, through a partnership with NPS, funds water quality assessment projects in parks. These projects support park-defined issues and needs.

WATER RESOURCE PROTECTION PROJECTS

FY 2003 Results Due to Project Funding Increase

The Natural Resource Challenge resulted in an increase of \$823,000 in the water resource protection projects budget beginning in FY 2001. As shown in Table 3, FY 2003 expenditures for this budget increase expanded the NPS's capability to fund data collection and analyses that can be used to describe surface and ground water flow regimes and investigate the dependence of park resources upon water. These efforts are targeted toward development of scientific information that will benefit decision-makers, including Federal managers, court judges, or State administrators such as State Engineers. Priorities are determined by the requirements of Federal or State law. Presentation of results may occur in State or Federal permit process documents such as rights-of-way and Clean Water Act permits, State water rights process documents such as applications, protests, or administrative hearing records, or Federal or State court process documents such as adjudication claims, objections, or court hearing records. Results are often intended to support settlement negotiations conducted to avoid contested case hearings or contested land use decisions or to support the implementation of settlements.

To increase the effectiveness of its water resource protection funding, NPS partners with other non-federal entities. Some studies occur as a result of collaboration with State or private entities with common science objectives. For example, hydrologic data collected by NPS studies for Lake Mead National Recreation Area and Death Valley National Park are shared with the Nevada State Engineer, southern Nevada water purveyors and private developers, thereby contributing to the larger-scale investigation of water availability in southern Nevada. In another example, data and other science information collected at Chickasaw National Recreation Area contributes to an on-going state-federal study of the Arbuckle-Simpson Aquifer in southeastern Oklahoma.

Table 3. Water Resource Protection Projects - FY 2003

Park	Region	PROJECT TITLE (s)	FY03 FUNDING \$(000s)
ALL	ALL	Support to the Office of the Solicitor	164.5
AZ Parks	IMR	Hydrologic Data Collection in Support of the Adjudication of the Little Colorado River Basin in Arizona	20.9
BLCA	IMR	Participation in the Adjudication of Colorado Water Div. #4	13.0
CAVE	IMR	Hydrologic Investigation, Restore Streamflow	21.1
CHIC	IMR	Hydrologic Data Collection, Participation in State Administrative Process	111.0
GRCA	IMR	Groundwater Study, Spring Protection	65.5
MEVE	IMR	Implementation of Water Rights Decree	1.2
MOCA	IMR	Hydrologic Data Collection in Support of the Adjudication of the Verde River Basin in Arizona	43.9
MT Parks	IMR	Implementation of the Montana-NPS Compact	1.8
SAGU	IMR	Investigation of Hydrology and Water Related Values	145.9
UT Parks	IMR	Participation in the Adjudication of Various Areas in Utah	3.0
BUFF	MWR	Investigation of Hydrology and Water Related Values	80.0
SLBE	MWR	Hydrologic Data Collection, Crystal River	13.0
THRO	MWR	Investigation of Hydrology and Water Related Values	11.5
CRLA	PWR	Assessment of Feasibility and Cost, Improve Priority Date	18.8
DEVA	PWR	Devil's Hole and Spring Flow Monitoring, Groundwater Study, Participation in Groundwater Model Development	105.1
GRBA	PWR	Assessment of Hydrologic Conditions and Vulnerability of Park Streams to Groundwater Development	40.0
LAME	PWR	Spring Flow Monitoring, Participation in Cooperative Aquifer Stress Test, Groundwater Model Development	329.0
OBRI	SER	Stream Flow Monitoring, Investigation of Hydrology and Water Related Values	73.6
ALL	ALL	Technical and Administrative Support to All Projects	66.2
		TOTAL FOR WATER RESOURCE PROTECTION PROJECTS	1,329.00

WATER RESOURCES DIVISION COMPETITIVE PROJECTS

Water Resources Division competitive projects support many park-based activities, including the design of information management systems, regulatory assessments, riparian/stream and watershed restoration and protection projects with water quality goals, or other water quality improvement projects. Projects may also include design and implementation of best management practices required to improve water quality to meet state-mandated polluted runoff or non-point source pollution control or other park water quality goals and objectives. In addition, projects may encompass one-time assessments or inventories of water quality baseline conditions or contaminants.

WRD competitive project funding for FY 2003 totaled \$1,483,000. This funding was derived from WRD base project funds (\$380,300), and support to the backlog of watershed and water quality assessment needs currently identified in NPS-PMIS from the new Watershed Condition Assessment program before it transitions to a long-term program of systematic park-based assessments of NPS watershed conditions (\$1,102,700).

Fully Funded Projects: Fully funded projects are projects that received the final funding installment in FY 2003. Although these projects will not receive additional funding from WRD beyond FY 2003, fieldwork, data analysis, report writing, or peer review may continue into the next year. A total of 17 projects received their last year of funding in FY 2003. Table 4 shows projects that received their final year funding in FY 2003.

**Table 4. Water Resource Division Competitive Projects
Final-Year Funded Projects - FY 2003**

Park	Region	PROJECT TITLE	FY03 Funding \$(000s)
GRTE	IMR	Baseline Water Quality Parameters/Land Use Characteristics of Five Snake River Headwater Tributaries	29.4
ISRO	MWR	Develop Water Resources Management Plan	25.0
SACN	MWR	Historical Trends in Phosphorous Loading from Permitted Point Source Discharges	25.0
CATO	NCR	Evaluate Water Quality for all Park Streams	14.0
ACAD	NER	Assess Current and Historic Atmospheric Deposition of Toxic Contaminants	49.5
DEWA	NER	Develop Groundwater Monitoring	41.0
MORR	NER	Distribution of Consumer Chemical Tracers to Evaluate Potential Septic System Sources of Fecal Bacterial Contamination	42.5
LAVO	PWR	Restoration of Drakesbad Meadow	25.0
MOJA	PWR	Perform Baseline Hydrologic and Biologic Inventory of Wetlands	25.0

Table 4. continued

Park	Region	PROJECT TITLE	FY03 Funding \$(000s)
OLYM	PWR	Analyze Channel Dynamics on the Hoh and Quinault Rivers to Protect Fish and Aquatic Resources	15.0
OLYM	PWR	Lake Ozette Tributary Sediment Sources, Transport, Potential & Control	50.0
PORE	PWR	Hydrologic and Ecological Impacts of Commercial Oyster Framing on the Biota of Drakes Estero	25.0
REDW	PWR	Evaluate Watershed and Stream Channel Conditions Related to Disturbance History and Coho Habitat in Mill Creek	20.7
REDW	PWR	Install Streamflow Gaging Station on Prairie Creek	14.7
BISC	SER	Develop Waterflow Needs in Biscayne NP Using Adjacent Coastal Wetlands Indicators	72.3
CANA	SER	Develop Water Quality Monitoring Program	50.0
MOCR	SER	Restore Native Vegetation to Savannah Wetland	18.2
TOTAL			542.3

Continuing Projects: Many WRD competitive projects receive funding for 2 years. Table 5 identifies projects with funding that extend at least one year beyond FY 2003.

