



Funding the Natural Resource Challenge

Report to Congress, Fiscal Year 2005





Partula gibba, a threatened and endangered candidate species, found in the wetlands at American Memorial Park on Saipan.

Funding the Natural Resource Challenge

Report to Congress, Fiscal Year 2005

Natural Resource Stewardship and Science
Washington, DC

U.S. Department of the Interior
National Park Service
Washington, DC

Contents

Executive Summary 5

Chapter One: Funding 11

Chapter Two: Measuring Progress 15

Chapter Three: Progress in Protecting Park Natural Resources 19

Park and Regional Natural Resource Programs	19
<i>Natural Resource Program Status</i>	19
<i>Challenge-funded Parks</i>	20
Air Resources Program	21
<i>Funding and Performance Summary</i>	22
<i>Airborne Toxic Contaminants</i>	22
<i>Climate Friendly Parks</i>	23
<i>Ecological Effects Examined</i>	23
<i>Emissions Inventories</i>	23
<i>Air Quality Monitoring Network</i>	23
Biological Resource Management Program	23
<i>Funding and Performance Summary</i>	24
<i>Biological Inventories</i>	24
<i>Biological Resource Management Projects—National Level Support</i>	24
<i>Ecological Restoration</i>	25
<i>Endangered Species Program</i>	26
<i>Invasive Species Program</i>	26
<i>Park Flight Migratory Bird Program</i>	28
<i>Vegetation Mapping Program</i>	29
<i>Wildlife Management and Health</i>	29
Geologic Resources Program	30
<i>Funding and Performance Summary</i>	30
<i>Disturbed Lands Restoration</i>	30
<i>Geologic Processes and Features</i>	31
<i>Geologic Resource Evaluation</i>	32
<i>Minerals Management</i>	33
<i>National Cave and Karst Research Institute</i>	33
<i>Soil Resources Inventory and Management</i>	33
Natural Resource Preservation Program (NRPP)	34
<i>Funding and Performance Summary</i>	34
<i>Alaska Special Projects</i>	34
<i>Disturbed Lands Restoration Projects</i>	35
<i>Natural Resource Management Projects</i>	36
<i>Regional Program Block Allocation Projects</i>	37
<i>Servicewide Support Projects</i>	38
<i>Regional Small Parks Block Allocation Projects</i>	39
<i>Threatened and Endangered (T&E) Species Projects</i>	39
<i>USGS Biological Technical Assistance Agreement—Park-Oriented Biological Support</i>	40
Natural Sounds Program	41
<i>Acoustic Science</i>	41
<i>Administration and Management</i>	41
<i>Air Tour Management Program</i>	42
<i>Outreach/Education/Partnerships</i>	42
<i>Planning</i>	42
<i>Technical Assistance Requests</i>	42
Resource Damage Assessment and Restoration Program	43
Resource Protection Program	44
Water Resources Program	45
<i>Funding and Performance Summary</i>	45
<i>Water Resource Projects</i>	45
<i>Water Resource Protection—Aquatic Resource Professionals</i>	47
<i>Water Resource Technical Assistance</i>	48
<i>Watershed Condition Assessment Program</i>	48
<i>Water Quality Monitoring</i>	49

Chapter Four: Progress in Learning About NPS Natural Resources 51

Cooperative Ecosystem Studies Units 51

Geographic Information System Program 53

Inventory and Monitoring Program 54

Inventories 55

Monitoring 57

Natural Resource Data and Information Program 60

Research Learning Centers 62

Chapter Five: Financial Details 67

Appendices

Appendix A: Natural Resource Challenge Funding History 77

Appendix B: Natural Resource Preservation Program Funded Projects 79

Appendix C: USGS—Biological Resources 91

Appendix D: Summary of Fully-Funded Water Resources Division Competitive Projects—FY 2005 103



Executive Summary

National Park Service (NPS) Natural Resource Program funding increases over the past six years have led to significant gains in core mission capability as a result of careful design, and efficiencies through cross-program interactions, partnerships, and accountability. Natural Resource Challenge (NRC) increases (2000–2005) are a key component of those increases and are making a difference now and providing the framework to do even more in the future. All these increases have allowed the Park Service to improve a variety of programs (see table below).

To date funding increases have included a greatly expanded and accelerated Inventory and Monitoring (I&M) Program with 24 of 32 Networks fully funded; 17 Cooperative Ecosystem Studies Units (CESU), including 12 with NRC funded NPS research brokers/coordinators;

increased expertise in parks and Servicewide programs, the Biological Resource Management Program, which includes programs for coordinating both native and non-native species management and control; 15 Research Learning Centers, encouraging research and providing educational support through a network of parks; 16 Exotic Plant Management Teams; and increases to the Natural Resource Preservation Program (NRPP). These funding increases allow the National Park Service to develop high quality scientific data, more sophisticated information and tools for improved management, and in many cases, more cost-effective approaches for the future.

Inventory Program

Numerous species newly discovered to be present in parks and numerous range extensions

NPS Natural Resource Stewardship Programs¹

All numbers shown in thousands of dollars

Program Components	Change in Program 1999–2005
Servicewide Natural Resource Programs	
Natural Resource Challenge-Affected Programs	
Air Quality Program	2,488
Biological Resource Management Program	8,475
Cooperative Ecosystem Studies Units ¹	129
Geologic Resources Program	729
Inventory and Monitoring Program ¹	33,735
Natural Resource Data and Information Program	1,505
Natural Resource Preservation Program	6,863
Research Learning Centers (15 Centers established) ¹	0
Resource Damage Assessment & Restoration Program (incl. Oil Spill Pollution Act)	468
Resource Protection Fund	290
Water Resources Program	12,436
Natural Resource Challenge Programs Subtotal	62,364
Cave and Karst Research Institute	333
Everglades—Comprehensive Restoration Plan (CERP)	4,657
Everglades—Critical Ecosystem Studies Initiative	2,682
Everglades Task Force Support	490
Geographic Information System (GIS) Program	[63]
Glen Canyon Adaptive Management Program ¹	95
Natural Sounds Program (formerly Overflight Program)	709
Subtotal—Servicewide Natural Resource Programs	71,267
National Park System Units, Other Field Units, and Central Office Natural Resource Stewardship Programs	40,443
Total Natural Resource Stewardship	111,710

¹ Reflects program funding after transfers to parks or regions

Raptor monitoring at Pinnacles National Monument led to the discovery of a nesting pair of peregrine falcons.

have been documented, as well as discoveries of several species new to science. Information developed through the monitoring design process and from inventories and ongoing park monitoring efforts being integrated into vital signs programs is providing important planning and compliance information into park resource conditions and trends.

- Four new plant species were added to park records at **Fossil Butte National Monument**. Although none of the species are rare in Wyoming, three of the species were found at the limit of their elevational range. These populations may be especially sensitive to climate change and will be monitored for range expansions and contractions.
- The Gulf Coast Network was able to acquire new imagery and LIDAR (Light Distance And Ranging) data shortly after hurricane Katrina passed over the coast of Mississippi. These data will be used not only by the natural resource staff as part of the long-term monitoring, but will provide elevation data which can be used to plan reconstruction of park infrastructure.
- The Southwest Alaska Network developed a database of 950 historic landscape photographs spanning the period of 1898 to 1976, including 81 repeat photographs at 63 sites originally taken during the Griggs expeditions (1915–1922) and during several other expeditions near the turn of the 20th century (1895–1912). Comparison of historical and 2005 photographs is revealing the nature and rate at which Katmai’s landscape is changing due to the retreat of glaciers, recovery of vegetation (particularly alders) after the volcanic eruption of 1912, and uplifted shorelines after the 1964 earthquake.
- North Carolina State University researchers developed and published a protocol for constructing wildfire fuel load maps based on Inventory generated digital vegetation maps and the corresponding digital photo mosaics. This methodology will assist in the development of plans to minimize wildfire risk to lives and property of persons living within or near Northeastern National Parks.

The Service completed an additional 131 datasets in FY 2005, bringing the total to 1,761 (63.6 percent) of outstanding datasets acquired or developed. The Service essentially met its target goal of 64 percent for the Natural Resource Inventories in FY 2005. Some parks will require an additional year to certify the accuracy of the biological (vertebrates and vascular plants) field inventories, even though most of those field inventories were completed and data sets avail-

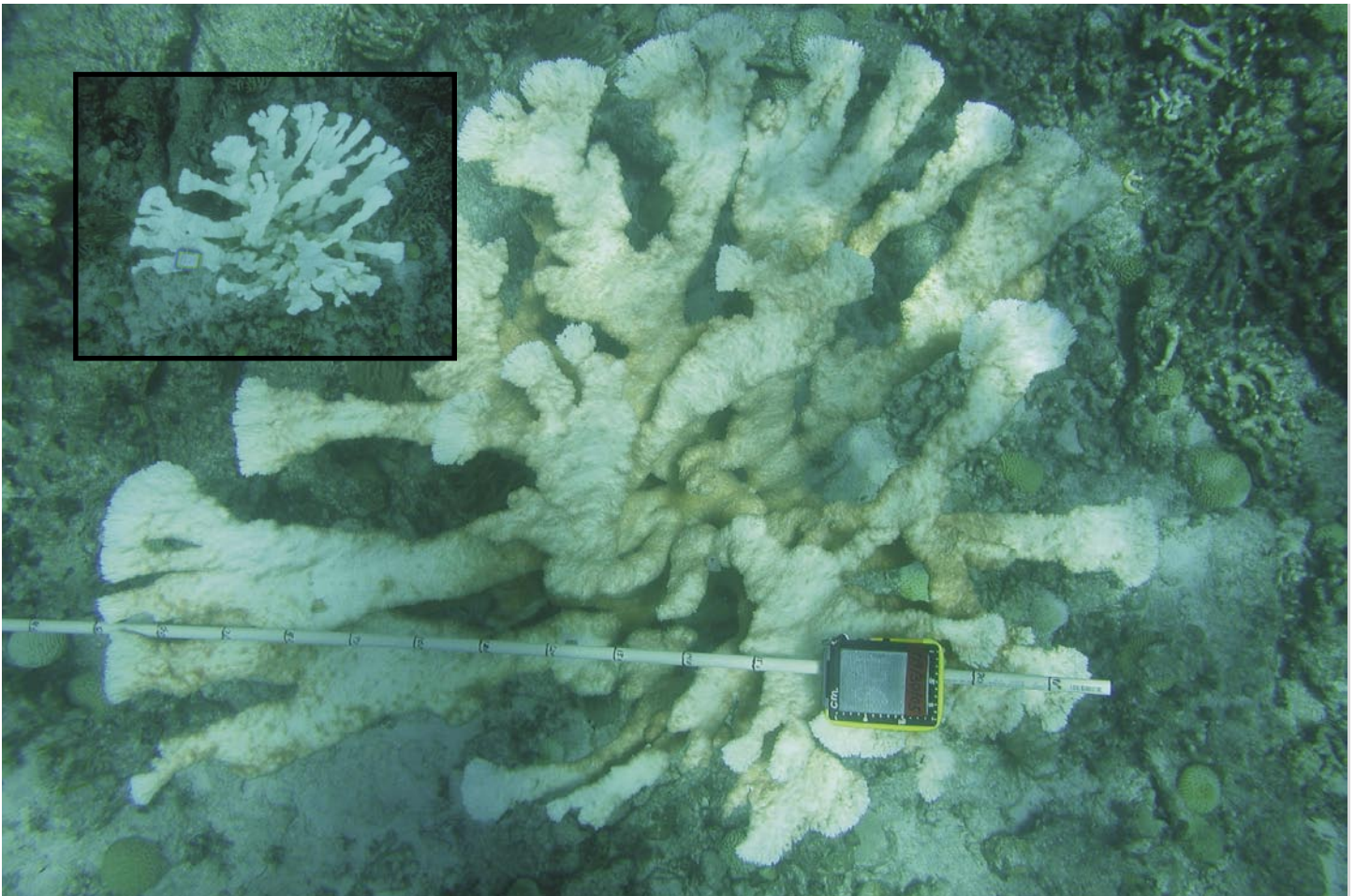
able by the end of FY 2005.

Vital Signs Monitoring

Two additional networks were funded for park vital signs monitoring in FY 2005, bringing the total funded to 24 networks encompassing 207 parks. This represents 77 percent of parks with significant natural resources having funding to initiate long-term park vital signs for monitoring. In addition, eight networks (63 parks) were partially funded. By the end of FY 2005:

- 22 networks (222 parks) have identified vital signs—the key to a low cost, management-oriented monitoring program.
- 12 networks (101 parks) and 3 prototype parks completed their monitoring program designs and have implemented monitoring.
- 5 networks (52 parks) that were first funded in 2003, have completed their monitoring program designs and are poised to initiate monitoring upon plan approval.
- 5 networks (32 parks) have completed Phase 2 of the monitoring program design process, which includes an initial identification and prioritization of vital signs for all parks in the network.
- The remaining 10 networks (85 parks) have completed Phase I reports, synthesizing available data and information needed to begin the vital signs identification process.
- All 32 networks, representing 270 parks, have received funding for water quality monitoring.
- Researchers are investigating coral reef colonies in **Virgin Islands National Park** in an attempt to learn more about destructive coral diseases affecting the reefs in the park and throughout the Caribbean. Scientists were alarmed to see extensive areas with disease. Along long-term monitoring transects maintained by the South Florida and Caribbean Network, monitoring revealed that diseased areas were killed in less than two weeks. These coral colonies were several-hundred years old.
- Raptor monitoring at **Pinnacles National Monument** in the San Francisco Bay Area Network led to the discovery of a peregrine falcon pair successfully nesting at the park and producing three fledglings (first time in 48 years), a Cooper’s hawk nest was found (first time in 13 years), sharp-shinned hawk nests were found for the second and third time, long-eared owl breeding was confirmed with three fledglings observed (first time in 19 years), and ten raptor species—the highest ever recorded in a season—were confirmed breeding in the park in 2005

The Service’s FY 2005 goal that 80 percent (216) of the 270 parks with significant natural resourc-



Monitoring at Buck Island Reef National Monument revealed extensive bleaching followed by disease. Coral showing initial signs of bleaching (large image) was completely bleached (inset) one month later.

es identify their vital signs was exceeded. As a direct result of the strategy of organizing parks into 32 vital signs monitoring networks, 222 parks (82.2 percent) had identified their vital signs, compared to the annual goal of 216 parks.

Partnerships

The combination of expanded expertise and activities has assisted in a number of fruitful partnerships, across program areas within the Park Service and with outside partners:

- The NPS I&M Program initiated the inter-agency Natural Resource Monitoring Partnership involving more than 60 state, federal and provincial governments (including agencies in Canada and Mexico) to promote collaboration and sharing of monitoring protocols and methodologies among agencies. The effort is also led by the Association of Fish and Wildlife Agencies and the U.S. Geological Survey (USGS).
- A cooperative agreement between USGS and the Park Service provided funding to delineate areas within **Mesa Verde National Park** that can be established as protected activity centers for its breeding population of threatened Mexican spotted owls. Locations of where spotted owl breeding activity was observed in 2005

were mapped using GIS technology.

- The Pacific Islands Exotic Plant Management Team, in cooperation with the University of Hawaii and the Maui Invasive Species Committee is working to prevent a miconia invasion from displacing Haleakala rainforest in **Haleakala National Park**. During FY 2005, over 3,500 acres of infestation was swept by ground crews and all detected miconia plants controlled. Over 37,000 acres were surveyed by helicopter with all detected miconia plants controlled by surgical spot spraying.
- In FY 2005, the Park Service continued to cooperate in a Climate Friendly Parks initiative with EPA, under which the EPA includes audits of greenhouse gas emissions within parks (in addition to criteria air pollutants). Under this initiative, the Park Service is demonstrating leadership in sustainable stewardship practices within parks and educating the public about them in all park areas.
- The Endangered Species Program expanded its educational efforts within the Park Service and beyond. A joint effort with the U.S. Fish and Wildlife Service resulted in a course, co-taught by instructors from both agencies, that teaches scientific principles and techniques for endangered species management. This course is offered at the National Conservation

Training Center and at Friday Harbor Marine Laboratory. The program also provided an instructor for a conservation genetics course offered by the National Conservation Training Center.

- During FY 2005, Park Flight continued to work with U.S. national parks and protected areas in 10 Latin American countries (Guatemala, El Salvador, Nicaragua, Honduras, Costa Rica, Panama, Mexico, Argentina, Brazil, and Uruguay) regarding migratory bird conservation and education efforts. Park Flight implemented the final year of a grant received through the Neotropical Migratory Bird Conservation Act for a bird conservation and education project at **Cuyahoga Valley National Park**.
- An Interagency Agreement between the Southwest Alaska Network and the USGS-EROS Data Center was initiated to develop protocols using satellite-based remote sensing and MODIS data as a tool to monitor timing of ice-on/ice-off on large lakes, duration of snow cover, timing of changes in plant productivity, and sediment plumes from glacial melt.

Innovative Approaches

New tools that address ways to disseminate valuable monitoring information to park managers and their constituency include:

- A web based platform developed by North Carolina State University to display National Park Service I&M natural resource information. This easy to navigate web system allows

resource managers and the general public to display and query field plot information via a standard web browser. The same program enables field scientists to inspect, edit, and augment their field data without the intervening use of field sheets or data transcriptions. The program generates both standard field reports and interpreted maps.

- The Central Alaska Network partnered with the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service, the Arctic Network and Western Arctic Parklands to develop an internet tool to analyze moose survey data. Completion of this internet tool will allow biologists to upload data for analysis in near “real time.” This will provide population estimates to park & refuge managers to quickly facilitate management decisions.
- The Sonoran Desert Network and Sonoran Institute developed a series of identification cards, consisting of key characteristics, photographs, and descriptions, for each of the 74 exotic plants identified through the multi-agency Arizona Wildlands Invasive Plant Working Group/Sonoran Desert Network exotic plants list. These cards are currently being used to train field botanists and park staff, and have been shared extensively with partners.
- The Water Quality Program continues the development of NPSTORET—a series of Microsoft Access templates/forms for entering and documenting the results of water quality monitoring projects in a format compatible with uploading into STORET (short for

The Endangered Species Program expanded its educational efforts within the Park Service and beyond. A joint effort with the U.S. Fish and Wildlife Service resulted in a course, co-taught by instructors from both agencies, that teaches scientific principles and techniques for management of endangered species like the Channel Island foxes shown here in a captive breeding facility.



STorage and RETrieval). STORET is a repository for water quality, biological, and physical data that is used by state environmental agencies, EPA and other federal agencies, universities, and private citizens.

These are a few of the exciting results of the application of new expertise, information, and partnerships for improving the management of natural resources in units of the national park system. In FY 2000, Congress demonstrated its commitment to natural resource management in national parks through the implementation of the Natural Resource Challenge. Since its inception, the Challenge has provided tangible benefits through information based management, increased expertise, partnerships, and resource leveraging. The Natural Resource Challenge and other funding increases continue to provide significant and relevant contributions as the Park Service works to meet the expectations of the American public and Congress that their national parks will remain “unimpaired for future generations.”



Chapter One: Funding

This report responds to directions in the House Report 106-22 for the FY 2000 appropriations for the National Park Service and other Department of the Interior and related agencies. In the House report, the NPS was requested to provide information concerning the expenditures and related accomplishments resulting from a series of increases to Natural Resource Stewardship Programs beginning in FY 2000, known as the Natural Resource Challenge. This report addresses FY 2005 expenditures and accomplishments for all Natural Resource Stewardship Programs, exclusive of Everglades Restoration and Glen Canyon Adaptive Management Program, as well as communicates the successful implementation of the Challenge to date. A detailed history of the Challenge is included as Appendix A.

The Challenge included a series of requests for new funding that were designed by field superintendents and subject matter experts to meet future natural resource management needs. Many of the increases resulted in accelerating or expanding earlier programs, while a few resulted in entirely new activities. The table below shows the funding for Servicewide Natural Resource Stewardship Programs, distinguishes those affected by Natural Resource Challenge funding, and identifies the funding level for FY 1999 (the year before the first Challenge increases) and FY 2005. Most of the differences with increases were as a result of the Challenge.