**Table 5. Water Resources Division Competitive Projects
Continuing Projects - FY 2003**

Park	Region	Project Title	FY03 Funding \$(000s)
WRST	AKR	Investigate Limnological Conditions in Tanada Lake Affecting Sockeye Salmon Production	17.3
CURE	IMR	Data Collection & Analysis of Required Water Quality Parameters; Outstanding Waters Designation	49.8
PEFO	IMR	Stream and Riparian Characterization and Analysis	26.8
WABA	IMR	Conduct a Riparian Corridor Restoration Study at Washita Battlefield NHS	49.5
BUFF	MWR	Characterization of Macroinvertebrate Community and Drift in a Tributary of BUFF, Prior to Damming	19.2
BUFF	MWR	Ground and Surface Water Interactions of the Buffalo National River	42.5
BUFF	MWR	Inventory and Assess Springs and Perennial Streams Buffalo National River	50.0
ISRO	MWR	Assess Hydrocarbon Pollution Threats to Park Waters	49.5
SACN	MWR	Determine Groundwater Impacts to the St. Croix National Scenic Riverway	40.0

Table 5. continued

Park	Region	Project Title	FY03 Funding \$(000s)
SACN	MWR	Classify Critical Aquatic Habitat for the St. Croix National Riverway	45.2
NCRO	NCR	Capture and Assess Stream Health in Highly Fragmented Parks	52.2
CACO	NER	Management of Dune Slack Wetlands	16.0
CACO	NER	Pilgrim Lake Dynamics	50.0
DEWA	NER	Regional Point Source Management to Support Special Protection Water Quality Regulations	50.0
GOGA	PWR	Plan Rodeo Lagoon Watershed Wetland Riparian Habitat Restoration	43.5
GRBA	PWR	Aquatic Survey and Condition Assessment of GRBA	58.5
HAFO	PWR	Water Quality Impacts to the Snake River from Landslides	25.0
PORE	PWR	Enhanced Wetlands Mapping for Tomales Bay Watershed	47.6
PORE	PWR	Restoration of Horseshoe Pond to Coastal Lagoon	62.5
REDW	PWR	Evaluate Stream Temperature Regimes for Juvenile Coho	29.1
BISC	SER	Identify Restoration, Reservations and Minimum Flows and Level Targets for Biscayne NP	50.0
MACA	SER	Develop Water Resource Management Plan	25.0
		TOTAL	940.7

OTHER PROJECTS

Cooperative Academic Program for Fisheries: Because of the limited professional fishery expertise within the National Park Service, this program uses a small amount of WRD base funding to further develop and increase cooperative relationships between the academic community and the NPS fisheries program. Funds are set aside to help foster graduate student research at National Park System units and to help cooperatively fund fishery students engaged in NPS park projects. Potential high priority projects suitable for graduate student research are identified through the NPS PMIS project need data system and matched to student availability through discussions with fishery professors. The program helps introduce top caliber fishery students to National Park Service programs, as well as expanding the level of expertise made available to parks. In FY 2003, a two-year project was completed in Rocky Mountain National Park to evaluate barriers to the upstream movement of non-native brook char. The successful reclamation of stream reaches for the reintroduction of native cutthroat trout depends on the permanent exclusion of competing trout species.

WATER QUALITY MONITORING: FY 2003 Funding

In FY 2003, the Water Resources Division received \$1,775,000 for the Water Quality Monitoring component of the Natural Resource Challenge. This was the 3rd year of funding for a program specifically intended to track and support the attainment of water quality standards in units of the National Park System as required by the NPS and DOI Strategic Plans. Planning and design of the program continues to be implemented in full integration with the NPS Park Vital Signs Monitoring Program. This is because water quality is a key vital sign in determining overall aquatic ecosystem health.

Full program funding was allocated to 17 Park Vital Signs Networks in FY 2003 (Table 6). In addition, funds supported the development of an NPS Servicewide water quality data management program within the U.S. Environmental Protection Agency (EPA) STORET national water quality database. While not shown in Table 6, WRD reallocated 16 work months involving five Division staff to support program administration and the development of program technical guidance, technical protocols, detailed study plan and Quality Control/Quality Assurance Plan guidance, and database management.

Table 6. Allocation of Water Quality Park Vital Signs Monitoring Funding - FY 2003

Network	Region	Number of Affected Parks	FY03 Funding \$(000s)
Central Alaska	Alaska	5	98
Heartland	Midwest	15	82
NE Coastal and Barrier	Northeast	8	90
National Capital	National Capital	11	71
Cumberland/Piedmont	Southeast	14	59
Appalachian Highlands	Southeast	4	70
North. Colorado Plateau	Intermountain	16	108
Greater Yellowstone	Intermountain	3	71
Sonoran Desert	Intermountain	11	64
North Coast & Cascades	Pacific West	7	82
San Francisco Bay	Pacific West	6	70
Mediterranean Coast	Pacific West	3	76
Southwest Alaska	Alaska	5	139

Table 6. continued

Network	Region	Number of Affected Parks	FY03 Funding \$(000s)
Northeast Temperate	Northeast	10	60
Southern Colorado Plateau	Intermountain	19	124
Pacific Islands	Pacific West	9	151
Great Lakes	Midwest	9	123
TOTAL: 2003 Network Monitoring	7 NPS REGIONS	155	1,538
Service-wide Data Management			237
GRAND TOTAL			1,775

Vital Signs Monitoring Networks: In FY 2003, all 17 Park Vital Signs Monitoring Networks fully committed their water quality funding to compilation of background information, analysis of issues and threats, detailed program planning, and supporting synoptic-level field assessments.

WATER RESOURCE PROTECTION: Aquatic Resource Professionals

In FY 2003, the National Park Service received \$1,200,000 to fund aquatic resource specialists in the field. The FY 2003 funding included an increase of \$200,000 through the Natural Resource Challenge to support 3 additional professionals. This brings the aquatic resource specialists in the field to a total of 16 new positions funded by the Challenge. These new professional staff provide technical assistance to parks, identify and conduct technical investigations to determine the condition of park aquatic resources, determine if actions of the National Park Service or external parties impair or impact resources, assist in developing and implementing aquatic resource mitigation and restoration projects, and interpret and implement National Park Service water resource-related policies and regulations. Accomplishments stemming from these new positions are listed in Appendix A.

**Table 7. Water Resource Protection - Aquatic Resource Specialists
FY 2002 and FY 2003 Funded Positions**

Region	Duty Station/Discipline	Status
AKR	YUCH/Aquatic Ecologist	FY 02 funded and filled
AKR	LACL/Fishery Biologist	FY 02 funded and filled
IMR	UT State Coord Office/Fishery Biologist	FY 02 funded and filled
IMR	Sonoran Desert Network/ Groundwater Hydrologist	FY 02 funded and filled
IMR	GRTE/Hydrologist	FY 02 funded; to be filled in FY 04
IMR/MWR	CHIC/Groundwater Hydrologist	FY 03 funded; to be filled in FY 04

Table 7. continued

Region	Duty Station/Discipline	Status
MWR	SACN/Aquatic Ecologist	FY 02 funded and filled
MWR	ISRO/Fishery Biologist	FY 02 funded and filled
NER/NCR	Center for Urban Ecology/Aquatic Ecologist	FY 02 funded and filled
NER	DEWA/Hydrologist	FY 02 funded and filled
NER	FIIS/Marine Ecologist	FY 03 funded; to be filled in FY 04
PWR	PORE/Aquatic Ecologist	FY 02 funded and filled
PWR	MORA/Geomorphologist	FY 02 funded and filled
PWR	LAME/Groundwater Hydrologist	FY 03 funded; to be filled in FY 04
SER	CHAT/Fishery Biologist	FY 02 funded and filled
SER	CHAT/Wetlands Ecologist	FY 02 funded and filled

WATERSHED CONDITION ASSESSMENT PROGRAM

A \$3.024 million increase to the Water Resources Division base occurred in FY 2003 as part of the Natural Resource Challenge to assess watershed conditions on a system-wide basis. The initiation of this new program is particularly timely because the nearly completed revision of the Department of the Interior Strategic Plan identifies the health of landscapes and watersheds as a key Outcome Goal, including health of uplands, wetlands, streams and riparian areas, and coastal and marine resources. The NPS currently administers programs as part of the Challenge to monitor water quality and assess water quantity conditions. The new watershed condition assessment program will integrate knowledge about water quality and quantity with new information developed about conditions of uplands, streams, riparian areas, wetlands, shorelines and coastal resources. Much of the information developed through assessments of watershed condition will support the information needs of park planning, resource protection, and resource restoration activities. Significant program accomplishments in FY 2003 are described below. Table 8 shows the budget allocation in FY 2003 for the watershed condition assessment program.

**Table 8. Watershed Condition Assessment Program
FY 2003 Budget**

Program Element	FY04 Funding \$(000s)
Watershed Condition Assessment Methods Compendium	250.0
Water Resources Competitive Project Program	1,102.7
NPS-USGS Water Quality Assessment Partnership Program	365.0

Table 8. continued

Program Element	FY04 Funding \$(000s)
WRD Watershed Condition Assessment – Critical Projects	500.0
Coastal Parks Phase I Watershed Condition Assessments	289.0
Marine Science Advisor	170.0
Other (incl. development of data systems)	189.0
TOTAL	2,865.7

Draft long-range program plan: An initial challenge for this new program is to define the concept of watershed condition assessment for the National Park Service and develop a framework and context for the systematic assessment of park watershed resource conditions. A five-year program plan was drafted that envisions substantial up-front investment in program planning, development of technical and program guidance, and integration with DOI strategic planning, NPS resource management planning, and NPS resource management, inventory and monitoring, and disturbed lands restoration activities. The program plan also provides support to the backlog of watershed and water quality assessment needs currently identified in NPS-PMIS before transitioning to a long-term program to support systematic park-based assessments of NPS watershed resource conditions.

Watershed Condition Assessment Methods Compendium: The field of watershed condition assessment is new, and there are no standard or widely-accepted methods or approaches to conducting structured, replicable assessments of watershed resources. A cooperative interdisciplinary project with the Cooperative Ecosystem Studies Units (CESU) system was initiated in 2003 to conduct a review, evaluation and classification of condition assessment methods, and to develop a compendium of methods applicable to NPS needs as well as guidance in methods selection.

Water Resources Competitive Project Program: There presently is a backlog of watershed resource and water quality assessment projects identified in NPS-PMIS. Thirty-three of these projects were funded through either the WRD Competitive Project Program process or through the NPS-USGS Water Quality Assessment Partnership Program.

NPS-USGS Water Quality Assessment Partnership Program: The NPS-USGS Water Quality Assessment and Monitoring Partnership Program was initiated under the Clean Water Action Plan and is funded primarily by the U.S. Geological Survey. In FY 2003, NPS expanded the program by contributing \$365,000 of Water Condition Assessment Program funds to support six multi-year partnership projects in parks. The six projects funded in FY 2003 include studies at Lake Roosevelt NRA, Rock Creek Park, Niobrara NSR, Mammoth Cave NP, Yosemite NP, and Canyonlands NP.

WRD Watershed Condition Assessment – Critical Projects: In FY 2003 funding, WRD funded projects that addressed emerging, high-priority park watershed condition issues that, because

of the applicable timeframes, could not be appropriately directed through the competitive project funding program. Examples of these projects include water quality assessments at Lakes Mead and Powell in support of a personal watercraft EIS process, and a hydrologic assessment at COSW in response to an emergency draining and repair of an upstream dam. Partnering with other Federal agencies, State agencies, and/or local watershed groups in carrying out these projects was emphasized. Table 9 shows the funding allocation for this project category.

**Table 9. WRD Watershed Condition Assessment – Critical Projects
Funded in FY 2003**

Region/State	Park	Project Title	FY03 Funding \$(000s)
PW California	WHIS	Sampling Water and Sediments for Contaminants: Supplemental Assistance for a Cooperative Project	24
PW/IM NV, AZ, UT	GLCA LAME	Development of a Comprehensive Water-Quality Monitoring Plan for Glen Canyon and Lake Mead National Recreation Areas	75
PW Nevada	GRBA	Susceptibility of Great Basin NP Resources to Ground-Water Withdrawals in Cross-Boundary Ground-Watersheds	164
SE Florida	BISC	Ground Water Characterization and Assessment of Contaminants in Marine Areas of Biscayne NP	75
SE South Carolina	COSW	Effects of Modified Dam Operations and Run-of-River Flow in the Congaree River to Floodplain Hydrology	68.5
Western states	SEKI ROMO	Assessing Airborne Contaminants in Water, Fish and Sediment in Western U.S. Parks	93.5
		TOTAL	500

Coastal Parks Phase I Watershed Condition Assessments: Because special considerations may apply in assessing watershed conditions associated with coastal parks, a series of coastal watershed assessments were initiated in 7 coastal parks on the Southeast Atlantic and Gulf Coasts, through cooperative agreements with three CESUs. These pilot assessments will evaluate existing information on each coastal park's water and aquatic resources and identify both watershed and marine-resource based issues and threats.

**Table 10. Pilot Coastal Watershed Condition Assessments
Funded in FY 2003**

Region/State	Park	Project Title	FY03 Funding \$(000s)
SE GA, NC	CAHA CALO CUIS	Assessment of Coastal Water Resources and Watershed Conditions in Cape Hatteras NS, Cape Lookout NS, and Cumberland Island NS	128
SE FL, MS	CANA TIMU GUIS	Assessment of Coastal Water Resources and Watershed Conditions in Timucuan NEHP, Canaveral NS, and Gulf Islands NS	120
IM TX	PAIS	Assessment of Coastal Water Resources and Watershed Conditions in Padre Island NS	42

Marine Science Advisor: The program continued to support Natural Resource Stewardship and Science’s senior scientist/marine science advisor for an additional year.