NPS Natural Resource Stewardship Programs			
All numbers shown in thousands of dollars/Years ¹			
Program Components	1999	2005	Change
Servicewide Natural Resource Programs			
Natural Resource Challenge-Affected Programs			
Air Quality Program	6,285	8,773	2,488
Biological Resource Management Program	–	8,475	8,475
Cooperative Ecosystem Studies Units ²	–	129	129
Geologic Resources Program	1,918	2,647	729
Inventory and Monitoring Program ²	5,787	39,522	33,735
Natural Resource Data and Information Program		1,505	1,505
Natural Resource Preservation Program	5,432	12,295	6,863
Research Learning Centers (15 Centers established) ²	–	–	0
Resource Damage Assessment & Restoration Program (incl. Oil Spill Pollution Act)	873	1,341	468
Resource Protection Fund	–	290	290
Water Resources Program	4,754	12,436	12,436
Natural Resource Challenge Programs Subtotal	25,049	87,413	62,364
Cave and Karst Research Institute	–	333	333
Everglades—Comprehensive Restoration Plan (CERP)	–	4,657	4,657
Everglades—Critical Ecosystem Studies Initiative	1,200	3,882	2,682
Everglades Task Force Support	800	1,290	490
Geographic Information System (GIS) Program	1,336	1,273	[63]
Glen Canyon Adaptive Management Program ²	–	95	95
Natural Sounds Program (formerly Overflight Program)	200	909	709
Subtotal—Servicewide Natural Resource Programs	28,585	99,852	71,267
National Park System Units, Other Field Units, and Central Office Natural Resource Stewardship Programs	65,832	106,275	40,443
Total Natural Resource Stewardship	94,417	206,127	111,710

Captive rearing pen for Chisana caribou, Yukon-Wrangler St. Elias National Park & Preserve border, with Mt. Natazhat (13,435') in distance. Photo by Mason Reid, NPS, WRST, 2005

¹ Actual funds received after any recessions or permanent assessments.

² Reflects program funding after transfers to parks or regions.

The table below shows FY 2004 funding and changes resulting from FY 2005 increases and other actions for all of the programs affected by the Natural Resource Challenge.

and parks affected by the Natural Resource Challenge. Additional detail about previous years and allocation of the funding within programs may be found in Chapter Five and several of the appendices.

The next three chapters focus on describing the accomplishments which were achieved in FY 2005 through the natural resource programs

**FY 2005 Changes to Natural Resource Stewardship Programs ¹
With Natural Resource Challenge Contributions Highlighted**
All numbers in thousands of dollars

Program Components	FY 2004	FY 2005 Program Increases	FY 2005
Servicewide Natural Resource Programs			
Air Quality Program	8,890		8,773
Challenge contribution	2,800		2,800
Biological Resource Management Program	8,575		8,475
Challenge contribution	7,985		7,985
Cooperative Ecosystem Studies Units ²	131		129
Challenge contribution	1,993		1,993
Geologic Resources Program	2,651		2,647
Challenge contribution	696		696
Inventory and Monitoring Program	36,932		39,522
Challenge contribution	33,462	3,068	36,530
Natural Resource Data and Information Program	1,521		1,505
Challenge contribution	1,098		1,098
Natural Resource Preservation Program	12,484		12,295
Challenge contribution	7,372		7,372
Research Learning Centers ²	-		-
Challenge contribution	2,698		2,698
Resource Damage Assessment & Restoration Program (incl. Oil Spill Pollution Act)	1,264		1,341
Challenge contribution	500		500
Resource Protection Fund	294		290
Challenge contribution	300		300
Water Resources Program	12,071		12,436
Challenge contribution	7,464	521	7,985
Cave and Karst Research Institute ³	344		333
Everglades Research and Restoration ³	9,967		9,829
GIS ³	1,291		1,273
Glen Canyon Adaptive Management ³	97		95
Natural Sounds Programs ³	921		909
National Park System Units, Other Field Units, and Central Office	100,356		106,275
Natural Resource Stewardship Programs			
Challenge contribution	6,595		6,595
Natural Resource Stewardship Programs	197,790		206,127
Challenge contribution	72,963		76,522

¹ Includes across-the-board reductions and other changes to base, so FY 2005 changes added to FY 2004 will not equal the FY 2005 final funding

² Reflects program funding after transfers to parks or regions

³ Programs not affected by Natural Resource Challenge



Chapter Two: Measuring Progress

The National Park Service, like most governmental organizations, is increasingly being required to report performance in measurable methods. The Government Performance and Results Act (GPRA) formalizes reporting requirements and stresses measuring performance by tracking outcomes. For the natural resources of the National Park System, the desired outcome is resources in good condition, as defined by the desired condition, usually identified in a planning document.

During Fiscal Year 2005 the National Park Service completed its transition to performance goals in the 2003–2008 Department of the Interior strategic plan. These 14 natural resource-related goals focus largely on the end outcome and intermediate outcome results linked to desired conditions. Although this transition included the adoption and reporting to the majority of these goals, work continued towards developing baselines and desired conditions for the four land health goals applicable to the Park Service. During 2005 only those parks with desired conditions identified in their general management plans, objective acreage data for each land type baseline, and sufficient information to document the current condition of their lands were able to address the land health goals. In some instances these desired conditions were so qualitative as preclude translation into readily measurable conditions, for performance management purposes. Work continued at the end of the fiscal year to assist the majority of parks in meeting these three elements which were required to adopt and report to the land health goals by 2007.

Development of strategic monitoring programs began in FY 2001. When fully funded and implemented, a method to measure resource

condition and performance in caring for resources will be in place, although it will take several years to develop significant trend data. Through FY 2005, 24 networks (of a total of 32) involving 207 of 270 parks with significant natural resources have been fully funded for condition monitoring. The first 12 networks (involving 101 parks) have completed the development of their integrated monitoring programs and have now implemented operational monitoring. The remaining networks are in various phases of the planning and design process, which is dependent on when they first received funding. All networks are on or ahead of schedule, and based on scientific peer reviews and comments from other federal and state agencies, these “state of the art” monitoring programs are benefiting many other agencies and organizations. An interim strategy is being developed to use information developed through inventories, planning for monitoring, and other efforts to allow reporting on resource conditions over the next several years while significant status and trend data are being collected.

Of the 10 goals with the FY 2005 targets reported in the table below, all were technically met or exceeded—some were exceeded to significant degrees. The Department considers actual accomplishments within 5 percent of the target to have been met.

The following table shows the relationship of natural resource programs to selected Department of the Interior strategic plan goals, i.e., goals from the National Park Service FY 2001–2005 plan that carried over to the 2003–2008 Department of the Interior plan. All programs respond to some elements of the new plan and had specific targets for FY 2005.

At Buck Island Reef National Monument crews worked to control invasive non-native Guinea Grass (shown here after treatment). Efforts like this contributed to the Park Service meeting its goal to control exotic plants on 1.9% of park lands.

**Natural Resource Challenge Support for Stewardship of Natural Resources in Parks—
Relationships to FY 2005 Strategic Plan Goal Targets**

**NPS Goal Targets for FY 2005
(NPS number/DOI number)**

**SERVICEWIDE NATURAL
RESOURCE PROGRAM
Supporting Park Performance**

**Goals relating to strategies to restore, maintain, sustain and protect
resources:**

la3B/PEM 1.010 75% (27 of 36) of reporting Class I NPS (DOI) lands meet ambient air quality standards (NAAQS). **(exceeded)**

Air Resources

la3C/PEM 1.011 85% (22 of 26) reporting Class I NPS (DOI) land meet visibility objectives. **(exceeded)**

la1B/PEM 2.004 Exotic Plant Species: 1.9% of park lands (49,500 canopy acres of 2.6 million acres) have had plant invasions effectively controlled. **(met)**

Biological Resource
Management

la2A./PEM 2.001 Threatened and Endangered Species: 41% of federally listed species that occur or have occurred in parks are making progress toward recovery [numbers not identified due to changing baselines]. **(met)**

la9/PEM 3.004 37% (1,201) of paleontological localities in NPS inventory (3,248) are in good condition **(met)**

Geologic Resources

la4A/PEM 1.008 98.8% (136,400 of 138,000 miles) of streams and rivers managed by the NPS that meet State and Federal water quality standards as defined by the Clean Water Act **(met)**

Water Resources

la4B/PEM 1.008 76.6% (3,651,000 of 4,765,000 acres) of estuaries and marine areas managed by the NPS that meet state and federal water quality standards as defined by the Clean Water Act **(met)**

**Goals related to strategy to improve information base, resource
management and technical assistance**

lb1 Acquire or develop 64% (1,771) of outstanding data sets identified in 2002 (2,767) of basic natural resource inventories for all parks. **(met)**

Inventory and Monitoring

lb3A Vital Signs: 80% of 270 parks with significant natural resources have identified their vital signs for natural resource monitoring. **(exceeded)**

lb3B 37% (101 of 270) parks with significant natural resources have implemented natural resource monitoring of key vital signs **(met)**



Chapter Three: Progress in Protecting Park Natural Resources

This chapter focuses on those Natural Resource Stewardship programs that emphasize preserving, restoring, maintaining, and protecting park resources and is organized into nine central program areas that include:

- Park and Regional Natural Resource Programs
- Air Resources Program
- Biological Resource Management Program
- Geologic Resources Program
- Natural Resource Preservation Program
- Natural Sounds Program
- Resource Damage Assessment and Restoration Program
- Resource Protection Program
- Water Resources Program

PARK AND REGIONAL NATURAL RESOURCE PROGRAMS

The Natural Resource Stewardship portion of the Operation of the National Park Service (ONPS) appropriation, which includes Natural Resource Management and Natural Resource Research Support, was \$206.1 million in FY 2005. Many, but not all, of the programs involved were affected by Natural Resource Challenge funding increases since FY 2000.

Of the total \$106.3 million designated for park and regional programs, most of the funding directly benefited parks. The Challenge contributed approximately \$6.6 million in park base increases in FY 2001 and FY 2002, which parks continue to receive. This report covers all natural resource management funding. Since park and regional programs represent the largest portion of the Natural Resource Stewardship budget, regions are asked to provide an overview of park and regional programs (exclusive of parks that received Challenge increases) and to identify any trends.

Natural Resource Program Status

Natural Resource Challenge initiatives have resulted in major improvements in how parks manage their natural resources. Critically needed basic inventories and monitoring programs have enabled parks to focus their natural resource programs on the most at-risk resources. Exotic plant management teams, specialists in air and water resources, increased technical support at the regional and park level, and increased project funding through the Natural Resource Preservation Protection Program have all contributed to increased science-based decision making. Additionally, Cooperative Ecosystem Study Units

and Research Learning Centers are attracting key scientists to conduct research in many of the nation's parks. Natural Resource Challenge funding is directly responsible for fostering partnerships and cost-share relationships, that otherwise would not be possible. It cannot be over-emphasized that parks would not have had other means of acquiring the data that Challenge projects generate, and would be forced into a position of non-response to emerging threats such as invasive plants and animals without this funding source.

Regions reported significant accomplishments by parks and some of those accomplishments are highlighted below. Regions also noted constraints on park natural resource programs due to across the board rescissions and inflationary pressures on their fixed costs. Parks and regions report applying adaptive management strategies to address these recent challenges.

Examples of the progress that park and regional personnel have made through the use of Challenge funding in natural resource management include:

- Collaboration with state and federal partners to accomplish natural resource management goals is an integral part of any successful resource management strategy and Challenge funding has led to many successful partnerships. In FY 2005, regional and park natural resource staffs worked with various state agencies to evaluate mandated state comprehensive wildlife plans to determine the benefit to parks adjacent to state and private lands that support sensitive species. Several regions have signed data-sharing agreements with state fish and wildlife agencies to allow sharing of data that will add to the knowledge base of resource managers in parks. **Glacier Bay National Park and Preserve** established a science board of federal and state subject matter experts to assess current knowledge and information gaps in our understanding of potential cruise ship impacts on physical, biological, and socio-cultural resources. The board's recommendations contributed to the Superintendent's decision to implement an adaptive management strategy that would allow an increase in cruise ship numbers in future years.
- Development of a region-wide science strategy was initiated by several NPS regional programs in FY 2005. This multi-disciplinary effort will

Geoscientist-in-the-park, Stephanie Shepard, helped address resource management needs at Sunset Crater National Monument by evaluating the development of volcanic soils in the park. The other half of her time was spent helping park visitors understand the volcanology that created the park's icon.

clarify ways and means to improve scientific information for understanding, interpreting, and managing parks. A comprehensive science strategy will greatly benefit parks with limited staffs by providing them with the tools necessary to research and assess actions to accomplish stewardship activities.

- Regional and park programs continue to find cost-effective ways to make existing natural resource funding stretch farther by hiring student interns and working with volunteers. **Mount Rainer National Park** was able to accomplish projects that would otherwise not be possible given current funding levels. For example, students assisted in completing amphibian, fish, water quality, passive ozone monitoring, and invertebrate surveys, while gaining valuable experience in sampling design, scientific methodology, GIS, and conducting ecological studies in wilderness areas. Volunteers also contribute many hours to park-based resource management activities that include removing of invasive plants at **Catoctin Mountain Park**, monitoring historical peregrine falcon breeding territories at **Dinosaur National Monument**, water quality monitoring at **Homestead National Monument**, and sea turtle monitoring at **Padre Island National Seashore**.
- Restoration activities in many parks are improving habitat for a variety of wildlife and plant species and providing information on restoration success. Resource managers at **Yosemite National Park** have worked with a number of partners to restore the ecological integrity of Royal Arches Meadow, a significant source of plants which were traditionally gathered by Native Americans. Results from this project will not only protect a culturally significant resource but will also provide information on effective techniques for meadow restoration that will be applied at other parks. Regional hydrology staff worked with **George Washington Memorial Parkway** to fund the construction of sediment-erosion tables which were placed in Dyke Marsh Preserve to provide long-term monitoring of erosion in the marsh. Measurements made at fixed points in the marsh will enable researchers to quantify small-scale changes in marsh accumulation and subsidence. Data from this project is critical to guide restoration efforts and measure success.

Challenge-funded Parks

The Natural Resource Challenge supported base funding increases for 36 national parks in FY 2001 and FY 2002. The increases were primarily directed at invasive species control and threatened and endangered species recovery, but

also focused on other native species efforts and basic natural resource capability for small parks. The funding became a permanent part of the parks' base funding.

Total Natural Resource Management base funds available in FY 2005 to these 36 parks approximated \$15 million. Almost 44 percent of that funding came from the Natural Resource Challenge program. Funding levels for 20 of the parks ranged from \$58,000 to \$350,000. Ten parks had from \$350,000 to \$900,000, while six parks had from \$900,000 to \$1,891,000 available for managing natural resources.

Eleven of the 36 parks reported net decreases to their programs, from FY 2004 to FY 2005, ranging from less-than-one to 17 percent. Of the parks reporting decreases, five experienced significant decreases of 5 percent or more. Eighteen reported increases, ranging from less-than-one to 51 percent. Seven parks reported exactly the same funding as the previous year. The overall program experienced a decline in funding from FY 2004 to FY 2005 of \$1,519,608 or 9 percent.

Many parks—nearly a third—continue to experience difficulties retaining funds for natural resource programs due to the absorption of fixed costs and other higher priority needs. Other parks, through a combination of differing circumstances and priorities, are able to more fully maintain the gains brought about by the Challenge. In all cases, as demonstrated by the accomplishments reported, the results of the Challenge are positive. In most instances, the Natural Resource Challenge funding greatly strengthened the ability of parks to address the most critical problems in managing invasives and improving habitat for threatened and endangered species. Additionally, the Challenge funding often provided the critical mass of capability to enable a park to attract more volunteers, partnerships, and other assistance to enhance the natural resource program. Accomplishment highlights include:

Inventories: During 2005, a floristic inventory was completed at **Curecanti National Recreation Area** and a species list was compiled for this park. An inventory of tree damage caused by tornadoes associated with Hurricane Ivan (2004) and Hurricane Katrina (2005) was conducted at **Catoctin Mountain Park**. Much of the initial inventory work funded by the Challenge is now complete but important additions to park species lists continue to be made. New discoveries are made through monitoring as evidenced by the capture of a female short-



A Kemp's ridley sea turtle nests at Padre Island National Seashore during 2005. A record 28 Kemp's ridley nests were found at the park this year.

nosed sturgeon at the mouth of the Potomac River, which runs through several parks including Rock Creek Park, the George Washington Memorial Parkway, and the Chesapeake and Ohio Canal National Historical Park. The short-nosed sturgeon was known only from "historic" records until 2002 when it was found in the Potomac and then captured again as part of a river monitoring program. The fish will be radio-tracked this spring as she heads up the Potomac to spawn and information on her movements will assist biologists in determining spawning needs for the species. Parks continue to work actively with broad groups of public and private groups to monitor at-risk species and provide for a better understanding of ecosystem health through good science.

Monitoring: In cooperation with the National Marine Fisheries Service, Kalaupapa National Historical Park continued to monitor and tag a small breeding population of the endangered Hawaiian monk seal. Challenge funds have enabled Mojave National Preserve to continue the monitoring of desert tortoise recovery and also provide outreach and education opportunities to increase public understanding of this threatened resource. Staff at Saugus Iron Works National Historic Site partnered with the Massachusetts Division of Marine Fisheries and Saugus River Watershed Council to monitor rainbow smelt, river herring, American eel, and other fish species within the park portion of the Saugus River. Monitoring sea turtle, brown pelican, and least tern nesting sites

is possible at Buck Island Reef National Monument thanks to Challenge funding.

Protection and Restoration: Funding from the Challenge allowed Channel Islands National Park to continue wild island fox recovery actions. A Bonneville cutthroat trout reintroduction project was completed at Great Basin National Park. Species restoration is now complete and the goal of establishing five separate trout populations in over eighteen miles of stream is accomplished. Invasive plant control work expanded dramatically as a result of the Challenge. In FY 2005, weed crews at Sequoia and Kings Canyon National Parks surveyed 6,688 acres and treated millions of invasive plants.

AIR RESOURCES PROGRAM
FY 2005 Allocation: \$8,876,000
Available: \$8,773,000

The purpose of the Air Resources Program is to preserve, protect, and enhance air quality and air quality-related values in the National Park System by ensuring compliance with the requirements of the Clean Air Act and the National Park Service Organic Act. Relying largely on non-regulatory approaches to achieve air quality goals, the Air Resources Program emphasizes the collection of credible air quality information to support scientifically sound decisions about actions affecting air quality and air quality-related values in the parks. Natural Resource Challenge funds augment and support air quality monitoring in parks; investigation of resources

Annual Performance Goal, Status, and Accomplishments	FY 2004	FY2005
FY 2004		
la3: Air quality in 62 percent of reporting parks has remained stable or improved	Met	
la3B: 69 percent of reporting Class I NPS (DOI) lands meet ambient air quality standards	Exceeded	Exceeded
la3C: 66 percent of reporting Class I NPS (DOI) lands meet visibility standards		
FY 2005		
la3: Air quality in 64 percent of reporting parks has remained stable or improved		Exceeded
la3B: 75 percent of reporting Class I NPS (DOI) lands meet ambient air quality standards		Exceeded
la3C: 85 percent of reporting Class I NPS (DOI) lands meet visibility standards		
Other Actions and Outcomes:		
·Air Resources Field Specialists supported by Challenge: total FTE	8.5 FTE	7.5 FTE
·Park emissions inventories: total parks completed or (<i>underway</i>)	45 (12)	46 (13)
·Air Quality Monitoring: total parks involved	69 parks	68 parks
·Visibility Monitoring: total parks involved	54 parks	54 parks
·Mercury Monitoring: total parks involved	15 parks	13 parks
·Ecological Effects Projects: total projects completed or (<i>underway</i>)	3 (5)	2 (4)
·Technical Assistance to Parks	15 parks	28 parks
·New Source Permit Review and Recommendations	39 reviews	55 reviews

that are sensitive to air pollution effects; review of permit applications proposed by new or existing sources and provision of recommendations to reduce impacts on parks; audits of, and recommendations to reduce, air pollution sources within national parks; data analysis; provision of information to permit applicants and regulatory agencies; and other technical assistance to parks. Parameters currently measured in parks include: ozone and/or dry deposition, wet deposition, and particulate matter. Special studies at **Great Smoky Mountains, Isle Royale, and Yosemite National Parks** address cloud water chemistry and develop monitoring equipment for remote locations and ozone precursors. This section focuses on certain activities administered and funded through the Air Resources Program including:

- Airborne Toxic Contaminants
- Climate Friendly Parks
- Ecological Effects
- Emission Inventories
- Air Quality Monitoring Network

Funding and Performance Summary

The Natural Resource Challenge provided base increases in FY 2001 of \$200,000 for Air Emissions Inventories and \$2.6 million in FY 2002 for Air Quality Monitoring and Assistance. As part of the Natural Resource Challenge, expertise in air quality-related skills has been expanded through the creation of 7.5 field-based positions. These positions provided significant assistance to parks in FY 2005. Most of these new air quality specialists are responsible for

working closely with park neighbors, regulatory agencies, other federal land managers, and the five regional planning organizations established by the U.S. Environmental Protection Agency (EPA) to develop visibility protection programs. The specialists work to ensure park managers are receiving timely and useful information about air quality conditions and related management issues; they also provide or broker technical assistance and scientific expertise for parks. Some of the specialists serve as senior science advisors or otherwise provide technical expertise for the vital signs monitoring program.

Airborne Toxic Contaminants

The National Park Service initiated the Western Airborne Contaminants Assessment Project (WACAP) in FY 2002 and it continued through FY 2005. The objective of this multi-year project was to inventory airborne contaminants in national park ecosystems using a network of sites in parks in the western United States to determine the risk from airborne contaminants to ecosystems and food webs in western national parks. Airborne contaminants can pose serious health threats to wildlife and humans, as some of these compounds tend to “biomagnify” in the food chain, having impacts on reproductive success, growth, behavior, disease, and survival. Inventories of contaminants are conducted in key parks in the West and in Alaska. Entities who cooperated in the project include EPA, U.S. Geological Survey(USGS), USDA Forest Service, Oregon State University, and the University of Washington.