NPS-USGS WATER QUALITY ASSESSMENT & MONITORING PARTNERSHIP PROGRAM

The NPS-USGS Water Quality Assessment and Monitoring Partnership Program was initiated under the Clean Water Action Plan and is funded primarily by the U.S. Geological Survey’s Water Resources Division, Office of Water Quality. Since 1999, more than \$13 million has been allocated for partnership water quality projects in parks. Through 2003, 91 partnership projects have been initiated in 61 national park units; 71 of these projects have been completed. Nineteen partnership projects were completed in 2003, and 20 projects continue into 2004 (Tables 11 and 12). Additional information on the program is available at: http://water.usgs.gov/nps_partnership/.

**Table 11. USGS Water Quality Assessment and Monitoring Partnership Projects
Final-Year Funded Projects - FY 2003**

Park	Region	PROJECT TITLE	FY03 Funding \$(000s)
CAKR	AKR	Occurrence and Distribution of Trace Elements in Land, Streams and Aquatic Life	42.5
SITK	AKR	Urban Impacts on the Water Quality of the Indian River	37.5
BITH	IMR	Monitor In-Stream Biological Resources, Chemical Stressors and Land Uses	42.0
GLCA	IMR	Evaluation of Water Quality Impacts from Visitation and Recreational Use within Side Canyons	85.0
GLCA	IMR	Assessment of Sediment Chemistry in the Colorado River Delta	72.0
WWSA	IMR	Synoptic Survey of Ammonium Perchlorate Presence along Lost River	42.4
YELL	IMR	State of Montana Water Right Compact	10.0
BUFF	MWR	Fixed-Site Streamflow and Water-Quality Monitoring for Calf Creek	42.4
INDU	MWR	Water-Quality and Ground-Water/Surface-Water Interactions near Long Lake	84.8
VOYA	MWR	Mercury Cycling in Small Lakes	65.0
VOYA	MWR	Assessment of Effects of Changes in Reservoir Operations on Trophic-State Indicators	42.5
ASIS	NER	Study Relationships between Land Use and Ground Water Quality in Chincoteague Bay Watershed	85.0
CACO	NER	Ground-Water Nutrient Transport to Estuaries and Fresh-Water Ponds	84.9
DEVA	PWR	Devils Hole Water and Sediment Chemistry	10.0

Table 11. continued

Park	Region	PROJECT TITLE	FY03 Funding \$(000s)
BICY	SER	Assessment of Nutrients and Pesticides in Barron and Turner River Canals	46.7
BISO	SER	Effects of Oil and Gas Operations on Ground-Water Quality	67.0
COSW	SER	Assessment of Mercury Input and Bioaccumulation	48.0
JELA	SER	Survey of Porewater Chemistry of Floating Marshes	50.0
TOTAL			957.7

**Table 12. USGS Water Quality Assessment and Monitoring Partnership Projects
Continuing Funded Projects - FY 2003**

Park	Region	Project Title	FY03 Funding \$(000s)
GAAR	AKR	Effects of Wastewater Effluent on the Water Quality of the John River	85.0
LACL	AKR	Potential Effects of Logging on Water Quality in Crescent River Watershed	85.0
BAND	IMR	Document Hydrologic Response to Watershed Restoration: Measure Runoff and Suspended Sediment	42.5
CANY*	IMR	Streamflow and Water Quality Monitoring Station for Salt Creek	42.5
CURE	IMR	Quality Assurance and Publication of Water Quality Data Collected from Streams, Rivers and Reservoirs	18.7
GLAC	IMR	Occurrence of Persistent Organic Pollutants and Current-Use Pesticides in Seasonal Snowpacks, Lake Water and Lake Sediment	84.1
BUFF	MWR	Determine the Dependence of Aquatic Resources on Streamflow in Response to a Proposed Tributary Impoundment	58.6
NIOB*	MWR	Research and Monitor Water Quality of Niobrara Scenic River	82.8
OZAR	MWR	303(d) – Source Identification of Fecal Indicator Bacteria in Water and Streambed Sediments	42.5
ROCR	NCR	Ecological Health Assessment in Riverine Faunal Communities	85.0
ROCR*	NCR	Effects of Fungicide Runoff on Aquatic Fungal Communities on Leaf Litter	42.5
ACAD	NER	Determine/Model Sources of Groundwater and Nutrients	85.0
CACO	NER	Robowell: Automated Groundwater Monitoring	42.5
DEWA	NER	Determining Impacts on Special-Protection Waters	85.0
SHEN	NER	Develop Park-Wide Episodic Acidification Vulnerability Map	85.0

Table 12. continued

Park	Region	Project Title	FY03 Funding \$(000s)
LARO*	PWR	Effects of Trace Elements on Water Quality and Biological Health	85.0
NOCA	PWR	Persistent Organic Pollution and Heavy Metals in Glacial Fed Lakes and Aquatic Biota	85.0
WHIS	PWR	Identification of Contamination Associated with Abandoned Mine Lands	85.0
YOSE*	PWR	Risk Assessment for Aquatic Ecosystems in Wilderness Areas	70.0
MACA*	PWR	Develop a Continuous Stream Flow Monitoring Station	42.0
TOTAL			1,333.7

* Water Quality Partnership Projects Supported by NRC Watershed Assessment Funds

**SUMMARIES OF WATER
QUALITY MONITORING
PROGRAM FUNDING
PARK VITAL SIGNS
MONITORING NETWORKS
FY 2003**

North Coast and Cascade Network

Water quality monitoring program funds totaling \$82,000 were used to: develop stream benthic macro-invertebrate monitoring protocols for Mount Rainier and Olympic National Parks; develop lake benthic macro-invertebrate protocols at Mount Rainier; develop land use maps for Ebey's Landing NRES, Fort Clatsop NM, Mount Rainier NP, and San Juan Island NHP; monitor water quality at Olympic NP; test synthetic stream hydrographs; develop network stream habitat and temperature monitoring protocols; and run a network stream habitat workshop. Forty-nine percent of the water quality funds were spent on personnel, and thirty-two percent were spent on cooperative agreements, including agreements with the Environmental Careers Organization to generate land use maps for four network parks, and the University of Washington (CESU) to test synthetic stream hydrographs.

Northeast Coastal and Barrier

In FY 2003 the network received \$90,000 in water quality monitoring program funding to support the development of the network's water quality monitoring program. A portion of these funds were used in an interagency agreement with the U.S. Geological Survey (USGS) to develop an estuarine nutrient enrichment component to the network's vital signs and water quality monitoring program. Potential monitoring variables were selected by assembling and synthesizing information from diverse sources, including technical workshops and meetings, existing programs, and site visits to Northeast Coastal and Barrier Network and Northeast Temperate

Network parks. The USGS conducted field tests of potential variables for monitoring ecosystem responses to estuarine nutrient enrichment at three network parks during FY 2003. Probabilistic sampling designs were developed in collaboration with park resource managers and the National Coastal Assessment team of the U.S. Environmental Protection Agency's National Health and Environmental Effects Research Laboratory. A second component of this project is being completed by cooperators from the University of Rhode Island. The cooperators are developing techniques to monitor potential sources of nutrient inputs in park watersheds. Funded with network water quality monitoring funds in FY 2002, the cooperators are conducting a baseline inventory of potential sources of nutrients within watersheds of each network park. This project will provide an inventory of recent changes in nutrient loading proxies at 10-year intervals back to 1970, as well as interpretation for each park. A manual of procedures for updating this inventory at each location, including detailed data source guides, is being developed as part of the final product.

Heartland Network

The network received \$82,000 in FY 2003 for water quality monitoring. These funds were used to initiate the development of an aquatic monitoring plan and implement preliminary baseline measurements for water quality impaired Clean Water Act 303d listed waters and expanded site measurements of geothermal water temperature at Hot Springs NP. The network also purchased two YSI multi-parameter monitoring instruments and supported a portion of the interim aquatic ecologist's salary and a seasonal position at Pipestone NM to assist in collecting water samples. An Interagency Agreement was initiated with U.S. Geological Survey (USGS) to begin a monitoring basic water quality and bacteria in a contaminated portion of the Jacks Fork River at Ozark NSR. An additional

interagency agreement was initiated to complete the hydrologic calibration for discharge of the Yellow River as it enters Effigy Mounds NM. At Herbert Hoover NHS, USGS is calculating flood inundation patterns and water velocity at points on the creek during 5-, 10-, 25-, 50-, and 100-year recurrence events. This information will be used to help determine the best sampling locations for monitoring changes in geomorphology. At a network aquatic workshop in October 2002, participants first identified impaired water bodies (303d) and recommended a monitoring strategy. Outstanding Natural Resource Waters (ONRW) and other significant water resources were considered in the context of aquatic ecosystem health and preliminary monitoring recommendations for developing protocols of ecosystem health were developed. The preliminary recommendations were validated in July 2003 when the network completed their final vital signs prioritization. In addition to the water quality funding tasks, since aquatic issues were considered a high priority, additional aquatic work was done with other funds. For example, general vital signs monitoring funding contributed to monitoring of the network's ONRW streams. Such efforts included an Interagency Agreement with USGS (\$30,000) to develop a macro-invertebrate monitoring protocol for freshwater springs, and a CESU agreement with Southwest Missouri State University (\$68,977) to develop a quality assurance protocol for stream geomorphology monitoring of Ozark River NSR.

Cumberland/Piedmont Network

The Cumberland/Piedmont Network received \$59,000 in water quality monitoring funds to begin water quality monitoring in five network parks. Three offices were staffed to carry out the Cumberland/Piedmont Network Water Quality Monitoring Program. Two additional field offices are located at Kings Mountain NMP and

Russell Cave NM. The field units each have a data manager trained in sampling procedures and database requirements. The three offices were equipped with portable incubators, field probes for pH, temperature, and dissolved oxygen, filtering equipment, and flow measurement rods. In addition, two small trucks were purchased to help access back-country sites. In FY 2003, field collection of water samples was activated at five parks. A laboratory Quality Assurance Plan has been written and distributed to EPA for review. Quality assurance testing of the analytical equipment was implemented with periodic performance tests purchased from Analytical Products Group. The laboratory also participated in latest performance evaluation test given by the U.S. Geological Survey. Approximately \$10,000 is budgeted annually for the quality assurance program, which includes maintenance agreements, performance tests, quality controls, duplicates, spiked samples, blanks and fortified blanks.

Sonoran Desert Network

Continuing to build on efforts initiated with FY 2002 water quality monitoring funds, the University of Arizona Water Resources Research Center (WRRC) led an effort to identify specific water quality monitoring parameters, protocols, and sites within Sonoran Desert Network parks. Personnel and the results of this effort served as the core of the Hydrology and Soils Workgroups during Phase 2 Monitoring Plan development. In FY 2003 the network received \$64,000 in water quality monitoring funds. About \$32,000 was used to initiate an investigation by the University of Arizona on the use of the State of Arizona's aquatic macro-invertebrate indices of water quality in network parks. The remainder of the water quality monitoring funds was used to support protocol development for water quality/quantity monitoring of tinajas, a leading candidate vital sign developed by the Sonoran Desert Network Hydrology

Workgroup, and to purchase digital water quality multi-probe, flow meter and accessories to support WRRC development of water quality protocols.

Central Alaska Network

A portion of the water quality monitoring funding for FY 2003 (\$98,000) was allocated through contract with West, Inc. to establish an integrated sample design (water quality, vegetation, fauna, physical environment) consistent with the overall landscape monitoring approach of the network. The final report from this contract will be received December 2004; the results will be used to ensure that initial protocols identified by the network for development are utilized in the overall sample design for the network. The network has prioritized its vital signs and identified these in the completed Phase II report submitted to the Washington Office. A primary goal of aquatic resource monitoring in the Central Alaska Network is to determine the key factors that affect community structure and productivity in ponds and streams and to detect changes in indices of productivity and community structure over time. Additional water quality funding was used to conduct a pilot project at Yukon-Charley Rivers National Preserve during FY 2003 as a first step in accomplishing this goal. This project assessed the level of variability in various water parameters across the landscape to help better determine a sample design for water quality monitoring. Data were collected from 9 ponds along the Yukon River at two sampling intervals, late spring and late summer. In late summer, thirteen stream sites were sampled including 8 sites along the Charley River and 5 tributaries of the Charley River.

National Capital Network

In FY 2003, the National Capital Network's water quality monitoring program funding (\$71,000) was used for salary and benefits of a term hydrologist who is writing the Water

Quality Monitoring Plan, and to purchase field sampling equipment to implement it. In FY 2003, the hydrologist completed the draft Phase 2 Water Quality Monitoring Plan and facilitated the completion of several tasks directly related to the completion of the Phase 3 monitoring plan. Surface waters within National Capital Network parks were identified and information was gathered on state-identified "impaired" (303d-listed), state-identified outstanding, and special protection waters within the parks. Information regarding monitoring efforts by Northern Virginia Soil and Water Conservation District, Fairfax County, Maryland Department of Natural Resources (MDDNR), and Montgomery County was collected. The term hydrologist accompanied park and other agency personnel during sampling efforts within network parks to compare their methods with those chosen to be used regionally. MDDNR agreed to apply their Maryland Biological Stream Survey (MBSS) sampling protocol to network streams within the state of Maryland. The NPS Inventory and Monitoring Program has contracted with Frostburg State University to adapt the MBSS protocols to Virginia streams.