Climate Friendly Parks

The effects of global climate change are being observed in many regions—glaciers are melting, weather patterns are becoming more unpredictable, sea levels are rising, and habitat changes are causing species shifts. These effects are particularly noticeable in national parks because of their locations and unique, protected resources. Maintaining park resources requires good stewardship practices within parks and on regional and global scales. In FY 2005, the Park Service continued to cooperate in a Climate Friendly Parks initiative with the EPA, under which the agencies collectively audit greenhouse gas emissions within parks (in addition to criteria air pollutants) and provide reduction recommendations. Under this initiative, the Park Service is demonstrating leadership in sustainable stewardship practices within parks and educating the public about them in all park areas.

Ecological Effects Examined

Two ecological effects studies concluded in FY 2005 in **Joshua Tree and Big Bend National Parks**. In addition, the Air Resources Program continued its support of two multi-year projects begun in FY 2004 to assess ecological effects in **Indiana Dunes National Lakeshore and Mount Rainer National Park**. Two additional multi-year projects were initiated in FY 2005 at **Rocky Mountain/Glacier National Parks and Congaree National Park**. Results indicate that nitrogen deposition at Joshua Tree National Park is likely a source of increasing invasive exotic grass cover. At Indiana Dunes National Lakeshore scientists are using controlled experiments to investigate the threshold levels of atmospheric nitrogen deposition that result in plant community shifts. USGS scientists with the assistance of park staff are developing protocols to track air quality related values at Mount Rainer National Park. Evaluation of long-term species changes and response to the effects of nitrogen deposition in alpine plant communities are the focus of research at Rocky Mountain and Glacier National Parks. At Congaree Swamp National Park researchers are developing an understanding of the microbial controls that link atmospheric-derived mercury deposited in the park to the formation of toxic methylmercury that poses a threat to ecosystem and human health.

Emissions Inventories

Park operations substantially complied with air pollution control, permitting, and emission requirements in FY 2005. For all parks that had inventories prepared, recommended mitigation measures were provided. Examples of recommendations that were implemented at

parks include the replacement of two-stroke engine powered snowmobiles owned and operated by the National Park Service with four-stroke engine-powered snowmobiles in **Yellowstone National Park, Grand Teton National Park, Crater Lake National Park, and Denali National Park and Preserve** and increased use of biodiesel fuels in NPS vehicles where biodiesel is available and cost-effective, such as **Great Smoky Mountains National Park**.

Air Quality Monitoring Network

At the time the Natural Resource Challenge was issued, there was some degree of air quality monitoring in 36 units of the National Park System. The Natural Resource Challenge, in 1999, called for expanding the air quality monitoring network to provide improved geographical representation, expanded parameter coverage, and increased support to parks for monitoring activities, with an emphasis on parks most threatened by air pollution or most vulnerable to degradation caused by air pollution. The Air Resources Program now oversees a network of ambient air quality monitoring sites in 68 units of the National Park System. Parameters measured include ozone, wet and dry deposition, visibility and particulate matter. Mercury is another contaminant for which monitoring was expanded as a result of the Natural Resource Challenge. Information from this monitoring will support better estimates of the amount, distribution, and seasonal trends of mercury being deposited into the ecosystem. All of these monitors are part of larger national networks. Through analysis of these and other monitoring data, the Air Resources Program can provide some level of air quality assessments to most natural resources units in the system.

BIOLOGICAL RESOURCE MANAGEMENT PROGRAM

FY 2005 Allocation: \$8,575,000

Available: \$8,475,000

Created in FY 2000 as part of the Natural Resource Challenge, the Biological Resource Management Program provides professional, science-based support for invasive species management, terrestrial ecosystem restoration, threatened and endangered species protection, integrated pest management, and wildlife management. The program has been successful in its systematic and nationwide response to the management needs of biological resources in parks. This section focuses on activities administered and funded through the Biological Resources Management Program including:

- Biological Inventories
- Biological Resource Projects—National Level

- Support
- Ecological Restoration
- Endangered Species Program
- Invasive Species—Invasive Animals, Invasive Plants, and Integrated Pest Management Program
- Park Flight Migratory Bird Program
- Vegetation Mapping
- Wildlife Management and Health

Funding and Performance Summary

The Natural Resource Challenge Funding for Biological Resource Management Programs target invasive plant control and strategic biological support, which totaled \$8,475,000 in FY 2005. Biological Resource Management Program activities contributed to programs that met the FY 2005 performance goals including disturbed lands and invasive plant species, threatened and endangered species, invasive animal species and species of management concern.

Biological Inventories

The Biological Inventories (BioInv) Program was created in 2005 to provide national leadership and technical assistance for park-level biological inventories that document the presence, absence, distribution, and abundance of species and sub-specific taxa in NPS units. The BioInv program assists the parks, the Inventory and Monitoring program networks, the regions, and all regional- and national-level NPS programs that acquire and use species-level information from biological inventories. In addition, BioInv program staff cooperates with other federal, state, and private institutions to enhance NPS goals related to science-based management of park natural resources.

The BioInv program develops and manages NPSpecies, a centralized internet database for all parks to store, manage, and disseminate biological inventory information. NPSpecies serves as “one-stop shopping” for information on the presence, absence, distribution, and abundance of species currently or historically in parks. NPSpecies contains certified, documented species lists and the supporting “documentation” for the lists. NPSpecies is closely integrated with NatureBib, the NPS natural resource bibliography database which provides the aforementioned citations, and a related digital, biological archive of the actual reports, distribution and abundance maps, and tabular data sets cited in NatureBib. NPSpecies was also designed to support park reporting of the threatened and endangered species, invasive animal species and species of management concern performance goals in the future.

The information contained in both these databases are subjected to quality assurance and control procedures that are an integral component of all Challenge-funded projects. Managers within the Park Service have recognized the need for quality database management within the science program and have insured, through front-end investments, that information contained in Servicewide databases is quality-controlled.

Biological Resource Management Projects—National Level Support

Biological Resource Management Program competitive funds are used for biological resource projects that address issues facing various park units and that benefit multiple partners. These projects address a myriad of resource management needs for aquatic or terrestrial plants and animals throughout the National Park System. In FY 2005, 23 projects were funded in 23 parks for a total funding of \$633,000. Below are highlights from some of these projects:

- Field support was provided by NPS staff for survey work conducted in partnership with the U.S. Fish and Wildlife Service to gather information on Kittlitz’s murrelet in Icy Bay on the coast of **Wrangell-St. Elias National Park**. Repeated surveys collected considerable information on the dynamics of murrelet temporal and spatial distribution in Icy Bay. Evidence of nesting on park lands has been observed but could not be confirmed. Data collected from this survey is currently being analyzed and will be used to develop a survey methodology for monitoring the declining population of Kittlitz’s murrelet. Other agencies who provided logistical and field support for this study include USGS and the Alaska Department of Fish and Game.
- An interagency agreement between USGS and the Park Service provided funding to delineate areas within **Mesa Verde National Park** that should be established as protected activity centers for its breeding population of threatened Mexican spotted owls. Locations of where spotted owl breeding activity was observed in 2005 were mapped using GIS technology.
- At **Carlsbad Caverns National Park**, park staff have completed two years of data collection on the presence of non-native Barbary sheep in the park. The presence of sheep is the result of human activities; many elements of the natural ecosystem and the park’s physical environment have been disrupted by their occurrence. Sheep have been observed biting off substantial portions of the stalks of plants, reducing or completely preventing the plant’s reproduction, and impacting the community of insects, arthropods, and birds

that rely on the pollen and seeds. Data from this project will be compiled and analyzed for use in the preparation of a long-term comprehensive plan for the management of sheep.

- GPS data points were collected at **Sleeping Bear Dunes National Lakeshore** to determine the distribution of the non-native perennial herb Baby's Breath. Information gathered from this project will assist resource managers in the development of a management plan and environmental assessment for this plant species that has invaded open areas of the dune habitat.
- Restoration of native woodland along a visitor corridor in the Central Crater of **Haleakala National Park** is underway due to Challenge funding and volunteers. As a result of the harsh, exposed climatic conditions, the native woodland system is not regenerating on its own after removal of feral animals. Staff and volunteers are working together to plant large individuals of native species between remnant scattered individuals to restore this valuable resource. This project serves as a model for further restoration efforts in the Crater to enrich endangered species habitat.
- Caves of **Lava Beds National Monument** were surveyed by scientists from the Center for Biodiversity and the University of Texas to assess the diversity of macroinvertebrates. Over 200 specimens were collected representing 5 different taxonomic groups.

Ecological Restoration

The Ecosystem Management and Restoration Program continues to work with specialists from other Natural Resource Programs to support ecosystem assessment and the restoration of disturbed lands in the context of soil and vegetation alteration, wildland fire, weed control, and contaminants. Responsibilities have expanded in this program area to include vegetation and ecosystem management, landscape management and partnering, and condition assessment.

In FY 2005, the ecosystem management and restoration program led a cooperative project with NatureServe to conduct the Seamless Network of Parks Project. This project was funded to support analyses and the development of partnerships for public and private conservation managers based on shared resources and management goals. Biodiversity management, invasive species, and nature-based recreational opportunities were selected as themes for partnership development. Workshops in Georgia, Florida, and South Carolina to identify resource-based linkages and develop partnerships were well attended by federal, state, county, academic, and private organizations. Over 25 projects in NPS units were generated as a result of the workshop discussions.

The Ecosystem Management and Restoration Program supported the NPS livestock grazing coordinator and activities which included site visits and technical assistance to **Sand Creek Massacre National Historic Site** and **Bent's Old Fort National Historic Site** on a variety

Kittlitz's murrelet with radio-transmitter, Icy Bay, Wrangell-St. Elias National Park and Preserve, Alaska. Photo courtesy of Michelle Kissling, USFWS, WRST, 2005



of stock and rangeland questions. With other NPS technical experts, the grazing coordinator completed an assessment of riparian and upland conditions on grazing allotments at **Lake Roosevelt National Recreation Area**.

Technical assistance to parks included program review and consultation. At **Colonial National Historical Park** restoration program staff provided review and comments on a seasonal pond management plan. An expert panel was convened at **Yellowstone National Park** to develop a strategy for restoration at Gardiner Basin. Other examples include ongoing consultation on natural resource program development at **Canyon De Chelly National Monument**, initiation of a roadside vegetation management project at **Fort Union Trading Post National Historic Site**, and technical support for waste removal and ecosystem restoration at **Golden Gate National Recreation Area**.

Endangered Species Program

The National Park System currently has 453 threatened, endangered, proposed, experimental, managed via conservation agreement, and candidate species. These are represented in 1,196 populations in 193 units. While mammals and birds represent only 26 percent of the listed populations in parks they draw 57 percent of the funding. The status of listed species and the expenditures on them in each park are updated and summarized annually in the NPS ESA Database. Analysis of existing data provides information that identifies recovery projects that could be funded by the Challenge and other sources in the future.

The Park Service has developed several programs that focus on federally listed plants. Through the Center for Plant Conservation, seeds are collected from NPS units around the country and placed in long-term storage. In a cooperative agreement with the Chicago Botanical Garden, interns specializing in botany assisted with projects at **Indiana Dunes National Lakeshore**, **Capitol Reef National Park**, and **Parishant National Monument**.

Number of Endangered, Threatened, Proposed and Candidate Species Found in National Park Units (as of September 30, 2005)

Endangered Species	262
Threatened Species	107
Experimental Species	9
Proposed Species	1
Candidate Species	64
Managed via Conservation Agreement	9
Delisted but Managed	1
Total	453

The Endangered Species Program expanded its educational efforts within the Park Service and beyond. A joint effort with the U.S. Fish and Wildlife Service is the course on scientific principles and techniques for endangered species management. This year, the course was offered at the National Conservation Training Center and at Friday Harbor Marine Laboratory in Washington State. The Endangered Species program also contributed an instructor to a conservation genetics course offered by the National Conservation Training Center and provided case studies from parks to be used in the course material.

Endangered Species Program staff provide technical assistance on listed species to parks including advising on monitoring programs at **Sleeping Bear Dunes National Seashore**, **Carlsbad Caverns National Park** and **Point Reyes National Seashore**. USGS protocols were reviewed for sensitive species utilizing the beaches at **Cape Hatteras National Seashore**. Staff continue to provide assistance to **Death Valley National Park** in assessing impacts on Devil's Hole pupfish. At **Channel Islands National Park**, three subspecies of island fox were federally listed as endangered in March, 2004, and the Endangered Species Program continues to advise the park on genetic management of small populations of these isolated subspecies.

The Endangered Species Program reviews implementation plans and annual accomplishment reports including damage control of desert tortoise critical habitat at **Lake Mead National Recreation Area**, translocation guidelines for black-footed ferrets at **Badlands National Park**, restoration of bat habitat at **Mammoth Cave National Park**, and radio-tracking Mexican spotted owl at **Grand Canyon National Park** to determine whether they forage above the canyon rim.

Invasive Species Program

The Invasive Species Branch provides a wide range of innovative and science-based services and policy guidance to manage harmful invasive species and manage risks presented by structural and public health pests in both natural and developed areas. Focal points of the branch include the Invasive Animal Program, Invasive Plant Program, and Integrated Pest Management Program. The Invasive Animal Program addresses invasive animal management. A major component of the Invasive Animal Program is the Forest Health Initiative funded through grants from the USDA Forest Service. The Invasive Plant Program oversees the operation of Exotic Plant Management Teams (EPMTs) located in 16 host

Summary EPMT FY 2005 Accomplishments

Inventoried acres	2,561,000*
Gross infested acres identified	64,103
Treated and retreated acres	9,963
Monitored acres	19,665
Restored acres	238

* Majority of acreage inventoried in Southern and Central Florida via systematic reconnaissance flights.

parcs. The Integrated Pest Management Program determines low risk, environmentally sound options for pest control. The Branch also focuses on the facilitation of partnership efforts to control invasive species, thus protecting significant resources in a cost-effective manner.

- **Invasive Animal Program**—The goal of this program is to ensure that populations of non-native animals in natural areas do not jeopardize or interfere with park or site objectives. This is accomplished by removing invasive populations or managing them to threshold levels. A database was developed in FY 2005 on park-level populations of invasive animals, and data collection is underway. Within another year, high quality data should be available to help set priorities and measure accomplishments on invasive animal management. This is a joint effort by the National Park Service and the Colorado Natural Heritage Program.
- **Invasive Plant Program**—Invasive plants infest approximately 2.6 million acres in the National Park System, reducing the natural diversity of these special places. The need to address biological invasions was recognized by Executive Order 13112—Invasive Species in 1999. It is the goal of the invasive species program to implement the Executive Order, manage the sources of new infestations, and reduce the effects of existing infestations. The Invasive Plant Program provides technical and policy assistance to parks and regions. Funding from the Natural Resource Challenge established rapid response Exotic Plant Management Teams (EPMTs) to control invasive plants. Modeled after the approach used in wildland fire fighting, EPMTs provide highly trained, mobile strike forces of plant management specialists who assist parks in the control of invasive plants. EPMTs are part of the long-term control on invasive plants established by the Natural Resource Challenge. This model has since been duplicated by the U.S. Fish and Wildlife Service for the refuge system. In 2005, 16 EPMTs partnered with over 200 parks to treat, control, inventory, and monitor invasive plants. The EPMTs treated, monitored, or restored approximately 30,000 acres and over 2.5 million acres were surveyed for invasive plants. Highlights of FY 2005 include:
 - o EPMTs inventoried over 2.5 million acres of NPS lands and were the catalyst for efforts that resulted in over 50 million acres of park and partner acres being inventoried. The majority of this accomplishment was an interagency cooperative project by the Florida EPMT, Central and south Florida were inventoried using systematic reconnaissance flights.

- o Over 19,600 acres that were previously inventoried or treated were monitored for new invasions during the year.
- o Cooperation and collaboration has long been recognized as a fundamental component of managing invasive species. Invasive species do not recognize property lines, political jurisdictions or agency boundaries. EPMTs are active participants in cooperative efforts with local, state, and regional organizations. In 2005 these collaborative efforts resulted in more than \$2.5 million in additional cooperative funding.
- o The Alaska EPMT has been a leader in the State of Alaska by organizing interagency steering committees, preparing publication on the invasive species of Alaska, and participating in state wide inventory efforts. The team is part of a state wide effort to control and contain the few weed species in the state and prevent the introduction of new species.
- o In order to improve efficiency, other federal agencies, state and local entities have developed partnerships with the Lake Mead EPMT to effectively manage weeds across watersheds and agency boundaries. The Lake Mead EPMT conducts interagency weed control projects for over five million acres of federal and county land in Southern Nevada.
- o The Mid-Atlantic Cooperative assisted the Commonwealth of Virginia by participating on the state’s Invasive Species Advisory Committee to devise a state-wide invasive species strategic management plan.
- o The Pacific Islands EPMT has continued to serve as the coordinating entity for an interagency program to control Miconia on the island of Maui. The EPMT works closely with the Maui Invasive Species Committee, utilizing funds from a variety of sources, including state and county agencies, private entities, watershed partnership groups, and federal agencies. Utilizing these partner groups with common goals, the Pacific Islands EPMT has achieved in excess of a five-fold increase in work capacity on the island of Maui.
- o EPMTs collaborated with the Student Conservation Association to build student corps to assist EPMTs in controlling invasive plants. As a result of the success of this program, the U.S. Fish and Wildlife Service is now fielding student conservation teams, thus building human capital throughout land management agencies in invasive species management. In FY 2005, student conservation teams treated more

than 1,340 acres providing 25,340 volunteer hours.

During the severe hurricane season of 2005, EPMTs from across the country contributed personnel and resources to the recovery effort. The mechanical skills, training, mobility, and experience of working in difficult conditions made EPMTs extremely valuable to relief efforts. The hurricanes will have lasting ecological effects. The physical disturbance and openings in the canopy will allow invasions from invasive plant species. Local EPMTs are already working closely with parks to inventory damage, predict areas where invasive plants may increase, and plan treatment efforts during FY 2005 and beyond.

- **Integrated Pest Management Program**—The Integrated Pest Management (IPM) Program provides policy guidance, technical assistance, and training, to reduce the risk from pests and pest management related activities affecting the public, employees, park resources and the environment. Integrated pest management assistance is provided to all NPS divisions (natural and cultural resources, facilities management, public health, concessions), in all management zones (natural, cultural, developed, special use). In 2005, approximately 1,925 individual pesticide use proposals were submitted for review. Staff from the NPS IPM program continue to serve as active members of the Federal Integrated Pest Management Working Group and are cooperating with other federal agencies to formalize integrated pest management training and certification, coordinate and instruct training courses. Some highlights are listed below:
 - o The NPS IPM Program is serving as the facilitator to help initiate photo monitoring points and installation of pheromone traps for the non-native invasive cactus moth, *Cactoblastis cactorum*, with USGS and APHIS, in parks with *Opuntia* species. Research permits will be obtained for specific parks; this will be the first time that early pest detection, which can facilitate rapid response to quickly eradicate or reduce spread, will be formally conducted under the NPS Research Permitting Process.
 - o IPM staff designed a “boot cleaner” and “bike scrubber” which have been copied and used by local and state agencies to reduce spread of sudden oak death (*Phytophthora ramorum*). IPM program staff serve as the key contacts for the Park Service and other agencies providing assistance and guidance to further reduce the threat from sudden oak death on federal and private lands.

Park Flight Migratory Bird Program

The Park Flight Migratory Bird Program works to protect shared migratory bird species and their habitats in U.S. national parks. The program also develops bird conservation and education projects and creates opportunities for technical exchange and cooperation between U.S. national parks and protected areas or parks in Latin America and the Caribbean. Park Flight is a partnership between the National Park Service, National Park Foundation, American Airlines, National Fish and Wildlife Foundation, U.S. Agency for International Development, and the University of Arizona. The program is made possible through the generous support of American Airlines, the Natural Resource Challenge, and Park Flight partners. Technical direction is provided by the University of Arizona Desert Southwest Cooperative Ecosystem Studies Unit and the NPS Biological Resource Management Program.

In FY 2005, the Park Flight Migratory Bird Program received the U.S. Department of the Interior’s “2004 Secretary’s Four C’s Award,” which honors individual or group efforts in Communication, Consultation, and Cooperation all in the service of Conservation. This award was established to recognize exceptional contributions, methods, and efforts to promote collaborative place-based community and citizen stewardship. The National Park Service and Park Flight Migratory Bird Program also received an award from the National Fish and Wildlife Foundation and U.S. Fish and Wildlife Service for consistent and generous support of International Migratory Bird Day.