Northern Colorado Plateau Network

In FY 2003, staff of U.S. Geological Survey-Water Resources Division; Colorado District (USGS-WRD), in cooperation with the Northern Colorado Plateau Network, developed a Microsoft Access database for management of existing and future water-quality data pertaining to network parks. On the basis of preliminary analyses of water quality data in the database, USGS-WRD prepared a data summary document to support the April 2003 Northern Colorado Plateau Network vital-signs workshop. In this workshop significant network water bodies, key water quality indicators, vital signs, and monitoring approaches were identified, discussed, and prioritized. USGS-WRD delivered to the network a provisional

version of the database and a document describing database development and basic user instructions. They also delivered a provisional GIS database with past/existing sampling locations for water quality and quantity. The USGS-WRD is contracted to cooperate in further analyses of existing water-quality data to support design work for the water-quality component of the network's vital-signs monitoring plan (Phase III). Narrative summaries of water-related management and scientific issues contained in the network's Phase I Report were reviewed by park and network staff and finalized in FY 2003 for the Phase II report. This provided important rationale for those water-quality vital signs identified for network parks. Also during FY 2003, the Northern Colorado Plateau Network and Southern Colorado Plateau Network jointly adopted a set of integrative vital-sign categories that span the concept of ecological integrity.

San Francisco Bay Network

In FY 2003, the network received \$70,000 from the Water Resources Division for water quality monitoring. About \$55,000 was used to support the salaries of the network water quality specialist and a seasonal technician. The remainder of the funds was used to support local travel, laboratory analysis and a cooperative agreement with Americorps to support water quality sampling in 2004. Network staff introduced the Long-term Water Quality Monitoring Program and feedback was solicited from each network park during planning meetings. Existing monitoring programs continued and baseline monitoring was initiated at John Muir NHS, Eugene O'Neill NHS, and Golden Gate NRA. Efforts to improve water quality in sediment and pathogen (fecal coliform) impaired water bodies were initiated. Network staff developed a water quality sampling plan (and conducted monitoring) for Olema Creek in Point Reyes National Seashore, as part of the Regional Water Quality Control Board's

Tomales Bay Pathogen TMDL Program. In addition, a Turbidity Threshold Sampling unit was installed to monitor sediment in the Tomales Bay Watershed. The network weather monitoring program has also progressed with the installation of weather stations and creation of a weather database.

Southern Appalachian Highlands Network

In FY 2003, the network allocated water quality monitoring funds (\$70,000) through an interagency agreement with the U.S. Geological Survey (USGS) to compile and analyze existing long-term data on physical and chemical water quality parameters for network parks. Data were organized by watershed, and trend analyses were performed at sites with sufficient data. The USGS agreement was extended to include a retrospective analysis of aquatic biological data for Big South Fork NRR (BISO), Blue Ridge Parkway, and Obed WSR (OBRI). Data will be organized in spreadsheets, linked to sampling information and mapped site locations, with generalized trend analyses conducted where data permits. Also, a network water quality monitoring plan is under development by USGS, with a draft to be completed in FY 2004. Vital signs related to aquatic resources were prioritized and ranked. Water quality attributes that ranked highly across all network parks included water quality core parameters (pH, DO, conductivity, temperature, flow), contaminants related to air quality degradation, pollutants related to coal mining and oil and gas extraction on the Cumberland Plateau, and bacteria related to impacts from upstream development and agriculture. At BISO and OBRI, several other water-related vital signs were identified as highly important vital signs: water flow/discharge because of water withdrawal concerns; proposals for impoundments in the parks' watersheds; aquatic macro-invertebrate species because of their ecological significance and their utility as indicators of good water quality. Freshwater

mussels were specifically identified because of their value as indicators of good water quality and because of the highly significant mussel fauna in these parks (the two parks harbor seven federally endangered freshwater mussel species).

Greater Yellowstone Network

With FY 2003 water quality monitoring funds, the Greater Yellowstone Network completed a summary of existing information on water quality and water quality monitoring programs; achieved substantial progress in developing a water quality GIS framework as a context for managing and analyzing water quality data; initiated a series of special studies to further characterize and define network water quality and watershed conditions and issues; and developed monitoring objectives for park-impaired waters. A report prepared under cooperative agreement with the University of Montana further analyzed available data for status, trends and variability in water quality, and compliance with state standards. The report additionally identified potential monitoring needs in relation to program objectives. Database construction is consistent with Servicewide standards and is being coordinated with development of a GIS system capable of portraying data in relation to watershed boundaries, land use/land cover, surface water and watershed classification. Special studies focused on water body and watershed classification, contamination of Soda Butte Creek in Yellowstone National Park, and additional macro-invertebrate characterization of park waters. Monitoring protocols were reviewed, including state-recommended protocols.

Mediterranean Coast Network

In FY 2003, the network spent \$76,000 in water quality monitoring funds. Major expenditures included \$30,700 to the new Californian Cooperative Ecosystems Study Unit for a continuation of ongoing network

data mining and data compilation efforts. In this case, funds will support a project to develop and organize water resource-related GIS data for the network. This project will fill a gap in the critical baseline information required to develop a comprehensive water quality monitoring program for the network. A total of \$22,855 funded a portion of the salary for two aquatic biological technicians to complete the fourth year of a five-year inventory to assess the status of aquatic amphibian populations in Santa Monica Mountains NRA watersheds. This work includes field assessment and inventory of stream biological and physical characteristics. In addition, \$7,000 funded technician support, lab work, and printing services for a report on a water quality monitoring project assessing vegetation and stream morphology on Santa Rosa Island (Channel Islands NP) with the goal of documenting changes in water quality since cattle were removed from the island in 1998. Remaining water quality funds covered water quality monitoring equipment for Cabrillo NM, partial funding of the network data manager's salary, remaining office setup and supplies, and travel to a national Water Quality Monitoring workshop and a national Inventory and Monitoring Program meeting.

Southwest Alaska Network

Network water quality funds (\$139,000) were used to begin compilation of existing water quality data from various sources for network parks. This included work done by the Alaska Department of Fish and Game in conjunction with lake fertilization studies, work by University cooperators, and reports completed by the Water Resources Division. A Freshwater Lakes and Rivers Scoping Workshop was held in November, 2002 to refine conceptual models and identify candidate attributes to monitor. Also, a term Aquatic Resources Specialist was hired in November 2002.

The network purchased a velocity meter and

a multi-parameter water quality logger with probes for core parameters plus turbidity, and a seasonal water quality technician was hired to accompany the Aniakchak fish inventory crew during the summer. A contract was written with Analytica Alaska, Inc., for lab analysis of additional water quality parameters. Surface samples were collected at eight locations within Aniakchak and one lake in Katmai. Field sampling included profiles at Surprise and Meshik Lakes, and measurements at all fish inventory sites and surface sample sites. Discharges were taken at all applicable sampling sites. An Interagency Agreement was initiated with U.S. Geological Survey-Water Resources Division in Alaska for stream gaging and associated work, and a work order was written for operation of the Johnson River gaging site in Lake Clark National Park. A CESU agreement was initiated with Dr. Robert Stallard to develop hydrologic models and analysis tools for characterizing river attributes such as upstream area, channel lengths, elevation drops, and slope. River basins and boundaries will be delineated as part of this project.