With the assistance of the Park Flight Program, two NPS units held important events related to migratory birds in FY 2005. In October 2004, NPS Director Fran Mainella participated in a formal dedication of **Cuyahoga Valley National Park** as an Important Bird Area (IBA), recognizing citizen scientists and park partners who have assisted with bird conservation efforts at Cuyahoga. The event also launched plans for international cooperation between Cuyahoga Valley and Point Pelee National Park, an Important Bird Area across Lake Erie in Ontario, which share many migratory bird species. In September 2005, the **Bandelier National Monument** Superintendent, New Mexico Audubon, and other partners participated in the dedication of that park as an Important Bird Area, offering bird walks, banding demonstrations and presentations for school children from the San Ildefonso and Pojoaque Pueblos in conjunction with the dedication.



Integrated Pest Management staff designed a "bike scrubber" to reduce the spread of sudden oak death.



Monitoring mule deer for Chronic Wasting Disease at Rocky Mountain National Park.

During FY 2005, Park Flight provided 10 international interns to help implement bird monitoring and education projects in the following national parks: **Sequoia and Kings Canyon National Parks, Point Reyes National Seashore, Golden Gate National Recreation Area, North Cascades National Park, Bandelier National Monument, and Pinelands/New Jersey Coastal Heritage Trail Route.** These international interns from Honduras, El Salvador, Costa Rica, Panama, and Mexico whose countries share migratory bird species with the U.S. parks, contributed more than 3,500 hours to the park efforts. Their involvement was coordinated through the NPS Office of International Affairs International Volunteers in Parks program. Park Flight continued to work with national parks and protected areas in 10 Latin American countries (Guatemala, El Salvador, Nicaragua, Honduras, Costa Rica, Panama, Mexico, Argentina, Brazil, and Uruguay) concerning migratory bird conservation and education efforts.

Park Flight continued during FY 2005 to contribute to the efforts of the Association of Fish and Wildlife Agencies, Partners in Flight, the North American Bird Conservation Initiative, the National Audubon Society, BirdLife International Important Bird Area Programs, and International Migratory Bird Day. All of these partnerships foster coordination of efforts that benefit the management of migratory species in the U.S. and abroad.

Vegetation Mapping Program

Vegetation information is a high-priority inventory need for most parks and is one of the 12 data sets identified as necessary for park resource management and protection. Vegetation maps are vital for the management and protection of wildlife habitat, sensitive plant communities, and ecological processes; as well as modeling vegetation flammability and fuel implications for fire management, analyses for site development suitability, and evaluation of resources at risk.

A standard process is followed for each park mapping project using documented, peer-reviewed protocols which include using the national vegetation classification system, field methods for collecting plot data, and accuracy assessment procedures for vegetation maps. The 28 final products prepared for each park unit mapped are provided digitally on the USGS web site.

Funding received for vegetation mapping allowed the Park Service to accelerate the rate at which parks are being mapped. By combining the

funding provided through the Natural Resource Challenge, with other funding provided by the USGS and NPS Fire Program, the Park Service was able to complete 11 more vegetation mapping projects (62 total complete), continue 73 ongoing projects, and initiate 24 new park mapping projects in FY 2005.

Wildlife Management and Health

The Wildlife Health Program provides policy guidance, technical assistance, and training to enhance the ability of park staff to meet the increasing demands of wildlife health issues including field anesthesia, sample collection and diagnostics, disease management, contraception, and the identification of wildlife health research needs. Consultation on wildlife health issues and provision of diagnostic services has continued to expand this fiscal year. The health team provided consultation, field and project management assistance, and/or training to over 30 parks representing all seven NPS Regions. Assistance focused on chronic wasting disease; however, a breadth of other diseases (e.g., rabies, brucellosis, John's disease, plague), physiology (e.g., stress, reproduction), and welfare issues (e.g., euthanasia, pain management) were addressed. In addition to diagnostic services, information was provided to parks on request on such issues as wildlife-domestic animal disease interactions, specific diseases and their prevention and management, disease risks associated with translocation of wildlife, disease sampling protocols, wildlife contraception, and animal welfare concerns.

Veterinary diagnostic services for wildlife are an important component of ecosystem health management. Through a cooperative agreement with Colorado State University Veterinary Diagnostic Laboratory, wildlife health staff teamed with the USGS National Wildlife Health Center to provide veterinary diagnostic services to park units. Surveillance of emerging diseases, such as chronic wasting disease of deer and elk and West Nile virus, as well as other diseases provided managers with valuable information to address wildlife health and public health concerns. Over 300 diagnostic evaluations were provided through the cooperative agreement to support 12 park units. A database was developed to track samples and the resulting disease diagnoses on submissions. This database will allow monitoring and eventually tracking of trends of disease occurrence in park units. The database also serves as a method to share data with partners (e.g., USGS) to understand disease occurrence on a larger scale.

GEOLOGIC RESOURCES PROGRAM

FY 2005 Allocation: \$2,651,000

Available: \$2,647,000

The Geologic Resources Program provides support to parks and the Directorate on a broad range of geologic science and minerals management activities. Program staff coordinates Service-wide functions and provides park managers with geoscience and regulatory expertise related to cave and karst systems, coastal and surficial geologic processes, disturbed land restoration, fossil resources, geologic hazards, soil resources management, environmental effects of mineral extraction, mineral extraction technology and engineering, and associated NPS policy and legal authorities to assist resource management decisions.

Utilizing the external geoscience interest in parks, Geologic Resources Program staff have developed cooperative ventures with other organizations to significantly increase the geologic capabilities of the Park Service and create an awareness of park geologic resource issues in the broader geoscience community. For example, partner funding has resulted in placing about 500 Geoscientists-in-the-Parks student volunteers and experienced professionals in parks in recent years. The Geologic Resources Program accomplishes many of its projects by utilizing and leveraging funds from partner organizations and other sources.

The program's FY 2005 accomplishments are summarized below under six broad program areas:

- Disturbed Lands Restoration
- Geologic Processes and Features
- Geologic Resource Evaluation
- Minerals Management
- National Cave and Karst Research Institute
- Soil Resources Inventory and Management

Funding and Performance Summary

In FY 2000, the Natural Resource Challenge provided the first funding for geologic resource management programs outside of the minerals management activities supported by the Geologic Resources Program. In FY 2003, Challenge funding through the Inventory and Monitoring Program provided for staff to carry out the Servicewide geologic resource inventory. In FY 2005 additional funds were provided for staff to manage the soils inventory. Challenge funding now supports nine geoscience specialists who provide expertise at the national level in cave resources and karst processes, coastal resources and processes, disturbed lands restoration, geologic hazards management, geologic mapping, paleontology, and soils. These professional geologists support parks, regions, and Monitoring Networks, and the Inventory and Monitoring Program.

Annual performance goals, status, and accomplishments are highlighted below. In addition to those shown here, two other goals relevant to the Geologic Resources Program are reported in the Natural Resource Protection Program-Disturbed Lands, and Inventory and Monitoring sections.

Disturbed Lands Restoration

The Disturbed Lands Restoration program allocates project funds to parks based on competitive proposals. Staff prepare the technical guidance, review park work plans for technical adequacy, and provide oversight on cost accounting and accomplishments reporting. In 2005, disturbed land restoration program staff oversaw restoration project funding for 13 projects in 12 parks, representing five NPS regions. These projects restored nearly 300 acres of severely disturbed land. Examples include restoration of natural cave drainage in **Timpanogos National Monument**, reclamation

Annual Performance Goal, Status, and Accomplishments	FY 2004	FY2005
FY 2004 25 percent (1,287) of 5,149 known paleontological localities in parks are in good condition	met	
FY 2005 37 percent (1,202) of 3,250 known paleotological localities in parks are in good condition *		met
Other Actions and Outcomes:		
• Geoscience Specialists supported by Challenge: total FTE	10	10
• Geoscientists-in-the-Parks Program: number of scientists (total parks)	45 (29)	51(29)
• Geoscientists-in-the-Parks Program: private:federal funding match	4:1	4:1
• Mineral Development Reviews: total operations (total parks)	54 (20)	33 (15)
• Technical Assistance to Parks	83 responses	115 responses

* In FY 2005, the National Park Service adjusted the Service-wide baseline number of paleontological localities to reflect the actual number of localities properly recorded and documented in parks as required in GPRa Goal Ia9 Technical Guidance.

of the placer-mined Glacier Creek in **Denali National Park**, restoration of a segment of the Merced River by removing the Happy Isles Dam in **Yosemite National Park**, and restoring the hydrology and soil disturbances associated with illegal marijuana plantations in **Sequoia/Kings Canyon National Parks**.

Restoration and reclamation specialists responded to over 25 technical assistance requests in 2005 involving disturbed lands, abandoned mine safety, and geomorphological concerns. Staff provide key technical assistance to park restoration efforts through site assessments, safety hazards analysis and mitigation design, geomorphic analyses and landform restoration design, materials/equipment cost estimates, and project oversight assistance. Many of these efforts will lead to park proposals for project funding to implement the recommended actions. Examples of park technical support in 2005 include development of restoration alternatives for canals on Cape Sable at **Everglades National Park**, uranium mine site characterization at **Canyonlands National Park**, restoration planning for gravel pits at **Craters of the Moon National Monument**, planning for landform restoration of a coastal beach/dune landform complex at **Apostle Islands National Seashore**, and cinder pit reclamation design at **Lava Beds National Monument**.

Geologic Processes and Features

The National Park System includes 121 parks known to contain important cave and karst resources. Over 3,900 caves are within park managed lands, in locations ranging from Guam to Maine, and all of these caves are considered significant under the Federal Cave Resources Protection Act. In 2005, cave and karst resource management staff provided technical assistance and support to cave stewardship efforts across the Park Service. Highlights of technical support provided to parks includes developing strategies for a cave management plan at Yosemite National Park, assessing the design of cave entry and exit doors in **Cumberland Gap National Historical Park**, evaluating travertine depositional features and paleontology resources at **Vicksburg National Military Park**, evaluating cave resources and mines at **Mississippi River National Recreation Area**, assisting **Wind Cave National Park** and **Sequoia/Kings Canyon National Parks** with cave diving issues, and working with **Hawaii Volcanoes National Park** staff on controversial issues about cave entry, high carbon dioxide levels in caves, and park service permitting procedures.

Coastal geology staff provide technical oversight,

support, and policy/regulatory advice to over 100 park units with coastal and lakeshore geologic concerns. In 2005, staff worked closely with Inventory and Monitoring Networks to define coastal resource monitoring plans and inventory needs. Development of protocols for coastal geologic mapping that integrate submerged marine resources with adjacent lands at **Kaloko-Honokohau National Historical Park** and **Dry Tortugas National Park** were made possible through collaboration with USGS.

At the close of an active weather year, Hurricane Katrina made landfall on the Mississippi units of **Gulf Islands National Seashore** and in **Jean Lafitte National Historical Park and Preserve**, forcefully demonstrating how coastal shoreline processes can affect people's daily lives and leaving permanent reminders that barrier islands are extremely dynamic, transient features. Staff coordinated with other agencies and university scientists to provide coastal process expertise to park managers and assisted parks with obtaining remotely sensed data to aid in storm response issues. Park Service post-hurricane response decision-making was greatly aided by the existence of baseline geologic information and remote sensing data.

Geologic Education and Outreach staff continue to promote conservation through cooperation, consultation and communication with projects designed to increase public awareness of the unique geologic resources in parks and to engage the professional geology community and earth science educators in using parks for teaching and research. The geology website is an important component of a public outreach effort with highlights of geologic program areas and numerous useful links to geologic community websites. The geology website continues to have high visitation and receives frequent inquiries and positive reviews from the public.

Geology education staff continued efforts in 2005 to facilitate geoscience research by working with the scientific community to meet the parks' research needs. They connected Geoscientist specialists with park staff to help examine research proposals, conduct peer reviews, and to identify significant research needs that will facilitate understanding and management of the park resources. The Geologic Resources Program continued to work with EarthScope project staff to facilitate the placement of research equipment in national parks and provide outreach opportunities for the public. Notably in FY 2005, four knowledge center components—Cave and karst, Coastal Geology, Glaciers, and Volcanoes—were selected as on-

line resources to the Digital Library for Earth Systems Education, the geoscience node of the National Science Foundation's National Science Digital Library.

Geoscientists-in-the-Parks program is instrumental in meeting the backlog of geoscience needs by partnering with professional geologic organizations and the academic community. Participating geoscientists completed more than 75 projects in 29 parks in FY 2005 and helped parks meet critical needs in natural resource management, research, public safety, and both formal and informal education. The success of this program is an outstanding example of fulfilling the Park Service's many needs through cooperative partnerships and collaboration.

Examples of geoscientist in the parks projects in FY 2005 include a professional geomorphologist examining rapid erosion and potential mitigation to address riparian land health concerns at **Knife River Indian Village** and **Fort Union Trading Post National Historic Site**, the completion of a paleontological report for **Glacier National Park** that will help park managers to better understand the significance of the park's paleontological resources, and a synthesis of existing research results, revision of geomorphic maps, and examination of geomorphic risks to structures and visitors at **Padre Island National Seashore** that will help park managers address resource concerns, provide protection of structures, and increase public safety.

In response to park requests in 2005, Geology Resource program staff provided technical support in the assessment and evaluation of geohazards in numerous parks. Because the Park Service is not alone in the need for comprehensive hazard assessment, monitoring, and planning, staff participated in multi-agency workshops to develop nationwide mitigation strategies for geohazards. Federal land management agencies such as the Bureau of Land Management, the U.S. Forest Service, many municipalities, and most states must address geohazards.

Examples of technical support for the year include the assessment of a recent landslide and rock fall potential along a popular hiking trail at **Bryce Canyon National Park**, the evaluation of several landslides resulting from record precipitation at **Santa Monica Mountains National Recreation Area** and **Cabrillo National Monument**, evaluation of avalanche, landslide, debris flow and rock fall hazards to address the relocation of a backcountry campground at **Klondike Gold Rush National Historical Park**,

the evaluation of potential rock fall hazards to roadways at **Colorado National Monument**, the assessment of flooding and erosion hazards at **Manzanar National Historical Park**, **Canyon de Chelly National Monument** and **Delaware Water Gap National Recreation Area**, and the coordination of a workshop to improve park interpretive staff's understanding of the geohazards and techniques to communicate this information to park visitors at **Golden Gate National Recreation Area**, **Point Reyes National Seashore** and **Rocky Mountain National Park**.

The Natural Resource Challenge provided funding to develop a Servicewide *paleontology* program to manage fossil resources and to provide technical assistance to parks. Diverse fossil resources have been documented in 179 parks and include plants ranging from microscopic algae and pollen to leaves and petrified logs. Animals ranging from marine shells to dinosaurs to Ice Age mammals, as well as trace fossils such as vertebrate tracks, burrows, and coprolites have all been identified on park lands. Many of these natural resources in the parks are of international significance and critical to understanding the history of life on Earth. In FY 2005, the incumbent vacated the position and the Program was unable to rehire due to funding constraints, resulting from increasing personnel costs and across-the-board budget reductions. Other program staff assumed many duties of the paleontology coordinator to address critical issues.

In 2005, the Program supported paleontological resource surveys at **Black Canyon of the Gunnison National Monument** and **Curecanti National Recreation Area** that led to the discovery and documentation of 37 paleontological localities in these parks. Most notably, this field survey led to the discovery of a new dinosaur site in the Morrison Formation at Curecanti National Recreation Area. Program funding supported a report entitled *Arches National Park Paleontological Survey*, which includes a description of the park's geologic history and stratigraphy, fossil resources and localities, and provides recommendations for resource management, interpretation, collections management and research.

Geologic Resource Evaluation

The Inventory and Monitoring Program, using Natural Resource Challenge funds, supports the completion of Geologic Resource Evaluations at parks. The evaluation helps park managers integrate the use of geologic resource information into resource management decisions. Because this is a major activity



A Cave Salamander (*Eurycea lucifuga*) near the exit gate in Cudjo Cave, Cumberland Gap National Historical Park.

Museum of Western Colorado paleontologist and NPS paleontological technician locating, document, and collect hundreds of dinosaur bones from a newly discovered locality that is threatened by human and natural impacts in Curecanti National Recreation Area.

carried out by the Geologic Resources Program, a summary of FY 2005 accomplishments is reported here. Parks are provided with several products including an on-site scoping meeting with park staff and geologic experts to evaluate and discuss the park's geologic resources and related resource management issues, a comprehensive digital geologic map, a bibliography of geologic literature and maps, and a comprehensive geologic report.

At the close of FY 2005, scoping meetings to evaluate park geologic resources and issues had been held at 154 parks in 31 states, 4 territories, and the District of Columbia. In addition to geologic resources program staff, park resource managers and geologic experts from the USGS, state surveys, and universities participated in these meetings.

Minerals Management

Staff with expertise in mining, oil, and gas development technology, policy, impact mitigation, geology, reclamation, and mining claim validity examinations, help park managers effectively protect park resources and values from the adverse effects of past, current and future mining inside and adjacent to park units. Currently, 25 park units contain nearly 750 active private mineral exploration or development operations, most involving the production of oil and gas. In 2005, Minerals Management staff assisted park resource managers by reviewing 11 new oil and gas proposals covering 20 operations in 4 parks, to ensure that the operations conform to NPS non-federal oil and gas regulations. These regulations require operators to use technologically feasible methods least damaging to park resources. Staff also helped oversee the plugging of two abandoned wells in parks, which presented the opportunity to work with partner organizations.

On lands adjacent to parks, Minerals Management staff work with other federal and state permitting agencies, along with mining project proponents, to ensure that park protection measures are incorporated into mineral leasing or other energy development decisions. In 2005, program staff assisted park and regional offices as well as other federal and state agencies on a variety of projects, such as a draft Environmental Impact Statement for the Koppers Coal Reserve adjacent to **Big South Fork National River and Recreation Area**, the State of Alaska's proposal to allow exploration on lands adjacent to **Denali National Park and Preserve**, the implications of a legislative change to the **Gulf Island National Seashore** enabling statute that would enhance the development of state oil and gas rights, and a

prospective operator's interest in developing oil and gas immediately adjacent to the boundary of **Theodore Roosevelt National Park**.

Oil and gas exploration sites, in addition to abandoned mines, represent a substantial portion of the disturbed lands which require restoration in parks. Current studies have estimated 3,200 abandoned mineral sites with over 10,000 hazardous openings, at least thirty miles of streams with degraded water quality, and more than 33,000 acres of disturbed lands occur on park-managed acreage. In FY 2005, the Geologic Resources Program continued to assist parks in addressing outstanding reclamation needs and augmented these efforts through successful partnerships.

National Cave and Karst Research Institute

A 1998 Act of Congress directed the National Park Service to establish the National Cave and Karst Research Institute in the vicinity of Carlsbad, New Mexico. Provisions in the Congressional Act provided for joint administration by the Service and an administrative partner and a directive that the expenditure of federal funds be matched by an equal amount of non-federal funds. The Geologic Resources Program was assigned the primary responsibility for establishing the Institute, and Congress provided an initial operating appropriation in FY 2001.

In 2005, the Institute successfully extended its network of partners through organizing a workshop for representatives from thirteen governmental, academic, and private cave and karst programs. This meeting resulted in the establishment of an Interim Board of Directors, Executive Committee, and Board committees charged with formally establishing the Institute, as a non-profit corporation. Articles of Incorporation were filed with the State of New Mexico, moving the Institute closer to achieving its mandate to become a jointly administered educational and research center.

A collaborative effort between the University of South Florida, the University of New Mexico, and the Institute, to establish a web-based karst portal, will facilitate the transfer of information and resources about karst worldwide. This joint effort has received worldwide interest and seed money has been secured for this endeavor.

Soil Resources Inventory and Management

In 2005, the Geologic Resources Program assumed responsibility for the Soil Resources Inventory and Management Program as part of reorganization. Staff from the Soils Resources

Inventory Program, funded by Challenge funds from the Inventory and Monitoring Program, is tasked with planning and executing soils surveys in parks. Soil surveys are conducted extensively through a partnership with the U.S. Department of Agriculture's Natural Resources Conservation Service and the National Cooperative Soil Survey.

Managing parks to preserve fundamental resources, processes, systems, and values depends on sound soil resource management. Natural features and diverse plant and animal communities depend on maintaining soil functions that support plant growth and limit accelerated soil erosion. Detailed information about the physical, chemical, and biological properties of soils in parks is essential for park resource management and protection, as well as to provide park managers with the ability to predict the behavior of soils under alternative uses.

The soils resources inventory helps parks secure the information needed to manage soil sustainability and to protect water quality, wetlands, vegetation communities, and wildlife habitats. This information also assists in control of invasive species and the establishment of native communities, as well as the management of potentially high-use or developed areas in the park (e.g., visitor centers, campgrounds, trails, access roads).

At the close of FY 2005, 70 NPS units have received a completed soils resources inventory, with an additional 46 parks underway. Soil scoping sessions were initiated for 6 parks, and technical assistance was provided to an additional 4 parks on the use of the completed soil resource inventories for a wide variety of soil resource management issues.

NATURAL RESOURCE PRESERVATION PROGRAM (NRPP)

FY 2005 Allocation: \$12,484,000

Available: \$12,295,000

The Natural Resource Preservation Program (NRPP) is a primary source of funds for special projects and provides the only dedicated source of NPS funding for natural resource management projects more than \$50,000. NRPP supports projects in a variety of areas such as wildlife, fisheries, and vegetation management; specialized inventories; planning; mitigation actions; and restoration activities. More than half of NRPP funds (\$6.9 million) support general park-level natural resource management projects. The balance strategically targets specific needs such as Disturbed Lands Restoration, Small Park Projects, Threatened and Endangered

Species Projects, and funds distributed to the regions to support natural resource projects in parks. Additionally, some funding is provided for USGS biological technical assistance. The program's FY 2005 accomplishments are summarized below under the eight broad program areas:

- Alaska Special Projects
- Disturbed Lands Restoration Projects
- Natural Resource Management Projects
- Regional Program Block Allocation Projects
- Servicewide Support Projects
- Regional Small Parks Block Allocation Projects
- Threatened and Endangered Species Projects
- USGS Park Oriented Biological Support Projects

Funding and Performance Summary

Funding for the Natural Resource Protection Program increased from \$5.432 million in FY 2000 to \$12.484 million in FY 2005 through the Natural Resource Challenge. In addition to contributing to the Park Service's general resource protection goal, many of these projects directly contributed to the National Park Service exceeding its goals for containing invasive vegetation, restoring disturbed land, and achieving stable or improving populations of threatened and endangered species.

Highlights of FY 2005 accomplishments in each program area are presented below. For a complete listing of projects funded under the Natural Resource Preservation Program, see Appendix B.

Alaska Special Projects

This funding category was established in FY 2003 to enable the Park Service to undertake projects to better protect and manage Alaska's National Park Service units, which are managed under the Alaska National Interest Lands Conservation Act and other Alaska-specific requirements. Selection criteria for projects supported through this source included appropriations language, proposal reviewers' recommendations, and park priorities.

Alaska Special Projects funding is focused on the highest priority park-focused natural resource projects for which other funding sources are currently not available. In FY 2005, the program again supported airborne contaminant baseline data collection from snow, water, fish, lake sediment, and vegetation across multiple parks, ongoing studies of salmon populations in **Aniakchak National Monument and Preserve** and marine bird disturbances in **Glacier Bay National Park and Preserve**. Two studies of declining caribou populations were also initiated in **Wrangell St. Elias National Park and**

Preserve, and staff at **Denali National Park** provided training for land bird surveyors.

- Alaska Special Projects funding supported several Alaska parks in their continued participation in the Western Airborne Contaminants Assessment Project underway in the Alaska, Pacific West, and Intermountain Regions. Project leaders are developing baseline data to determine the risk to ecosystems and food webs in high latitude and high elevation national parks from long-range transport of airborne contaminants. A multi-disciplinary team of research scientists from the EPA, USGS, Oregon State University, USFS, and the United Kingdom are conducting the study. The team collected samples from four lake basins in three Alaska national parks (**Denali National Park and Preserve**, **Noatak National Preserve**, and **Gates of the Arctic National Park and Preserve**). Analyses of FY 2003 snow samples found increasing levels of mercury at higher elevations in Denali National Park.
- Important baseline data on escapement, population structure, genetics, and morphology of sockeye salmon within **Aniakchak National Monument and Preserve** is supported through Alaska Special Projects funding. Sockeye salmon in the park support commercial, sport, and subsistence harvest. Baseline information is necessary to assess any future large-scale changes (natural or human-caused) and will help identify populations that are less productive, and hence more vulnerable to over-exploitation.

- Funding was provided to **Glacier Bay National Park and Preserve** to initiate a project that assesses the distribution of ground-nesting marine birds on beaches within the park. Information obtained from this project will inform managers on potential egg-harvest sites in the park. A local tribe, the Hoonah Tlingit, have expressed interest in re-establishing their traditional practice of collecting seagull eggs in the park. Resource management staff will use the information provided by this study to evaluate visitor impacts on this important natural resource.
- Funding for an intensive monitoring project on recovery efforts for the Chisana caribou herd, distributed throughout eastern **Wrangell-St. Elias National Park and Preserve** and western Yukon Territory, Canada, received funding in 2005. The herd has declined precipitously over the last 15 years (from over 3200 in 1987 to about 360 in 2003). A Canadian captive rearing project was initiated in 2003 to increase calf recruitment by protecting cows and calves during the early life stages. Monitoring will allow the park to determine the effects of a novel, intensive management program on an important native animal population, but also to maintain a partnership in international conservation efforts.

Disturbed Lands Restoration Projects

A portion of the Natural Resource Preservation Program was established in FY 2000 for projects related to disturbed land restoration. Disturbed lands are those park lands where natural conditions and processes have been degraded,

A Chisana caribou cow and calf in captive rearing pen on the Yukon-Wrangell-St. Elias National Park and Preserve border. (Photo by Mason Reid, NPS, WRST, 2005)



damaged, or destroyed by developments (e.g., facilities, roads, mines, and dams) and/or by agricultural practices (e.g., cropping, grazing, or timber harvest). Restoration is the process of assisting the recovery of disturbed areas through direct manipulation of degraded ecosystem components. Regions submit proposals for park projects; then a panel of subject matter experts reviews and recommends projects for funding based on project quality, resource threats, and other factors. Projects must cost at least \$10,000 but not more than \$250,000 and may last no more than 3 years. Parks receive their project funding annually. This portion of funding assists in implementing the Natural Resource Challenge component related to natural resource restoration and in meeting the Park Service's Strategic Plan performance management goals.

Projects that received their last year of funding in FY 2005 are highlighted below:

- Funding for staff to build maintainable catchments along the trail system at **Timpanogos Cave National Monument** has minimized imported debris from degrading the cave's pure water supplies. Visitor foot traffic spreads mud, which coats the surrounding cave formations, and causes the formations to lose their astounding color, decreases the water quality, and provides food sources to sustain non-cave adapted species. Park staff will continue to treat these disturbed areas to minimize the visitation effects on the cave's water drainage and the rest of the cave's ecosystem. Park staff presented restoration and research findings at the 2003 and 2005 National Cave and Karst Management Symposium and the 2004 and 2005 National Speleological Society Convention.
- Clean-up and restoration of 15 former placer mining claims located along Glen Creek in the Kantishna Hills district of **Denali National Park and Preserve** has led to the accomplishment of goals for disturbed lands, land health, water quality, and visitor safety. The project was approached in four phases: (1) structure, equipment and non-hazardous debris removal, (2) floodplain reconstruction (earthwork and re-vegetation), (3) hazardous waste container removal, and (4) contaminated soils removal. The contractors estimate they removed approximately 200 partial or full containers, 18 yards of contaminated soils, and approximately 30,000 lbs of abandoned equipment.
- Restoration of natural areas damaged by marijuana growers in **Sequoia and Kings Canyon National Parks** is possible through Challenge funding. Work has commenced with removal of all garbage and irrigation hose,

re-contouring major pads and plant terraces, covering soil with branch slash, and removal of dams to restore stream hydrology. Similar work is planned at **Whiskeytown National Recreation Area**, once park sites are secured by law enforcement.

Natural Resource Management Projects

Natural Resource Management Projects make up the largest segment of the Natural Resource Preservation Program. To receive Natural Resource Management funding, regions must submit high-priority park project proposals which are then reviewed and ranked by a panel of subject-matter experts. The panel provides project funding recommendations to the NPS Associate Director for Natural Resource Stewardship and Science based on project quality, resource threats, and other factors. Projects must cost at least \$50,000 but no more than \$900,000 and be completed within three years. Many projects require at least two years to complete with most requiring three. Projects receive their funding annually and are subject to review and approval of an annual accomplishment report. With funding provided by the Challenge, the total number of natural resource management projects funded through this program was 53 projects in FY 2005. The majority of projects funded within this category support restoration, invasive species control, resource assessment and mapping, and natural resource management plan development. Projects that received their last year of funding in FY 2005 are highlighted below:

- Brown bear population size estimates were obtained for coastal areas of **Lake Clark National Park and Preserve** and for all bear habitat within **Katmai National Park** using a line-transect double-count aerial census technique developed by the Alaska Department of Fish and Game. A total of 388 brown bear groups were observed during the study. Preliminary compilation and review of the survey data is complete and analysis is underway.
- Funding was provided to researchers to gather information critical to the management of brucellosis-affected bison in **Grand Teton National Park**. Objectives of this work include monitoring disease-related demographic parameters, disease surveillance, and identifying an effective oral vaccine delivery system. The field portion of the final study was finished in FY 2005, determining the most effective bait distribution strategy. Preliminary results indicate that deployment of bait in front of moving grazing herds is the most effective strategy.
- A project at **Rocky Mountain National Park** to reduce the prevalence and spread of chronic wasting disease through surveillance of mule

deer and elk and live testing of mule deer is proving successful. The goal for tonsil biopsy testing in mule deer was exceeded through a combined effort with the Colorado Division of Wildlife. The work of both agencies resulted in testing 488 deer in during FY 2003 and FY 2004 and 292 deer in FY 2005. From park data, the prevalence of Chronic Wasting Disease decreased from 7.27 percent in FY 2003 and 2004 combined to 3.64 percent in FY 2005. Deer that tested positive for Chronic Wasting Disease were removed from the population.

- Funding was provided to fence the remaining boundary of the 1996 expansion of **Walnut Canyon National Monument** with the goal of completing 7 miles of fencing to protect cultural and natural resources. Objectives for fencing were accomplished in full and a number of wildlife crossings were constructed to facilitate the movement of elk, deer, and antelope across the fence.
- In cooperation with Tennessee Technical University and the Army Corps of Engineers, staff at **Mammoth Cave National Park** developed a mobile culture facility to propagate mussels. The facility accomplishes three important conservation strategies including the culture of juvenile mussels, with an emphasis on seven endangered species, to augment mussel populations in the Green River, recovery of seven federally listed endangered mussels, and provision of a temporary emergency refuge for adult mussels during a catastrophe. In 2005, the mussel culture facility received the first group of juvenile mussels from Tennessee Tech University.
- At **Kalaupapa National Historical Park**, funding from the Natural Resource Preservation Program was used to exclude ungulates from the Pu'u Ali'i Plateau by the construction of fences. This work was conducted in remote, steep terrain that required helicopter assistance to transport laborers to the site and distribute materials along the fence line. The project area represents the most pristine native tropical rain forest in the park, and it is considered the highest priority in the park for protection from feral animals. Long-term maintenance of the unit will be shared and coordinated between the State of Hawaii Natural Area Reserve System managers in Maui County and Kalaupapa resource management staff.

Regional Program Block Allocation Projects

Natural Resource Preservation Program funding is available for block allocation to regions for park projects as a part of regional natural resource programs. The allocation of funds is evenly distributed among the regions at \$192,300

per region per year. Qualified projects are those that improve natural resource knowledge and condition, including projects such as specialized inventories (those currently outside the scope of the Servicewide I&M Program's 12 databases) and mitigation actions (i.e., fossil inventories and invasive plant or invasive animal control).

The regions require parks to submit projects for competition for this funding source, projects encompass a wide variety of resource issues. While some are fairly specific in their approach to an identified need, others take a strategic view to provide fundamental information that can facilitate progress over a large number of parks or regional initiatives. These projects are rated and ranked by a panel and selections are made to balance the distribution of funds across the region's parks.

In FY 2005, a total of \$1,346,000 was allocated to 69 projects in 55 parks. A complete list of these projects is included in Appendix B, however highlights of some projects are listed below:

- Results from a project funded to develop a framework for best management practices of off-highway vehicles in Alaska National Parks and Preserves has led to a reduction in management concerns in some units and increases in others. For instance, at **Lake Clark National Park and Preserve** it was estimated that the park contained 26 miles of trails in its coastal area in 2001. The 2005 mapping effort identified only 13, all in relatively good condition. In contrast, park staff at **Gates of the Arctic National Park and Preserve** identified 2 miles of trails in the 2001 assessment, but 22 miles of degraded trail were mapped in 2005 and 31 additional miles were identified for future inventory. Major strides in baseline data collection were accomplished and techniques for the collection of off-highway vehicle trail condition assessments and the development of trail stabilization prescriptions were refined to a high degree. Primary project emphasis was placed on on-the-ground data collection within affected park units. Baseline information was collected in 6 park units and resulted in the completion of field data collection on 174.2 miles of off-highway vehicle trails.
- Cave specialists at **Wind Cave National Park** initiated a survey of cave microbiological organisms with regional funding in 2005. Samples were collected from 10 sites in and around Wind Cave. DNA extracted from the soil samples will be used to identify individual species. A paper was presented at the National Speleological Society Convention in 2005.
- Determination of appropriate harvest levels of

deer at **Apostle Island National Lakeshore** is closer to reality as result of Challenge funding. In FY 2005, funding was provided for aerial overflights for deer counting surveys, deer browse surveys, and pellet counts conducted on several islands and the mainland unit. A protocol for sampling herbaceous species for browse damage was developed and tested, and hair snares were established to obtain hair samples for DNA testing. Data entry is currently being done and data analysis is underway.

- Funding allocated for a mooring system at **Virgin Islands Coral Reef National Monument** will protect natural resources by providing boaters with an alternative to mooring in shoreline mangroves. The first phase of this system is designed to accommodate approximately 45 vessels.
- Plans are underway to restore American Butternut in four units of **Mammoth Cave National Park**. Project funds were used to purchase American Butternut seedlings from Nolin Seed Nut Nursery which were planted in a seed orchard along the Green River. Butternut seedlings were also donated to the park from the University of Tennessee and planted in riparian habitat along the Green River. Scion wood was collected from 15 healthy butternut trees and will be grafted onto root collars. Grafted trees, grown in a tree nursery, will be planted back into the park in 2006.

Servicewide Support Projects

In addition to parks, there are often project needs outside specific Servicewide programs that require funding unavailable from other sources. These special needs are often interdisciplinary, and may include activities with professional organizations, certain publications, or work on Servicewide databases. Specific project needs that cannot be accommodated operationally are identified for funding by the Natural Resource Preservation Program, fee monies, or other sources. A significant amount of funding provides specialized assistance to parks, either through direct provision of experts or through special topic workshops on issues affecting parks. Funding is also provided for the development and support of tools to assist parks, night sky projects, and development of partnerships for shared resources and management goals.

Support of efforts to establish and provide leadership to Cooperative Ecosystem Studies Units (CESU) remains a major focus of Servicewide Project funding, as does development, production, and distribution of education and information related material. Accomplishments of projects funded through this program in FY 2005, including the following:

- In FY 2005, staff from the Biological Resource Management Program and NatureServe, completed a cooperative agreement and work plan to fund the Seamless Network Project to support analyses and the development of partnerships based on shared resources and management goals. Natural resource data relevant to partnership development was collected and analyzed under three themes: biodiversity management, invasive species and nature-based recreational opportunities. Statewide workshops to identify resource-based linkages and develop partnerships were held in Georgia, Florida and South Carolina and attended by federal, state, county, academic and private organizations. Workshops generated over 25 projects that include National Park Service units.
- In FY 2005, the *Year in Review*, a publication that summarizes and analyzes significant natural resource preservation issues in the National Park System for the calendar year, contained approximately 75 articles with more than 125 pictures. Both print and Web editions exemplify the National Park Service graphic identity style and are easy to read summaries of the year in natural resource management and science.
- Servicewide Projects funding paid for preparation and dissemination of research findings to park management in the resource management bulletin *Park Science*. Distributed to parks, national program offices, and domestic and international partners, *Park Science* is published in both hard copy and electronically on the World Wide Web. Design enhancements (professional graphic design and two-color printing) that began in FY 2001 continued in FY 2005. Funding supported editing, design, and printing for issues published during FY 2005 and others being planned for FY 2006. Funding also covered re-design of the *Park Science* web site.
- In FY 2005 the Geologic Resources Program received financial support enabling its specialists to provide on-site technical expertise to 33 parks on a wide range of geologic resource management issues, including geologic resource assessment, impact mitigation, restoration, monitoring, policy and regulatory application, interpretation, park planning, and interagency coordination. Examples of types of assistance provided includes: petroleum engineering support to **Big South Fork National River and Recreation Area** during the plugging of an oil and gas well to ensure compliance with NPS standards, coordination of a Cave and Karst management workshop at **Yosemite National Park** to lay the foundation for a comprehensive cave resources manage-

ment program, evaluation of stream erosion issues associated with off-road vehicle use at **Canyon de Chelly National Monument**, and assessment of safety issues associated with historical underground sand mines at **Mississippi National River and Recreation Area**.

Regional Small Parks Block Allocation Projects

Funding is provided to regions to allocate to small parks for projects. Small parks are defined, for the purposes of this funding, as those parks that fall in the lower third of funding for all parks. These funds are provided to help small parks achieve some of their natural resource goals. Small Parks funded projects include a wide variety of management issues such as natural resource management and monitoring plans, invasive species control, restoration of native ecosystems, natural resource surveys, inventories, assessments and analyses, and fence repair for resource protection.

In FY 2005, 62 projects in at least 53 parks were funded. Highlights of 2005 funded project are shown below and a complete list of the projects is included in Appendix B.

- At **Scotts Bluff National Monument** a project was funded and implemented to remove debris and fence material from a former golf course that was within the boundary of the park more than 50 years ago. Two seasonal employees, who were funded by this project, removed fence posts along what used to be three quarters of a mile of the west boundary of the

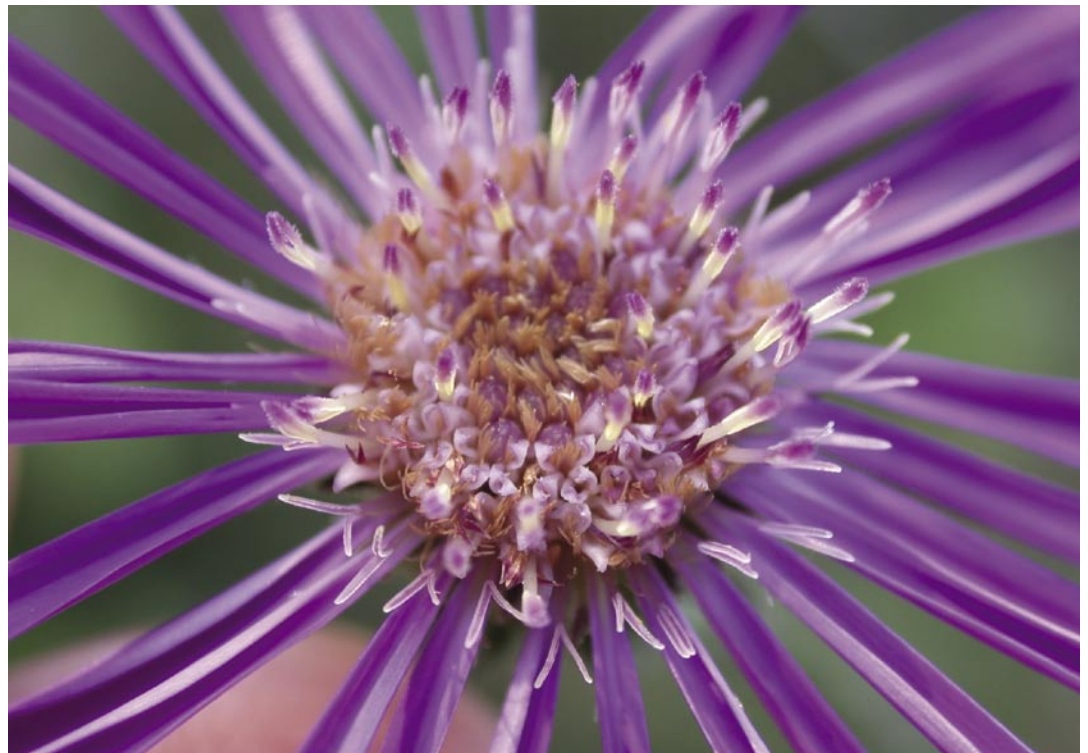
park. All the posts removed from the prairie were transported to the maintenance area where the concrete was removed and recycled, as were the metal posts themselves.

- Through Challenge funding, efforts are being made to increase the reproductive productivity of Georgia aster, a federal candidate plant species in **Chattahoochee River National Recreation Area**. Project goals are to stabilize Georgia aster populations through seed propagation, reintroduction to suitable habitats, and controlling nonnative invasive encroachment on populations in park habitats. The Atlanta Botanical Garden has germinated Georgia aster from the park seed collection and maintains a population in their native plant conservation garden.