Northeast Temperate Network

The network expended \$60,000 in FY 2003 to initiate water quality scoping of all network parks except for Acadia ACAD and Boston Harbors, through an interagency agreement with U.S. Geological Survey in Maine. Completed tasks include: draft descriptions of past and current inventory or monitoring related to freshwater resources; drafted conceptual models of network key ecosystems; identification of current and emerging threats for network ecosystems and important agents of change that could impact network aquatic resources; and summarization of information from State 305(b) reports and 303(d) lists. The network established an interagency agreement with USGS for FY 2004 to assist in the scoping for Acadia and Boston Harbors and continued water quality monitoring development efforts

in all network parks to lay the foundations for monitoring program design. The agreement follows the phased reporting established by the NPS Inventory and Monitoring Program. The first Phase of this project was completed in September 2003 and Phase II is building upon these results.

Southern Colorado Plateau Network

In FY 2003, the network allocated water quality monitoring funds (\$124,000) to support park scoping of water resource issues and to initiate a project with U.S. Geological Survey-Water Resources Division (USGS-WRD) synthesize available water quality data. Staff of Bio-Environs, Inc. visited network parks to meet with park personnel, become familiar with individual park resources and issues, and gather water-resource related information that may not be available outside each park. The network entered into an agreement with the Colorado District of USGS-WRD to compile and summarize existing network park water quality data in an Access database. This effort follows an earlier cooperative endeavor between the Colorado District and the network to develop the Access database and populate it with network park water quality data. By extending USGS-WRD efforts to include network parks, the resulting database and data synthesis will include water quality data across entire the Colorado Plateau. Also, network conceptual models for water resources are fully integrated into the Northern Colorado Plateau Network/Southern Colorado Plateau Network conceptual model framework.

Pacific Island Network

In FY 2003 the network received \$151,000 in water quality monitoring funds and accomplished the following: 1) A water quality workshop was held to gather input from NPS (both network parks and the Water Resources Division), U.S. Environmental Protection Agency (EPA), state, U.S. Geological Survey, and non-

governmental organization partners. A workshop report was released that summarizes recommendations for study areas, and adoption of existing monitoring protocols and programs for augmenting water quality monitoring in network parks and a general strategy and summary of issues was included in the network monitoring plan; 2) At the National Park of American Samoa, agreement was obtained to begin cooperative efforts with EPA's EMAP program (Coastal Water Quality Assessment) to allow comparison of water quality conditions within the park with conditions in the rest of the territory; 3) A \$99,630 cooperative agreement was finalized with the Cooperative Ecosystems Studies Unit - University of Hawaii to hire two topical workgroup assistants who are currently gathering data and information on existing programs and methods, and providing expert assistance in planning, and monitoring; and 4) The network acquired basic field equipment for monitoring, and computers and supplies for planning and office work.

Great Lakes Network

The network used \$123,000 of water quality monitoring funds to accomplish the following. Regional staff, working for the network, visited park libraries and read pertinent literature on past research and monitoring efforts on aquatic resources in the nine parks and prepared a brief summary of their findings in the Phase I Report. This will culminate in preparation of a full synthesis report by January 2004 in time for indicator selection. A private contractor was hired (\$2,490) to research and summarize federal, state, and provincial water quality criteria and standards, including those under the U.S. Environmental Protection Agency and the Great Lakes Water Quality Agreement with Canada. This water quality information report was included as a supplement to the network's Phase I Report and was briefly summarized in the Phase I Report. The network allocated \$46,650

to the University of Minnesota, Natural Resources Research Institute (NRRI), Center for Water and the Environment, to gather all water quality monitoring data sets from the nine parks and subject them to statistical analyses. To develop a long-term means of archiving and serving water quality data, the network allocated \$50,000 through the CESU to Michigan State University to build a web-based information management and data serving platform. The objective is to bring important data together in a one-stop shopping web site for the network parks. NPS Air Resources Division staff summarized air resource information for the nine parks. Network staff used the results of park conceptual models, and a list of 80 indicators from the State of the Lakes Ecosystem Conference to develop a list of aquatic candidate Vital Signs for the nine parks. Network staff contracted with NRRI, Center for Water and the Environment to conduct and evaluate water quality monitoring procedures at Apostle Islands NL. A portion of the funding went toward the salary of the network coordinator to help oversee aquatic tasks.

APPENDIX C PUBLICATIONS CONTRIBUTIONS AWARDS

PUBLICATIONS / CONTRIBUTIONS

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AWARDS

Jennifer Back received a STAR Award for exceptional dedication, team cooperation, and contributions toward protecting the water rights and resources of Chickasaw NRA, Lake Mead NRA, and Death Valley NP.

Paul Christensen received a STAR award for his outstanding efforts in initiating water rights and water-related resources studies simultaneously at Montezuma Castle NM, Tuzigoot NM, and Saguaro NP to support claims in the Verde River and Santa Cruz River Adjudications in Arizona.

Chris Gable received a STAR award for her efforts to develop high quality technical data to accomplish branch monitoring needs

during a period of reduced staffing support. She accomplished field and office work in support of WRB stream monitoring stations, assisted WRB staff in the use of ADAPS software, and provided logistical support to monitoring gages at Yellowstone NP, Death Valley NP, Mesa Verde NP, Chickasaw NRA, and Lake Mead NRA.

Jeff Hughes received a STAR Award for exceptional dedication, team cooperation, and customer service toward protecting the water rights and resources at numerous park units, particularly Theodore Roosevelt NP and Obed WSR.

William Van Liew received a STAR Award for exceptional dedication and contributions toward protecting the water rights and resources of NPS units, particularly at Death Valley NP (Devil's Hole) and Lake Mead NRA.

David Vana-Miller received a STAR Award for his efforts leading to the completion of Water Resources Management Plans for Sleeping Bear Dunes National Lakeshore, New River Gorge National River/Gauley River National Recreation Area/Bluestone National Scenic River, and Richmond National Battlefield Park.

John Wullschleger was awarded a STAR award by Intermountain Region for representing Intermountain Region and several Colorado River NPS units on the Biology Committee of the Upper Colorado River Recovery Program for Endangered Fish.

APPENDIX D STAFF

OFFICE OF THE DIVISION CHIEF STAFF

Dan Kimball: Division Chief, MS in Water Resources Administration. Specialty areas include water and natural resources management, administration, and planning and the evaluation of natural resource development projects.

Sharon Kliwinski: Water Resources Washington Liaison, BS in Environmental and Pollution Sciences. Specialty areas include environmental legislation and regulations and water and natural resource policy issues.

Elizabeth Crisfield: Water Resources Washington Liaison for Everglades Restoration, BS in Physics, MS in Soil Physics. Specialty areas include Everglades soils and hydrology, Comprehensive Everglades Restoration Plan, and associated Everglades policies.

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

Patty Hennessy: Secretary, BBA in Management. Specialty areas include report editing, web page development, and meeting planning.

Carol Liester: Purchasing Assistant.

Laura Harte: Colorado State University Archivist, M.A. in Archival Science, M.A. in Historical Archaeology, B.A. in History with specialization in environmental and western history.

PLANNING AND EVALUATION BRANCH STAFF

Mark Flora: Branch Chief. Hydrologist, MS in Environmental Science (Water Resources). Specialty areas include water resources management planning, water quality, and watershed management.