Threatened and Endangered (T&E) Species Projects

The long-term goal of allocating funding to Threatened and Endangered Species Projects is to reverse the decline of listed species and to re-establish species now extirpated from parks. Projects that favor funding on-the-ground conservation efforts are preferred. Despite the obvious importance of implementing identified recovery plan actions, limited funding has precluded parks from implementing many needed actions and funding from the Natural Resource Preservation Program addresses this need. In FY 2005, \$477,000 was allocated specifically for these projects. Threatened and endangered species projects are also funded under the Natural Resource Management Proj-

A macro shot of a Georgia Aster flower at Chattahoochee River National Recreation Area. This is an individual from an introduced population as part of a restoration project. There are now several hundred plants at this location. Photo: Alex Reynolds.



ects category and are eligible for Small Parks funding as well. Projects that received funding in FY 2005 are highlighted below:

- Development of long-term translocation guidelines for the black-footed ferret population at **Badlands National Park** was initiated under a cooperative agreement with the University of Wyoming. All field data collection for this project has been completed and data analysis is underway.
- Hoffmann's rockcress is an endangered plant known from four sites on Santa Cruz and one location on Santa Rosa Island in **Channel Islands National Park**. This project provides infrastructure and materials essential for recovery of Santa Rosa Island genotypes. The establishment of new infrastructure enables park staff to move quickly when plants flower in order to collect viable seeds necessary for reproduction. Slow response has been a problem that has hindered recovery in the past.
- **Haleakala National Park** received funding to conduct research into the habitat use of the endangered Maui parrotbill in the Manawainui area of the park. The main focus of this project is to determine if this area of the park is appropriate for supplementation of this endangered species. Follow-up work next season will include conducting vegetation surveys, increasing banding efforts, and establishing future release sites. A preliminary assessment of the Manawainui area, from the 2005 field season, suggests that this area would not be the most ideal site to release birds in the future.
- Volunteers augmented efforts by the staff in the restoration of the Echo River Passage in **Mammoth Cave National Park**. The purpose of this project is to remove the decaying creosote impregnated walkway timbers that contaminate aquatic habitat for the endangered Kentucky cave shrimp and other specialized aquatic cave species. In fiscal year 2005, volunteer events were organized with the National Speleological Society with over 100 participants at each of 4 events.
- Plans to re-establish, stabilize, and manage populations of Greenback cutthroat trout at **Rocky Mountain National Park** are underway thanks to funding received in 2005. A tentative timeline provides for barrier work to be completed in 2006, non-native trout removed in 2007, and the greenback cutthroat trout restored in 2008. Work on testing and improving barriers downstream is in progress and baseline invertebrate samples were collected above a proposed chemical treatment site. These baseline data will be used to document the effects of fish toxicants and neutralizing agents on invertebrate communities.

USGS Biological Technical Assistance Agreement—Park-Oriented Biological Support Projects

The U.S. Geological Survey-Biological Resources Program and the National Park Service, through the Natural Resource Preservation Program, jointly support biological projects that provide exploratory research and technical assistance to parks. Of 21 separate projects funded in FY 2005, 16 projects received their last funding allotment. Information on the project topics and status reports on the projects are contained in Appendix C. Many of this year's projects addressed continuation of projects underway from previous fiscal years. Selected project highlights include:

- A project to monitor avian community changes and habitat use within the Giacomini Wetland Restoration Project at **Golden Gate National Recreation Area** was initiated in FY 2005. The Giacomini Wetland Restoration Project will be one of the largest tidal marsh wetland restorations in coastal California, as well as one of the most significant changes in the Tomales Bay watershed. To date, the study of the avian community of the proposed restoration area has involved spatially explicit area and point count surveys on the Giacomini Ranch site and on three reference wetlands along Tomales Bay, with surveys being designed to determine whether changes in the avian community can be attributed to the restoration. During FY 2006, an analysis and report will be prepared that will provide baseline information about the avian communities on the Giacomini Ranch restoration site and reference sites prior to restoration action. As restoration proceeds, monitoring of avian community changes, based on the results of this project, will help with assessing restoration success and will provide a basis for adaptive management decision-making.
- A project to augment and expand endangered freshwater mussel populations in the **Big South Fork National River and Recreation Area** received funds in FY 2005. Four species of freshwater mussels were propagated for release in the recreation area. Nearly 25,000 juveniles of the four mussel species were produced and cultured at the Freshwater Mollusk Conservation Center at Virginia Tech University, to ages ranging from 2 weeks to 2.5 months, and released in the park during summer 2005. Plans for 2006 include continued efforts to produce and release artificially propagated juveniles into the Big South Fork of the Cumberland River with the goal of restoring and maintaining the park's native mussel resources.

NATURAL SOUNDS PROGRAM

FY 2005 Allocation: \$921,000

Available: \$909,000

The mission of the Natural Sounds Program is to protect, maintain or restore soundscape resources and values in units of the National Park System in a condition unimpaired by inappropriate sounds. This mission is fulfilled by working in partnership with parks and others to increase scientific and public understanding of the value and character of park soundscapes. In addition, this program was created in part to implement the National Parks Air Tour Management Act of 2000, in cooperation with the Federal Aviation Administration.

Surveys indicate that many visitors who recreate in national parks seek to escape the clamor of everyday life—they come to “get away from it all,” “find peace and quiet,” or “solitude.” The type of park unit (e.g., national battlefield, national seashore, national recreation area, or national park) and its specific features help to shape visitor expectations. These expectations may include quiet, the sounds of nature (e.g., wind, birds, geysers, elk bugling, wolves howling, or waterfalls), sounds reflecting our cultural and historic heritage (e.g., cannonballs firing, tribal dances, or reenactments) and sounds associated with recreation (personal water craft, snow mobiles, air tours, or park operations). Natural sounds also are intrinsic elements of the environment often associated with parks and their purposes and vital to the functioning of many park environments, such as wildlife, which depend on the ability to transmit and receive sound for many life essential functions. The Natural Sounds Program helps to evaluate current park sounds and plan for achieving desired sound conditions, including assisting parks with their air tour management program and working with the military regarding aircraft noise issues.

The Natural Sounds Program recently underwent a full board strategic analysis and restructuring. The following core operations or program responsibilities were identified and FY 2005 accomplishments are summarized below under these six broad program areas:

- Acoustic Science
- Administration and Management
- Air Tour Management Program
- Outreach/Education/Partnerships
- Planning
- Technical Assistance Requests

Acoustic Science

The primary goals of this program area are to develop acoustic data collection protocols that conform to a nationwide monitoring strategy, initiate collection of basic acoustic data, complete data analysis and reporting, and increase information management.

Natural Sounds Program acoustic staff produced various acoustic protocols collaboratively with the Volpe Center (Department of Transportation). Protocols for the collection of acoustic data will be finalized in 2006 and a monitoring plan implemented. The protocols will create standards that improve and reduce the cost of data collection and will allow for efficient use of data for either air tour management plans or other soundscape planning efforts.

Acoustic data collected by park service staff at **Arches National Park, Badlands National Park, Bryce Canyon National Park, Devil’s Postpile National Monument, Mojave National Park, Saguaro National Park, Sequoia/Kings Canyon National Parks, Whitman Mission National Historic Site, Yosemite National Park, and Yukon Charley Rivers National Preserve** will be reviewed and summarized for a variety of purposes, including air tour management planning, soundscape management, and noise impact assessment.

In 2005, the Natural Sounds Program information management team developed several databases that have increased our ability to store, retrieve and utilize acoustic data.

Administration and Management

The Natural Sounds Program underwent a top to bottom strategic alignment exercise, the result of which created a logical linear relationship between performance reporting and budget with general and specific program goals and objectives. Program staff developed one standardized numeric tracking system, based on identified core program functions, that is used for filing and tracking program costs, employee time, and performance metrics.

A budget planning and tracking system was implemented that promotes efficiency and demonstrates accountability. This is an integrated system that links financial processes and work planning and execution, so that costs (procurement, travel, personnel, etc) can be identified, tracked, and linked to program goals and products. This information can then be analyzed for current year reporting as well as out year projections and budget formulation. Accountability and production are key elements

in building program capacity for existing and future needs.

Air Tour Management Program

The goals of this program area are to jointly develop Air Tour Management Plans with the Federal Aviation Administration, jointly implement other aspects of the National Parks Air Tour Management Act of 2000, and to execute plans that guide the development of the Air Tour Management Program.

In 2005, the Natural Sounds Program chaired three meetings of the National Park Overflight Advisory Group, which is a congressionally mandated stakeholder group consisting of members from the aviation industry, trade associations, user groups, tribes and environmental and recreation groups interested in overflight issues.

Natural Sounds Program staff worked with their counterparts in the Federal Aviation Administration to produce a plan for the implementation of the air tour management planning program. Finalization of the implementation plan will occur in 2006. Staff continues to develop, review, and improve draft air tour plans that are currently underway for six national park units including **Haleakala National Park, Hawaii Volcanoes National Park, Kalaupapa National Historical Park, Badlands National Park, Mount Rushmore National Memorial, and Lake Mead National Recreation Area.**

Outreach/Education/Partnerships

The activities of this Natural Sounds Program area focus on developing and implementing outreach and education programs to educate parks and partners about the importance of park soundscapes and the role sound plays in overall ecosystem health as well as potential impacts to visitor use.

Natural Sounds Program staff initiated and fostered a partnership with Colorado State University to establish an "Acoustic Fellow Chair" which is jointly funded (50/50) to employ a year long graduate student in the field of acoustic ecology to assist with research and other program needs. The partnership is based on the premise that each year the new fellow will build on the work done in the previous years, thus maintaining forward momentum and leveraging the work done by previous interns. The Natural Sounds Program also employs two research associates through cooperative agreements with both the Colorado State University engineering department and the Department of Recreation and Tourism. University partnerships allow the Park Service to access to research and expertise that

may not be otherwise available.

Natural Sounds Program staff regularly attends regional Airspace/Military coordination meetings in order to promote and foster productive working relations with the various branches of the U.S. military. In 2005, staff established an Air Force contact for dealing with overflight issues at **Big Bend National Park**. Attendance at regional Airspace/Military coordination meetings will continue in 2006 as it facilitates continued cooperative relationships between parks and military airspace managers and allows issues to be dealt with in an efficient manner.

Staff presented two different panel presentations on Soundscape Management Planning and Basic Acoustics at the 2005 NPS George Wright Society Conference.

A brochure entitled *Enjoy Natural Sounds* was printed and distributed in partnership with the Nature Sounds Society during 2005. An educational poster designed by the Natural Sounds Program is available, and additional information is available on their website: <http://www.nature.nps.gov/naturalsounds/>.

Planning

Staffs from this program area are available to assist parks in various planning efforts including soundscape planning, General Management Plans, airport planning, administrative/operations planning, and commercial services plans.

Soundscape management planning program staff drafted a nationwide programmatic soundscape management plan that will allow parks to assess the ambient sound environment and quality (or conversely the noise condition) in order to develop appropriate management actions. This plan, when complete, will provide parks with a document from which park-specific guidance can be easily developed. The draft programmatic, nationwide soundscape management plan will be peer-reviewed and finalized in 2006. In addition to soundscape planning program staff has assisted various parks in reviewing General Management Plans and other resource management plans.

Technical Assistance Requests

Numerous Technical Assistance Requests were received by the Natural Sounds Program in 2005. It was decided that to efficiently address all requests it would be necessary to develop a standardized system for prioritizing and responding to park generated Technical Assistance Requests. Natural Sounds Program staff develop-

The Natural Sounds Program

Soundscapes

Elk bugling in the cool autumn air of Rocky Mountain National Park, birds calling in the Everglades, a cannon shot at Gettysburg National Military Park, the quiet reverence at the Vietnam Memorial ... these are the sounds that make a trip to our national parks a unique and memorable experience. In many cases, visitors choose to recreate in national parks to escape the clamor of everyday life, to hear birds, streams, wind, and other natural sounds. Many parks also contain unique cultural resources: battlefields, historic cabins or homes, preserved evidence of a people or an early lifestyle. These are provided for the contemplation and appreciation of visitors, and it is important that the acoustic quality of these areas is as consistent with the preserved cultural environment as possible.

The term "soundscape" refers to the total acoustic environment of an area and can include both natural and human-produced sounds. The soundscape of a national park is often taken for granted, but it represents an important part of the park environment. Like water, scenery, or wildlife, it is a valuable resource that can easily be degraded or destroyed. As a result, soundscapes require careful management if they are to remain unimpaired for future generations. Protecting and managing the soundscape resources in our national parks is the mission of the Natural Sounds Program Center.

Sounds and Wildlife

Appropriate soundscapes are important for animal communication, territory establishment, courtship and mating, nurturing young, and effective use of habitat. Scientific studies have shown that wildlife can be adversely affected by high levels of noise. Although the severity of the impacts varies depending on the species being studied and other conditions, research has found that wildlife can suffer adverse physiological and behavioral changes from noise and other human disturbances. Noise has been associated with suppression of the immune system and increased levels of stress-related hormones in animals. Studies have also shown that songbirds that live in noisy places have to sing louder than birds in quieter environments. Birds forced to sing at a higher volume have to expend increased levels of precious energy to attract a mate or ward off predators. Bighorn sheep are less efficient at foraging for food when they are exposed to aircraft noise, and mountain goats often flee from the sound of helicopters and airplanes. Still other research has demonstrated that noise can adversely affect reproductive success in caribou and communication in whales. When these effects are combined with other stress factors experienced by wildlife such as winter weather, disease, insect harassment, and food shortages, noise can have important implications for the health and vitality of wildlife populations within a park.

The Natural Sounds Program is founded on the following principles:

- Appropriate natural, cultural and historic soundscapes are integral to visitor experience.
- Appropriateness of sounds is a determination based on the purposes and values for which a specific park unit was established coupled with management objectives and the NPS Organic Act.
- The soundscape of a park unit is a resource necessary for the enjoyment of present and future visitors.
- Appropriate soundscapes are essential for the overall health of park ecosystems, including the vitality of specific wildlife communities.

As visitation to parks has increased from 190 million in 1975 to 429 million in 2000, the effects of noise and the importance of an appropriate soundscape have become more apparent. Since its inception, the mission of the Natural Sounds Program has expanded to address a variety of noise issues affecting units of the National Park Service. The Natural Sounds Program assists parks in addressing noise issues by gathering baseline acoustic data to characterize park soundscapes; identifying intrusive and inappropriate sources of sound; developing soundscape goals, objectives, and standards; and identifying appropriate measures for mitigating noise impacts.

Listen Up!

When you visit a park or wilderness, you enter a world of memorable sights.

When you listen to a park or wilderness you enter a world of inspirational sounds.

Program Overview

Natural and culturally appropriate sounds are an important element of the national park experience. The National Park Service has determined that the soundscape is a resource and a value to be appreciated and protected under the Organic Act in such a way as to leave it unimpaired for enjoyment by future generations. The Natural Sounds Program Center was officially established in October 2000 to assist park and regional staffs in protecting, conserving, or restoring the soundscape resource. An important element of this mission is working with the Federal Aviation Administration (FAA) for developing all tour management plans for the more than 100 parks experiencing commercial air tour operations.

Representative Sound Levels in Some Parks

Sound Source	Sound Level (dBA)
Threshold of human hearing	0 dBA
Volcans crater	40 dBA
Bonville train	10-20 dBA
Leaves rustling	20 dBA
Crickets (5m)	40 dBA
Birds - night	45 dBA
Suburbs - day	55 dBA
Copercation (5m)	60 dBA
Loose rock (50 m)	60 dBA
Thunder	100 dBA
Military jet (100 m)	120 dBA

Current Issues

- Air tour management planning for national park units
- Relationship between park operations and baseline acoustic ambients
- Military overflights
- Effects of airport development projects on national park resources
- Potential impacts to cultural, natural, and historic resources from motorized recreation
- Identifying partnership-based solutions to potential impacts to park resources caused by indirect noise sources (i.e., activities outside the boundaries of a unit of the national park system)
- Advancing scientific monitoring and modeling technology to support park management goals and objectives

For more information about the Natural Sounds Program, visit the National Park Service Internet Website at: <http://www.nature.nps.gov/naturalsounds/index.htm>

The NPS Natural Sounds Program designed this poster to provide visitors with another manner in which to enjoy their parks.

ed a priority ranking matrix to review, rank, and weight responses to park specific requests based on a myriad of factors ranging from the time sensitive nature of the request to the geographic distribution of data sets available.

Program staff responded to both a formal call for technical assistance as well as a number of informal requests. Requests ranged across a number of issue areas, including airport impact analyses, impacts from other sound sources (e.g. racetracks, avalanche control, oil and gas drilling permits, etc), and air tour management planning.

Staff assisted with airport issues by providing technical acoustic and planning input to many parks. A few examples include providing technical assistance to San Antonio Missions National Historical Park on Stinson Airport proposed improvements, providing assistance to Devils Postpile National Monument on proposed commercial overflight routes from Mammoth Airport, and consulting with Big Bend National Park and John Day Fossil Beds National Monument in working with the FAA and the military on overflights.

Program staff assisted parks with a variety of impact assessment, including review and comment

on the draft final Environmental Impact Statement for the Colorado River Management Plan at Grand Canyon National Park, consultation with Stones River National Battlefield staff regarding oil and gas wells, and researched and wrote the soundscape section for an avalanche control environmental assessment at Glacier National Park.

RESOURCE DAMAGE ASSESSMENT AND RESTORATION PROGRAM

FY 2005 Allocation: \$1,264,000
Available: \$1,341,000

Under the Park System Resource Protection Act (PSRPA) (16 USC 19jj), the Oil Pollution Act (OPA) of 1990, the Clean Water Act as amended by OPA (CWA), and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the National Park Service conducts damage assessments and restoration for injuries to park resources in national park system units. The Resource Damage Assessment and Restoration Program supports: 1) Policy development and guidance; 2) direct technical assistance to parks in conducting damage assessments for incidents injuring park resources and in planning and implementing restoration projects; 3) outreach and training on damage assessment for NPS personnel, DOI Solicitors and program

offices, 4) Case Management, and 5) Cost Recovery. In FY 2005, 20 cases were settled which resulted in over \$2.2 million in restoration deposits into the DOI Natural Resource Damage Assessment and Restoration fund (see table below). Also in FY 2005, 11 parks completed restoration projects from prior years totaling over \$574,253 in work. These projects included the restoration of seagrass, desert habitat, erosion control and repair, historic landscape restoration, and the repair or replacement of park facilities. Currently over \$6.8 million remains on deposit in the DOI Fund for restoration projects that are either underway or in the planning stage at various park units.

RESOURCE PROTECTION PROGRAM

FY 2005 Allocation: \$294,000

Available: \$290,000

In its fourth year of funding, the Resource Protection Program is supporting projects that use innovative approaches involving natural resource specialists, protection rangers, partners from other agencies and applied researchers focusing on resources at risk. Diverse programs have gained a footing with Resource Protection funding. Highlights from this program area in 2005 include development of a resource protection curriculum for instructor training, advancements in analytical tools to target

resource protection efforts in Appalachian parks, improvement in technical tools to protect cacti in **Capitol Reef National Park** and bats in **Lava Beds National Park**, and the continuation of efforts at **Mount Rainer National Park** prevent commercial harvest of edible mushrooms. Projects chosen for funding increasingly show the innovation and collaboration between divisions within parks and with other agencies.

Highlights for projects that received their last year of funding in 2005 are.

- A project to establish the use of surveillance systems to protect rare cacti from illegal collecting at **Capitol Reef National Park** is complete. Establishment of guidelines and procedures for the proper deployment and use of surveillance products to detect the illegal collecting of federally listed or rare plants was the main focus of this project. An additional objective was to develop procedures on how to gather evidence that proves the elements of a crime and leads to successful prosecution of those responsible for resource theft and damage. Park staff presented a paper on this surveillance project at the George Wright Society meeting in 2005.
- Knowledge and competencies of NPS employees were enhanced by the 2005

Settled Damage Assessment Cases FY 2005

		<i>Deposits for year</i>		
State	Park	Description, Case Name, Responsible Party	Statute for Case	Settlement Amount
CA	SAMO	Purcell/Chesebro Fence (encroachment)	19jj	\$2,464
CA	GOGA	Bella Vista Restaurant (tree cutting)	19jj	\$195,000
CO	GRSA	Zapata (fire)	DOJ - 19jj	\$519,096
FL	BISC	MY JO Grounding, Wurster	19jj	\$222,000
FL	BISC	Coastal St. Marks Tug and Barge (grounding)	19jj	\$75,000
GA	CHAT	Chatahoochee Bluffs (erosion)	19jj	\$17,521
GA	OMUL	New South Associates (cultural resource injury)	19jj	\$5,474
MA	MIMA	Ritchie Auto Accident	Quick Claim	\$480
MI	GUIS	Gilbert Taylor (grounding)	19jj	\$30,800
PA	VAFO	Paoli Rail Yard (contamination)	CERCLA	\$500,000
TN	GRSM	Orr Vehicle and 129 Fire	19jj	\$24,600
TN	OBED	OBED Oil Spill, USCG Funds for Damage	OPA	\$56,860
TN	OBED	Assessment (Initiate)	OPA	\$191,858
VA	FRSP	Laclergue MVA	19jj	\$9,482
VA	GEWA	Merryfield Trees (encroachment)	19jj	\$315,597
VIIS	VIIS	M/V Pesca Nostra (grounding)	19jj	\$11,002
WV	APPA	Elias, William and Patricia (encroachment)	19jj	\$3,000
WY	YELL	Bridge Bay Marina (fuel spill)	19jj quick claim	\$25,228
WY	YELL	Vehicle roll over, criminal case Huyser	19jj restitution	\$13,879
WY	YELL	Xin Li Vehicle	19jj restitution	\$3,597
			Total FY 2005	\$2,222,938

Note that this table only represents cases settled. No on-going cases, nor those that have been excluded from the docket have been listed.

completion of a resource protection curriculum. Curriculum goals included teaching the employee to understand the relationship between their individual responsibilities, the responsibilities of other employees and partners, and the relationship to the agency mission and public service. A course of study report was produced by Indiana University and it was determined that the curriculum met the criteria for implementation at the Servicewide level. A Train-the-Trainer course was conducted in partnership with Indiana University and continuing education credits were issued for 30 new instructors, representing all NPS regions and WASO.

WATER RESOURCES PROGRAM

FY 2005 Allocation: \$12,071,000

Available: \$12,436,000

The Water Resources Program, in partnership with parks and others, provides Servicewide leadership, technical assistance, and funding support with respect to the preservation, protection, and management of water and aquatic resources of units of the National Park System. The Program provides services directly to parks through a broad range of programs in the areas of water quality; water rights; floodplain management; ground water analysis; watershed and wetlands protection; water resources management planning; fisheries and marine resources management and protection; policy, legislative, and regulatory analysis; information management; and training. The Water Resources Program provides a model for cost effective, centralized support for the vast majority of parks that do not have the range of technical expertise they need. Identifying priority water resource issues and providing technical support from a centralized program requires a high level of professionalism at all levels of the Service.

In FY 2005, the Water Resources Program continues to provide the highest level of support possible to parks in addressing a wide variety of water and aquatic resources-related issues. Activities and corresponding funding are divided between five principal categories. FY 2005 accomplishments are summarized below under these program areas:

- Water Resource Projects
- Water Resource Protection–Aquatic Resource Professionals
- Water Resource Technical Assistance
- Watershed Condition Assessment Program
- Water Quality Monitoring

Funding and Performance Summary

The program area receiving the largest percentage of Water Resources Program funding is Technical Assistance (35 percent—\$4,323,100) followed by Water Quality Monitoring (23 percent—\$2,837,800), Watershed Condition Assistance (22 percent—\$2,762,800), Water Resource Projects (10 percent—\$1,307,300), and Water Resource Protection–Aquatic Resource Professionals (10 percent—\$1,205,000). The Water Resources Program supports attainment of and reporting to strategic goals in water quality, surface and ground water quantity, and the new Department of Interior Land-Health goals related to wetland, riparian, upland, and marine resource protection.

Water Resource Projects

The Water Resource Projects category includes three areas: Water Resource Protection Projects, Water Resources Program Competitive Projects, and Other Projects which are non-competitive. Water resource projects are funded in the areas of general water resources, water quality, wetlands protection, and water rights.

Water Resource Protection Projects

Funding in this category increased the Park Service's capability for data collection and analyses that can be used to describe surface and ground water flow regimes and investigations into the dependence of park resources upon water in support of the new Department of Interior Water Quantity Strategic Goal. These efforts are targeted toward the development of scientific information that will benefit decision makers, including federal managers, court judges, or state administrators such as state engineers.

The majority of FY 2005 project funds were used to support ongoing studies designed to characterize surface or ground water flow systems. In the western U.S., ongoing projects are developing modeling capabilities for predicting the effects of large-scale development in regional ground water flow systems. In the eastern U.S., hydrologic studies are developing information on the effects of impoundments on surface river systems. These tools are needed by decision makers to understand the potential for impacts to park water resources in the future from a number of existing water development proposals. In addition, hydrologic data is often required to implement settlement agreements.

Additionally, project funds are used to study the relationship between water quantity and flow timing and water-dependent park resources. In FY 2005, water-dependent resources that were

studied include riparian vegetation, fish migration, and geomorphology. These results are needed by decision makers to understand the potential effect on the water-dependent resource of potential changes in stream or ground water flow.

Finally, the results of these studies must be presented to decision makers in written or verbal format often in a forum dictated by law or regulation. For this reason, a portion of the water resources protection project funds were used to support the Department of the Interior Office of the Solicitor in providing legal advice and representation to the National Park Service.

To increase the effectiveness of its water resource protection funding, the Park Service partners with other federal, 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. In yet another example, hydrogeologic analyses conducted for **Great Sand Dunes National Park and Preserve** is being used in conjunction with work being conducted by The Nature Conservancy and local water conservation districts to support water rights protection for the park.

Water Resources Program—Competitive Projects

Water Resources Program Competitive Projects support a wide array of park-based activities, including water quality assessment and improvement projects; wetlands restoration, condition assessment, inventory and other wetland projects; and ground water assessment and monitoring, watershed condition assessments, watershed management planning, surface water hydrology studies, floodplain assessment, river management, and other water resource related projects. Projects support National Park Service Strategic Goal I.a.4 A and I.a.4B (water quality), I.a.4C (water quantity) and the new Department of the Interior strategic goals for Land Health including I.a.1C (wetlands), I.a.1D (riparian and stream areas), and I.a.1F (marine and coastal areas).

Water Resources competitive project funding is derived from Water Resources Program base project funds and funding from the new Water-

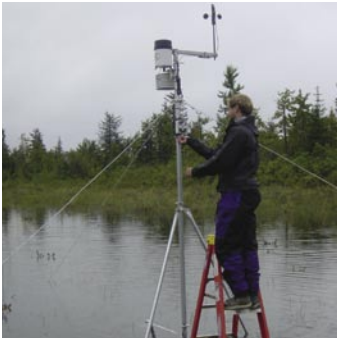
shed Condition Assessment Program during its transition to a long-term program of systematic park-based assessments of NPS watershed conditions. Over the past ten years, in order to meet increased salary costs per Full Time Employee (FTE) and budget rescissions, the Water Resources Program has had to reduce funding to its project programs by \$1.4 million. As a result, Water Resource's base funding will no longer be adequate to sustain the competitive project program beyond FY 2006. Therefore, once the Watershed Condition Assessment Program is fully operational in FY 2007, the competitive project program is scheduled to become inactive.

Water Resources Program—Other Projects

This program receives Water Resources Program 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. In FY 2005, projects at Colorado State University and Montana State University received funding through this program.

Highlights of FY 2005 accomplishments in the Water Resources Projects category appear below. For a complete listing of projects funded in FY 2005 under Water Resource Protection, see Appendix D.

- Critical water resources information was gathered along a state proposed 90-mile new road corridor through **Denali National Park**. Project managers collected hydrologic inventory data and flood-flow statistics, conducted a water quality analysis, completed an air photo interpretation of flood-prone areas, analyzed channel geometry of major rivers, provided an aerial survey for springs, and completed water chemistry of selected springs. A formal report entitled *Water Resources Assessment of the Toklat Basin in the Vicinity of the Stampede Trail Alignment* was completed. This project helped the park exceed its FY 2005 goals for surface water quality and water quality.
- Solstice Creek Dam removal in **Santa Monica Mountains National Recreation Area** will restore access to spawning endangered southern steelhead trout by removing in-stream barriers (low-water crossings and dams) that may impede the migration of adult and juvenile trout. The project calls for removal of three remaining dams and a low-water crossing and replacing the crossing with a residential bridge.
- **Rock Creek Park's** maintenance yard storm drains have been retro-fitted to reduce storm water pollutants and safely convey stormwater



Alaska Conservation Foundation intern, Craig Murdoch, checks the Onset® Hobo Micro Station data logger in Glacier Bay National Park's Dry Bay Preserve. This site is instrumented for temperature, relative humidity, barometric pressure, wind speed/direction and precipitation accumulation (i.e., tipping bucket rain gage).

At Great Sand Dunes National Park and Preserve NPS and USFWS fishery biologists evaluated the Sand Creek drainage in order to evaluate the possible reintroduction of native Rio Grande cutthroat.

discharges into nearby park streams. The runoff will be discharged into the open channel without causing severe channel erosion downstream allowing for the affected stream to recover and become more productive for aquatic organisms.

- A study at **Assateague Island National Seashore** is evaluating relationships between estuarine fin fish, invertebrates, water quality, and sea grass coverage. A unique group of datasets collected in the waters surrounding Assateague Island National Seashore chronicle change in environmental attributes over the past 15 to 30 years during a period when sea grass coverage was expanding. Sophisticated statistical analyses will take advantage of the spatial and temporal range of these data to test for significant correlations between fisheries, habitat and environmental conditions.
- Given the heavy use of the herbicide glyphosate to control unwanted vegetation along canals and structures in areas of **Biscayne National Park** adjacent to the water control structures, a detailed survey was conducted of canals and coastal environments where glyphosphate is applied. Potential study areas and selected collecting sites were surveyed after coordinating with local agencies that use herbicides. Samples were analyzed for chlorinated pesticides, PCBs, triazine herbicides, phenoxy acid herbicides, and glyphosate. Preliminary results are being reviewed and data reduction and reporting will be completed in FY 2006.

Water Resource Protection—Aquatic Resource Professionals

Prior to funding provided by the Natural Resource Challenge, only 20 parks had aquatic resource professionals on staff. Founders of the Challenge recognized the need to increase professional expertise and to employ more park-based aquatic resource professionals to address water resource-related issues and to develop more comprehensive and programmatic approaches to aquatic resource protection at the park level. 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.

In FY 2005, fifteen positions were fully funded for aquatic resource specialists. Twelve of the positions are duty-stationed in parks, and there is

one position in the Sonoran Network Office, the Center for Urban Ecology in the National Capital Region, and the Utah State Office. Primary areas of focus include hydrology, fisheries ecology, wetlands, and geomorphology.

Noteworthy accomplishments of the aquatic resource professionals are:

- The groundwater hydrologist supporting the Southern Plains and Heartland Networks' parks served as technical liaison to a state sponsored aquifer study and worked to support an evaluation of the potential impacts of a proposed large-scale groundwater development on basin water resources affecting **Chickasaw National Recreation Area**, provided technical support to the development of a flood evacuation plan for **Fort Davis National Historic Site** with the aim of protecting park natural resources, infrastructure, and/or visitors, and provided technical support for a fluvial geomorphic assessment at **Homestead National Monument**.
- The fishery biologist at the Sonoran Desert Network assisted the Northern Colorado Plateau Network with completing fish databases for 8 parks including: **Arches National Park**, **Black Canyon of the Gunnison National Park**, **Bryce Canyon National Park**, **Canyonlands National Park**, **Capitol Reef National Park**, **Curecanti National Recreation Area**, **Dinosaur National Monument**, and **Zion National Park**.
- The geomorphologist, who supports the networks parks of the Pacific West Region, assessed causes of erosion and assisted in developing a plan for protecting John Muir's gravesite at **John Muir National Historic Site**, and assessed causes of river flooding at **Mount Rainier National Park**.
- The wetlands ecologist, who supports the networks parks of the Southeast, conducted a wetland delineation at **Tuskegee Airmen National Historic Site** in response to a proposed Development Concept Plan, conducted a fish inventory and final report for **Guilford Courthouse National Military Park**, provided technical assistance and oversight for wetland and stream restoration plans provided through the Corporate Wetlands Restoration Project at **Chattahoochee National Recreation Area**, and provided **Timucuan National Historic Site** with a wetland delineation and assessment of potential impacts to open water and marsh habitat from the proposed Cedar Point boat ramp project.
- The fishery biologist, who supports the networks parks of the Southeast, assisted in the restoration of shoal bass in **Chattahoochee**

River National Recreation Area, in partnership with Georgia Department of Natural Resources with aid from Georgia Power and Piedmont College.

- The hydrologist, who supports the networks parks of the Northeast, helped develop a flood analysis report at **Delaware Water Gap National Recreation Area**. This report was prepared in response to an emergency request by the Superintendent following two major flood incidents.

Water Resource Technical Assistance

Water Resource Technical Assistance was the fundamental component of the Water Resources Program before the Natural Resource Challenge and has not been expanded with Challenge funding. Through this effort, the Water Resources Program provides direct assistance to parks on high priority needs using a combination of its own staff and expertise acquired through cooperative agreements. Examples of technical assistance accomplishments in FY 2005 are:

- Assisted in the planning for native trout restoration in **Great Basin National Park, Great Sand Dunes National Park, and Rocky Mountain National Park**.
- Assisted in the development and review of marine resource protection strategies for **Dry Tortugas National Park**.
- Provided assistance for the development of alternative wastewater discharge locations at **Lake Mead National Recreation Area**.
- Collaborated with other Interior and non-federal interests to advance the level of scientific information available to decision makers for Arbuckle-Simpson ground water aquifer in southeastern Oklahoma to protect resources at **Chickasaw National Recreation Area**.
- Provided continuing assistance to **Olympic National Park** related to the proposed removal of two dams on the Elwha River, including assisting in the development of a sediment monitoring plan and interpretation of the results of a physical modeling study of sediment redistribution and release.
- Participated in the development of Fisheries Management Plans for **Biscayne National Park** and **Isle Royale National Park**.
- Provided assistance to **Cape Cod National Seashore** on the potential impact of groundwater withdrawals from wells at the North Truro Air Base.

Watershed Condition Assessment Program

Fiscal Year 2005 was the third year for the recently established Watershed Condition Assessment Program, a Natural Resource Challenge-funded

program geared to assessing watershed conditions on a System-wide basis. The Watershed Condition Assessment Program integrates data and knowledge pertaining to water and other watershed resources to help define desired conditions and assess existing conditions within park managed uplands, streams, riparian areas, wetlands, and coastal/marine areas. The information developed through assessments of watershed resource conditions contributes to information needs of park planning, resource protection, and resource restoration activities. Information developed by the Watershed Condition Assessment Program complements the Inventory & Monitoring Program to develop science-based information on conditions and trends relative to important park resources. Information from these Challenge programs will be useful to parks as they develop Resource Stewardship Strategies and are fundamental to the needs of the Department of the Interior Strategic Plan that identifies the health of landscapes and watersheds as a key outcome goal.

Program efforts in FY 2005 emphasized continuation of baseline condition assessments at coastal and marine parks, continued development of a compendium of watershed assessment methods and classification systems for potential use by parks, and funding support to the competitive project program for backlogged watershed resource and water quality assessment projects. Two full-time staff members provide dedicated support to implement long-range program components including assistance on coordination of resource assessments in managed coastal/marine environments and overseeing the transition to a systematic program of park-based assessments of watershed resource conditions.

As of FY 2005, the Water Resources Program has initiated condition assessments of 41 ocean and Great Lakes parks with more planned for FY 2006. These reports provide baseline condition assessments and valuable insights use by park managers into factors affecting the health of park resources for. Through the Cooperative Ecosystem Studies Units (CESUs), university scientists review and synthesize existing information to determine the status of coastal park resources, including water quality, habitat condition, invasive and feral species, extractive uses, physical impacts from resource use and coastal development, and other issues affecting their condition. Recommendations are then made concerning needs for further studies to address known resource problems and/or fill information gaps in order to more fully evaluate conditions.

Final coastal watershed assessment reports were published for **Padre Island National Seashore**, **Cape Lookout National Seashore**, **Timucuan Ecological and Historic Preserve**, **Gulf Islands National Seashore**, and **Cumberland Island National Seashore** in FY 2005. Water Resources Program staff work collaboratively with programs such as the U.S. EPA National Coastal Assessment, USGS, NOAA, state and local agencies, watershed councils, landowners, and other community stakeholders to address issues cooperatively on a local watershed or regional oceanographic scale.

In FY 2005, Water Condition Assessment Program funding also supported projects that addressed emerging, high-priority, park watershed condition issues that, because of the applicable time frames, could not be appropriately directed through the competitive project funding program. Examples of FY 2005 new starts include water quality sampling and analyses to determine the concentrations of water quality parameters that may impact the overall health of the Devils Hole Pupfish in **Death Valley National Park** and a baseline evaluation of tributary-stream conditions in **Ozark National Scenic Riverways**.

Water Quality Monitoring

Fiscal Year 2005 was the fifth year of funding for the Water Quality Monitoring component of the Natural Resource Challenge, a program specifically intended to track and support the attainment of water quality standards in units of the National Park System as required by NPS and DOI Strategic Plans. The National Park Service is committed to significantly reduce the number of stream and river miles and acres of lakes and marine areas that do not meet water quality standards. As part of this goal, parks are also committed to protecting unimpaired water quality from future impairment, including waters classified as Outstanding National Resource Waters or state-equivalent listed waters. Additionally, parks are committed to working with state Clean Water Act programs, as well as taking appropriate management actions within parks, to support the restoration of impaired water bodies in parks to an unimpaired condition. Presently, about 118 park units have one or more waterbodies that do not meet state water quality standards for one or more pollutants on approximately 1,770 miles of rivers and streams and 1,100,000 acres of lakes, reservoirs, estuaries and marine areas. Planning and design of the program continues to be implemented in full integration with the Inventory & Monitoring Program. By fully integrating the design of these programs, considerable cost efficiencies have and

will continue to be realized in staffing, planning and design, administration, implementation, data management, and reporting.

In FY 2005, full water quality monitoring funding was allocated to all 32 NPS Vital Signs Monitoring Networks. The networks fully committed their water quality funding to compilation of background information, analysis of issues and threats, detailed program planning, and supporting synoptic-level field assessments, and initiation of finalized monitoring plans. Network planning approaches included hiring personnel, in-house allocation of staff, equipment acquisitions, CESU and other university cooperative agreements, and USGS Interagency Agreements. All 32 networks accomplished one or more of the following activities:

- Network water quality planning workshops
- Historic data compilations and analyses
- Information on state-listed impaired waters and park “outstanding” waters
- Documentation of significant water quality stressors/threats
- Synoptic inventory studies in support of detailed statistical design
- Database management and GIS support programs
- Development of water quality monitoring protocols.

The Water Resources Program continues to support network water quality monitoring programs by providing national program administration and reporting, establishing baseline inventories and analyses of available water quality data, supporting digitization of legacy data from analog reports and other archival materials, establishing a Servicewide water quality database in the EPA-STORET (short for STOrage and RETrieval) national water quality database, and developing the means to flow data from the Networks into STORET. Three water quality research associates and a student worked to support this database development, management, and reporting activities through cooperative agreements with Colorado State University.



Chapter Four: Progress in Learning About Our Parks' Natural Resources

This chapter focuses on accomplishments in programs primarily directed at developing reliable information for resource management. Detailed financial information related to these goals appears in Chapter 5. Programs included are:

- Cooperative Ecosystem Studies Units
- Geographic Information System Program
- Inventory and Monitoring Program
- Natural Resource Data and Information Program
- Research Learning Centers

COOPERATIVE ECOSYSTEM STUDIES UNITS (CESUs)

Cumulative Increases: \$1,993,000 (FY 2001 and FY 2003)

FY 2005 Allocation: \$131,000

FY 2005 Available: \$129,000

Cooperative Ecosystem Studies Units (CESUs) are multi-agency partnerships with the nation's universities and other institutions, organized around biogeographic areas. Seventeen individual CESUs are part of a national network that has been competitively established with leadership from the Park Service, USGS, and other Federal agencies. Currently, 12 federal agencies participate in the CESU Network, along with 181 universities (including 42 minority institutions) and 24 state, tribal, and non-governmental partners. As an innovative partnership among federal agencies and the nation's universities, CESUs are delivering a responsive program of high quality research, technical assistance, and education for the multi-disciplinary resource management needs of national parks.

CESU funds from the Natural Resource Challenge are allocated to the regions for a coordinator at each host university in each of the CESUs. Coordinators work with park managers to identify research, technical assistance, and education needs, and to provide specialized expertise and assistance available from the universities and other federal agency partners in the CESU Network. Remaining available funds support research, technical assistance, and educational activities as well as operating expenses.

Challenge funding to support Park Service participation in 5 of the 17 CESUs is not currently available. Current funding supports coordinators at 12 CESUs and a portion of the National Coordinator Program Office. Regional offices help support NPS participation in these five CESUs, through funding from collateral

duties or assigning additional responsibilities to existing coordinators.

In FY 2005, the National Park Service received a total of \$1.985 million to support NPS participation in each of 12 Cooperative Ecosystem Studies Units (CESUs). A total of 635 NPS projects were administered through CESUs and supported a diverse range of funding sources that totaled over \$32 million dollars.

A synthesis of key themes for 2005 CESU programs are provided below.