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

Kevin Noon: Wetland Specialist, Ph.D. in Wetland Ecology. Specialty areas include wetland evaluation, management, restoration, and regulatory issues.

Jim Tilmant: Fishery Management & Marine Resources Program Team Leader, MS in Wildlife and Fisheries. Specialty areas include aquatic and marine resources management, fish biology, and population dynamics.

John Wullschleger: Fisheries Biologist, MS in Fish and Wildlife Science. Specialty areas include freshwater invertebrates, marine-intertidal biota, fluvial ecology, and stream habitat restoration.

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

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

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

Lael Wagner: Secretary

WATER OPERATIONS BRANCH STAFF

Bill Jackson: Branch Chief, Ph.D. in Hydrology. Specialty areas include sedimentation processes, fluvial geomorphology, and river assessment, restoration, and management.

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

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

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

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

Pete Penoyer: Hydrogeologist, Associate in Hazardous Materials, MS in Geology, Professional Degree in Hydrogeology. Specialty areas include ground-water

analysis, ground-water contamination, site assessments under CERCLA, and water quality monitoring.

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

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

Barry Long: Hydrologist, BS in Watershed Sciences, MS in Forest Hydrology. Specialty areas include physical-chemical aspects of water quality.

Roy Irwin: Senior Contaminants Specialist, Ph.D. in Biology. Specialist in environmental contaminants, ecological/biological aspects of water quality, monitoring study design and development, measurement uncertainty, and QA/QC issues.

Kim Johnson: SCEP Hydrologist. BS in Watershed Science.

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

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

Steve Mackie: Colorado State University Research Associate, STORET Database Project. MS candidate in Forestry.

John Christiansen: Colorado State University Research Associate, Clean Water Act Impaired Waters Project, MS Civil Engineering.

Pat Wiese: Colorado State University Administrative Assistant, BS in Biology.

WATER RIGHTS BRANCH STAFF

Chuck Pettee: Branch Chief Supervisory Hydrologist, MS in Watershed Science. Specialty areas include water rights establishment and protection and water resources policy.

Jeff Albright: Supervisory Hydrologist, Information Management Program Leader, MS in Watershed Management. Specialty areas include surface water hydrology, water rights, and data management.

Bill Hansen: Supervisory Hydrologist, Adjudication Program Leader, MS in Hydrology. Specialty areas include water rights policy and adjudications, surface water hydrology, and watershed management.

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

Jennifer Back: Hydrologist, MS in Watershed Science. Specialty areas include surface water hydrology and water law.

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

Kathryn Converse: Student Trainee (Hydrology), BS in Earth Sciences. MS candidate in Watershed Science.

Paula Cutillo: Hydrologist, BA in Environmental Policy and Analysis, MS in Groundwater Hydrology, Ph.D. in Hydrogeology. Specialty areas include subsurface hydrodynamics and hydrogeologic modeling.

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

Scott Grover: Hydrologist, BS in Watershed Science. Specialty areas include surface water hydrology, field methods, and data analysis.

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

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

Jennifer Miller: Student Trainee (Hydrology), BS in Natural Resources Management. MS candidate in Watershed Science.

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

Mark Wondzell: Hydrologist, BS in Forestry, MS in Agricultural Engineering.

Jennifer Friedman: Research Associate, Colorado State University, Monitoring and Enforcement Group, BS in Natural Resource Management (Environmental Policy).

Carmia Fiechtner: Student Hourly, Colorado State University, Adjudication Group, BS in Watershed Science.

Brad Gillies: Student Hourly, Colorado State University, Monitoring and Enforcement Group, BS in Watershed Science. MS Candidate in Mechanical Engineering.

Eric Lord: Research Associate, Colorado State University, Monitoring and Enforcement Group, BS in Mineral Land Management, JD, MS in Forestry.

Flora Romero: Colorado State University Administrative Assistant.

NRC AQUATIC RESOURCE FIELD PROFESSIONALS

See table on next page.

**PARK-BASED AQUATIC RESOURCE PROFESSIONALS
NATURAL RESOURCE CHALLENGE
(February 2, 2004)**

REGION	INCUMBENT	SPECIALIZATION	DUTY STATION	GEOGRAPHIC FOCUS AREA	SUPERVISOR	WRD POC
AKR	Amy Larson	Aquatic Ecologist	YUCH	Central and Northwest Alaska Network Parks	Tom Liebscher, YUCH	Weeks
AKR	Dan Young	Fishery Biologist	LACL	Southwest and Southeast Alaska Network Parks	Judy Putera, LACL	Tilmant
IMR	Melissa Trammel	Fishery Biologist	Utah State Coordinators Office, Salt Lake City, UT	Upper Colorado River Basin Parks	John Reber	Wullschlegler
IMR	Colleen Filippone	Groundwater Hydrologist	Sonoran Desert Network I&M Office, Tucson, AZ	Arizona and New Mexico Parks	John Reber	Martin, L.
IMR	Position announcement closed 1/30/04	Hydrologist	GRTE	Northern Rocky Mountain Parks	John Reber	Smillie
IMR/MWR	Sue Braumiller	Groundwater Hydrologist	CHIC	Southern Plains / Heartland Network Parks	John Reber/Steve Cinnamon	Christensen
MWR	Brenda Moraska Lafrancois	Aquatic Ecologist	SACN	Great Lakes Network Parks	Steve Cinnamon	Vana-Miller
MWR	Jay Glase	Fishery Biologist	ISRO	Great Lakes Network Parks	Steve Cinnamon	Wullschlegler
NER/NCR	Jeff Runde	Aquatic Ecologist	Ctr. Urban Ecol. Washington, DC	National Capital / Mid-Atlantic Network Parks	Doug Curtis	Rosenlieb
NER	Alan Ellsworth	Hydrologist	DEWA	Eastern Rivers & Mountains / NE Coastal & Barrier Network Parks	Dave Reynolds	Flora
NER	Patricia Rafferty	Marine Ecologist	FIS	NE Temperate / NE Coastal & Barrier Network Parks	Mary Foley	Tilmant
PWR	Marie Denn	Aquatic Ecologist	PORE	San Francisco Bay / Sierra / Klamath / Mediterranean Coast Network Parks	Superintendent, PORE	Wullschlegler
PWR	Paul Kennard	Geomorphologist	MORA	North Coast & Cascades / Klamath Network Parks	Superintendent, MORA	Smillie
PWR	Tom Culhane	Groundwater Hydrologist	LAME	Mojave Desert Network Parks	Kent Turner, LAME	Van Liew
SER	Jim Long	Fishery Biologist	CHAT	Southeast Coast / Gulf Coast / Appalachian Highlands / Cumberland-Piedmont Network Parks	Sherril Fields	Tilmant
SER	Cherry Green	Wetlands Ecologist	CHAT	Southeast Coast / Gulf Coast / Appalachian Highlands / Cumberland-Piedmont / South Florida - Caribbean Network Parks	Sherril Fields	Wagner

Water Resources Division

2003 Annual Report

June 2004

Natural Resources Report NPS/NRWRD/NRR-04/01

National Park Service

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