- CESUs continue to observe an upward trend in interdisciplinary, social science, and cultural resource projects. The expertise available to administer these projects is becoming increasingly diverse and management needs continue to be well-served by CESUs.
- The integration of natural and cultural resources in key projects is becoming an important priority for several CESUs. For example, CESUs in the Intermountain Region were involved in planning a Grazing Workshop at **Sand Creek Massacre National Historic Site**, a Heritage Orchard Maintenance Workshop at **Capitol Reef National Park**, a workshop for **Bryce Canyon National Park** on writing Cultural Landscape Reports, and a Sustainable Vertebrate Pest Management Workshop at southern Arizona parks.
- CESUs continue to play an important role in organizing and conducting workshops, symposia, regional summits, and training sessions on important research and management issues. For example, the Rocky Mountains CESU funded and/or participated in seven educational workshops and science symposia. These workshops typically include multiple agencies and CESU partners. The Great Plains CESU sponsored the 32nd annual Natural Areas Association Conference. The Great Lakes-Northern Forest CESU coordinated and co-sponsored the 4th annual Western Great Lakes Research Conference. The Chesapeake Watershed CESU sponsored a Grasslands Restoration Workshop. The North Atlantic Coast CESU sponsored a series of workshops on basic statistical methods for park managers and scientists.
- CESU coordinators are providing key services to Inventory and Monitoring Networks. For example, coordinators help locate expertise and facilitate projects to assist in conducting inventories, developing conceptual models,

writing monitoring protocols, reviewing reports, and conducting peer reviews. In FY 2004 and in FY 2005, approximately one third of NPS funding administered through CESUs was from Inventory and Monitoring Networks.

- Collaboration with Natural Resource Challenge programs and other Servicewide programs has increased. CESU coordinators work with Research Learning Centers, Exotic Plant Management Teams, and the Inventory and Monitoring Program to facilitate productive synergy among multiple programs funded by the Challenge.
- Opportunities for undergraduate and graduate students to become involved in NPS projects is increasing due to increased encouragement to participate in internship programs, design of degree programs, and student career positions. For example, at the North & West Alaska CESU, five graduate and undergraduate projects were initiated in response to park needs. These projects related to interpretative training, ethnography fieldwork, and treeline response to climate change. The Colorado Plateau CESU, in cooperation with **Grand Canyon National Park** and the Grand Canyon Association, established an annual graduate student fellowship of \$30,000 per year. The North Atlantic Coast CESU supported a student intern at **Assateague Islands National Seashore**. The Gulf Coast CESU supported three diversity students working in parks during the summer of 2005, coordinated with other CESUs to facilitate the attendance of 28 diverse students at the George Wright Society Conference, and worked closely with the Student Conservation Association.
- CESU coordinators continue to collaborate with each other to ensure that parks in their respective region have access to the best available expertise from across the entire CESU Network.

Highlights of FY 2005 project accomplishments include:

- A project to assess the conditions of streams and associated wetlands in **Harpers Ferry National Historical Park** was funded by the Natural Resource Preservation Program. A cooperative agreement with the University of Maryland allowed university researchers to work with park staff to characterize the physical and chemical conditions of selected streams and associated wetlands at the parks, to inventory macroinvertebrates inhabiting these streams and wetlands, and to identify aquatic habitats that are sensitive to environmental degradation from pest management

activities and other human interventions. Nine reaches of streams were sampled at least 6 times for habitat conditions, water chemistry, and macroinvertebrates. Preliminary results provide evidence of some stream degradation, including relatively low invertebrate diversity, erosion of channel and substrate, and the presence of pollution tolerant invertebrate taxa. This baseline information is important to park managers so that they can work to restore degraded habitats and protect relatively pristine communities that are likely to be sensitive to environmental changes.

- A study in **Rocky Mountain National Park** by New Mexico State University and the USGS, concluded that human and road-related disturbance negatively affected bighorn sheep's use of a mineral site at Sheep Lakes. In this study, as the number of vehicles and people present at Sheep Lakes increased, the amount of time and the number of attempts required to successfully cross the road by bighorn sheep increased. At times, during the summer months, up to 400 vehicles per hour passed through the area. The findings from this research will directly inform the park as they develop a Bighorn Sheep Management Plan, in cooperation with the Colorado Division of Wildlife. Funding from the Natural Resource Challenge in collaboration with the Continental Divide Research Learning Center and obligated through the Colorado Plateau CESU Cooperative Agreement made this research possible.
- Fiscal year 2005 was the last of three years of "seed money" funding through the Desert Southwest CESU to "grow" the Hummingbird Monitoring Network into its own non-profit organization. The Hummingbird Monitoring Network achieved non-profit status this year, and will no longer be supported by the National Park Service and the Arizona-Sonora Desert Museum. The Network operates 27 monitoring sites from Arizona to British Columbia and is looking to expand into Colorado, New Mexico and Texas. Monitoring sites span the CESU membership roster with national parks, national forests, Indian reservations, military installations, university and non-profit preserves, and private lands. Besides collecting important data on hummingbird populations that can be used by land managers, many volunteers and students are learning valuable skills.
- Interns from the Sonoran Institute are working alongside NPS field personnel conducting both social and physical sciences research and developing recommendations for park management on appropriate trail locations, trail designations, and areas that require restoration to a natural setting at **Sequoia National Park**. Trail



The integration of natural and cultural resources in key projects is an important priority for CESUs. While native Hawaiian master masons reconstruct the fishpond wall at Kaloko-Honokohau National Historical Park, a CESU funded project documents their techniques and craftsmanship.

Dr. William Lamp and Michelle Haube of University of Maryland-College Park, collecting aquatic samples in a small stream in Harper Ferry National Historical Park..

recommendations will be vetted in the suite of alternatives presented in the General Management Plan for the park.

- The Southwest Center of the University of Arizona is producing two half-hour programs for the PBS series *The Desert Speaks* on the subject of the drought that is affecting the southwestern United States and northwestern Mexico. The first program will focus locally on the effects of the current drought which causes the loss of desert plants in **Organ Pipe Cactus National Monument** and **Saguaro National Park**, and mortality of upland and coniferous plants in **Chiricahua National Monument**. The second program will focus on historical droughts that have affected the greater Southwest, demonstrated by tree-ring evidence from bristlecone pines in the White Mountains of California, giant sequoias in **Sequoia National Park**, and from dwarf Douglas fir trees in **El Malpais National Monument**. The current drought will be placed in the context of historical droughts. Nationally, an estimated 6 million people view *The Desert Speaks* so this is an excellent venue in which to have resource issues facing the southwestern national parks presented to the public.

GEOGRAPHIC INFORMATION SYSTEM PROGRAM FY 2005 Allocation: \$1,291,000

Available: \$1,273,000

The goal of the NPS Geographic Information System (GIS) Program is to provide quality geospatial data, information, and applications utilizing GIS for park planning, program operations, and scientifically-based management of park resources. Today, most NPS units utilize GIS technology and data. GIS provides powerful visualization and analysis tools to assist park managers with resource management problems. GIS allows resource managers to bring together and geographically link information that otherwise would be impossible to integrate and enhances the abilities of managers to discover changes, patterns, and trends in resources over time.

GIS technology has contributed to NPS resource management since the mid-1970s, when **Yosemite** and **Great Smoky Mountains National Parks** embarked on the first geospatial projects. The funded program originated as a natural resource program and many GIS data layers remain natural resource related, but the technology has been adapted for various cultural resource disciplines, facility location information, interpretation, and other uses throughout the National Park System. The NPS GIS Program is now led by the Office of the Chief information Officer (OCIO), in

recognition of its broad applicability across many NPS program. The funding essentially operates as seed funding and is distributed to regions to support a combination of Regional Technical Support Centers (RTSCs), in addition to a natural resource GIS coordinator located in the Natural Resource Program Center. The Natural Resource GIS Coordinator serves on the NPS GIS Committee, along with regional, park, and program members, to represent the NPS GIS community and provide policy, funding, and operational recommendations to the Chief Information Officer and the Associate Director of Natural Resource Stewardship and Science. Additionally, there is significant coordination with the Department of the Interior through the Enterprise Geospatial Information Management team and across government through the Federal Geographic Data Committee (FGDC).

In FY 2005, approximately half of the GIS program funding supported park and regional staff or partners. About one-third of the funding financed projects with the balance covering other support costs. This funding is matched about ten-fold for efforts undertaken by, or coordinated through the RTSCs.

Highlights of 2005 GIS projects are summarized below:

- The NR GIS Program implemented an integrated information system called the Natural Resource and Servicewide GIS (NR and GIS) Data Store System in 2005. The system integrates several, disparate legacy metadata and data services into one interoperable set of web and desktop applications. The Data Store is based on standards set by the FGDC, industry, and DOI, as well as NPS-specific requirements.
- A GIS team at **Grand Teton National Park** created 135 random transects (grid and line) with navigation points in alpine, aspen, cottonwood, sage, and willow habitats types for the Greater Yellowstone Network's land bird monitoring project. GIS analysis techniques were used to create each habitat type and the random transects. Navigation points were used by field biologists to make bird observations along each transect. A hybrid MS Access/ESRI geodatabase was created to store the entire project's spatial data (transect and navigation point locations) and field observations for bird species.
- Since May of 2005, an Arctic I&M Network data-mining project has been underway to compile a spatial database of previous fisheries work within the network's five park units. ABR Inc. and the Alaska Natural Heritage Program were contracted to compile lists of possible



Eastern massasauga (*Sistrurus catenatus catenatus*) rattlesnake at Indiana Dunes National Lakeshore. Inventory work at the park resulted in the first documentation of a juvenile Eastern massasauga rattlesnake in several decades.

references. The resulting bibliography was used to compile past fish collection locations, species composition data, and related aquatic information. The Network is collaborating with the Alaska Department of Fish and Game to utilize their spatial database to store and share the fish data. The end goal is to produce a map that synthesizes existing knowledge and helps determine locations for future data collection. All five Arctic Network units will be surveyed over the next three summers starting with the Noatak National Preserve.

- A GIS team at Big Cypress National Park supported the Wildland Fuels Vegetation Mapping project initiative by identifying habitats suitable for sampling and assisting with the field protocols. The project was directed by the South Florida and Caribbean I&M Network, and included a Fire Return Interval Departure (FRID) analysis map based on historical burn records. The Preserve's Resource Management biologists used GIS extensively to map several state-listed or threatened and endangered species, including the Florida panther, the Red-Cockaded woodpecker, and the Big Cypress fox squirrel.

INVENTORY AND MONITORING PROGRAM (I&M)

FY 2005 Allocation: \$36,932,000

Available: \$39,522,000

This program provides park managers with information about what they manage (inventories) and the condition of the resources they manage (monitoring) so that science-based informed decisions can be made about actions that affect natural resources. The program, which began in the early 1990s, has expanded greatly as a result of Natural Resource Challenge increases. In FY 2000, the National Park Service organized 270 natural resource parks into a system of 32 networks to provide an efficient means of carrying out expanded inventory and monitoring (I&M) activities. The program as a whole increased from its 1999 level by nearly seven-fold by FY 2005. In FY 2005, the program received a net increase of \$2,590,000.

Through this program, each of the parks involved is to obtain 12 basic inventory products and park networks are to develop and implement programs to monitor the most critical vital signs (indicators of park ecosystem health) in all parks with significant natural resources. The vital signs monitoring portion of the program began in FY 2001. Earlier designed prototype monitoring programs serving 22 parks continue, and provide

assistance to the more extensive but less intensive vital signs monitoring programs carried out through networks.

As of FY 2005, more than 1,750 park data sets had been completed. This resulted in seven essentially completed inventory data sets for all natural resource parks (natural resource bibliographies, vertebrate and vascular plant species lists, base cartography data, baseline water quality data, water body location and classification, air quality data, and meteorological data) in addition to making progress on the remaining five inventories. Additionally, 24 networks encompassing 207 parks have been funded to monitor vital signs. The 24 networks are involved in a three-phase planning process to develop quality, peer-reviewed monitoring program designs that will provide the best possible information for management use. The first 24 networks completed the vital signs identification phase (phase 2 of 3). In these networks, the following categories of vital signs predominated: land use/cover change, weather and climate, water chemistry, surface water dynamics, bird distribution and abundance, and mammal populations.

The I&M program directly achieves goals of the National Park Service strategic plan. The Service's inventory goal had a target in FY 2005 to complete 1,771 (64.0 percent) of the 2,767 outstanding data sets. The Service fell slightly short of accomplishing that goal by completing an additional 131 data sets in FY 2005, bringing the total to 1,761 (63.6 percent) of the outstanding datasets. The Service's FY 2005 goal that 80 percent (216) of the 270 parks with significant natural resources identify their vital signs was exceeded. As a direct result of the strategy of organizing parks into 32 vital signs monitoring networks, 222 parks (82.2 percent) had identified their vital signs, compared to the annual goal

of 216 parks. In the new strategic plan, the Park Service will focus on implementing the measurement of park vital signs, rather than identifying them; this is a direct result of new funding under the Natural Resource Challenge.

Universities, other non-governmental entities, and non-NPS government agencies produced inventory and monitoring products totaling more than \$13 million during the year. Efficiencies and leveraging was obtained by partnering. For example, in FY 2005, I&M funding was combined with funding from USGS and the NPS Fire Program to further accelerate vegetation mapping. The Alaska land cover mapping project is being accomplished by combining I&M funding with a variety of cooperative projects, including those with the USGS, Ducks Unlimited, National Wetlands Inventory, and the University of Alaska.

This section focuses on activities administered and funded through the Inventory and Monitoring Program including:

- Inventories
- Monitoring

Inventories

Natural resource inventories, which are being conducted as part of the Natural Resource Challenge, are revealing many new and exciting insights into the natural resources contained in parks. Not only are the investigations increasing our knowledge and understanding about park resources, but the information being provided is also being used to address a wide variety of resource management issues and activities.

The Inventory component of the National Park Service Inventory and Monitoring Program reports to the strategic planning goal on Natural Resource Inventories that states that by

Basic Data Sets	End of FY 2005	End Of FY 2006	End Of FY 2007	FY 2008-10 ¹
	Completed	Completed	Completed	To be Completed
Natural Resource Bibliographies	270	270	270	N/A
Base Cartography Data	270	270	270	N/A
Species Lists	270	270	270	N/A
Species Occurrence and Distribution	44	100	200	70
Vegetation Maps	62	80	116	154
Soils Maps	70	100	130	140
Geology Maps	68	100	141	129
Water Body Location and Classification	270	270	270	N/A
Baseline Water Quality Data	270	270	270	N/A
Air Quality Data	270	270	270	N/A
Air Quality-Related Values	100	150	175	95
Meteorological Data	270	270	270	N/A

¹ The Servicewide program acquires basic inventory data sets for about 270 parks with significant natural resources. However, some parks have acquired some of these data sets and a few parks may not need all 12 sets. To be completed column reflects the number of parks Servicewide with outstanding needs.

September 30, 2005, acquisition or development of 64 percent (1,771) of the 2,767 outstanding data sets identified in 2002 of basic natural resource inventories for all parks will be complete. The number of outstanding datasets was increased to 2,767 in FY 2002 when vegetation maps were added to the baseline inventories. The Service completed an additional 131 datasets in FY 2005, bringing the total to 1,761 (63.6 percent) of the outstanding datasets. The Service fell slightly short of achieving the target for the Natural Resource Inventories in FY 2005 because most parks will require an additional year to certify the accuracy of the biological (vertebrates and vascular plants) field inventories, even though most of those field inventories were completed and data sets available by the end of FY 2005.

The increased funding for natural resource inventories received through the Natural Resource Challenge since FY 2000 is allowing the National Park Service to significantly increase the rate at which the basic natural resource inventories are completed. By combining Challenge funding, with funds previously available for inventories, the Service now estimates that it will complete the basic resource inventories for all 270 natural resource parks over a period of approximately 10–12 years, rather than the 20–25 years projected to complete the inventories prior to receiving the additional Natural Resource Challenge funding.

The Washington Office works closely with park resource managers and others to obtain information about which of the 12 basic natural resource inventories are of highest priority to the parks for addressing various resource management and protection issues, updating resource management plans, or developing management actions in response to a particular threat to park resources. Priorities were revised in fiscal 1997 and are currently being used to establish Service-wide strategies for completing the inventories.

In FY 2005, inventory funding was devoted primarily to six of the 12 basic inventory categories: species occurrence and distribution, vegetation mapping, soils mapping, geologic resource inventories, baseline water quality data inventories, and Air Quality Related Values (AQRV's).

As in previous years, biological surveys in FY 2005 resulted in species new to science, documentation of range extensions of species, and species newly documented for parks. Some highlights from FY 2005 inventory efforts are briefly described below.

- Four new plant species were added to park records at **Fossil Butte National Monument**. Although none of the species are rare in Wyoming, three of the species; glandular willowherb, sawatch knotweed, and combleaf cinquefoil were found at the limit of their elevational range. These populations may be especially sensitive to global climate change and will be monitored for expansions and contractions.
- New caves were discovered at **Mammoth Cave National Park** during efforts in 2005 to inventory bats. In May 2005, during the second (and final) year of a bat inventory at Mammoth Cave National Park, a state-listed (“special concern”) pregnant female Rafinesque’s big-eared bat was captured, fitted with a radio transmitter, and released. The next day, park interns equipped with a radio receiver, picked up the signal and followed it to a previously unknown pit cave on the park. The discovery of maternity caves on the park will provide Mammoth Cave National Park resource managers with important population trend information for this species that can be incorporated into a cave bat monitoring protocol.
- Current inventory work at **Channel Islands National Park** has led to the discovery of a species of garter snake on Santa Rosa Island that was previously not known to exist on any of the Channel Islands. Researchers are tentatively calling this species the aquatic garter snake, pending confirmation of species identification through genetic testing. Based on past studies together with additions from the current inventory study, Santa Cruz remains the most species-rich of the Channel Islands, with three amphibian species and five reptile species.
- Of significant note in 2005 is the web based platform developed by North Carolina State University to display National Park Service I&M natural resource information. This easy to navigate web system allows resource managers and the general public to display and query field plot information via a standard web browser. The same program enables field scientists to inspect, edit, and augment their field data without the intervening use of field sheets or data transcriptions. The program generates both standard field reports and interpreted maps.
- Inventory work at **Indiana Dunes National Lakeshore** resulted in documentation of a juvenile Eastern massasauga rattlesnake. This was an important finding for the Lakeshore as it is the first verification in several decades, and it will influence management actions both inside and outside of the park. Key results from inventories of rare and exotic plants at Indiana Dunes and **Sleeping Bear Dunes National**

Lakeshores include first time documentation of two rare plant species and two exotic plant species at Sleeping Bear Dunes and the mapping of 205 populations of the rare Pitcher's thistle and 335 populations of exotic plants at Indiana Dunes.

- Trapping surveys at four wetlands in **Delaware Water Gap National Recreation Area** confirmed the presence of the federally threatened bog turtle at a wetland where they had not been observed for almost 20 years. This significant finding led to a follow-up project that captured and radio-tracked two bog turtles. Research results from the radio-tracking project demonstrated extensive use of the wetland by bog turtles and documented critical microhabitats including the locations of hibernacula.
- North Carolina State University researchers have developed and published a protocol for constructing wildfire fuel load maps based on digital vegetation maps and the corresponding digital photo mosaics generated by the I&M Program. This protocol allows for the rapid development of fuel load models for both spring and fall fire conditions and the consequent deployment of these models into the on-going National Park Service wildfire planning effort. This methodology will assist the development of plans to minimize wildfire risk to lives and property of persons living within or near Northeastern National Parks.
- Inventory work has resulted in 37 additions to Arctic Network park mammal species lists. Park resource managers were excited to find a tiny shrew, one of the most poorly documented small mammals in North America, in **Bering Land Bridge National Preserve, Gates of the Arctic National Park and Preserve, and Cape Krusenstern National Monument**. Major range extensions were also documented for the barren ground shrew.

Monitoring

Natural resource monitoring provides site-specific information needed to understand and identify change in complex, variable, and imperfectly understood natural systems and to determine whether observed changes are within natural levels of variability or may be indicators of unwanted human influences. Thus, monitoring provides a basis for understanding and identifying meaningful change in natural systems characterized by complexity, variability, and surprises. Monitoring data help to define the normal limits of natural variation in park resources and provide a basis for understanding observed changes. Monitoring results may be used to determine what constitutes impairment and to identify the need to initiate or change manage-

ment practices. Understanding the dynamic nature of park ecosystems and the consequences of human activities is essential for management decision-making aimed at maintaining, enhancing, or restoring the ecological integrity of park ecosystems, and to avoid, minimize, or mitigate ecological threats to these systems.

The intent of park vital signs monitoring is to track a subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources, known or hypothesized effects of stressors, or elements that have important human values. The elements and processes that are monitored are a subset of the total suite of natural resources that park managers are directed to preserve “unimpaired for future generations,” including water, air, geological resources, plants and animals, and the various ecological, biological, and physical processes that act on those resources. The broad-based, scientifically sound information obtained through natural resource monitoring will have multiple applications for management decision-making, research, education, and promoting public understanding of park resources.

During the development of the vision for park vital signs monitoring, it was clear that a “one size fits all” approach to monitoring design would not be effective in the National Park Service considering the tremendous variability among parks in ecological conditions, sizes, and management capabilities. A primary purpose of vital signs monitoring is to provide park managers with the data they need to understand and manage park resources, and the data most relevant to different types of park systems should be expected to be very different. Furthermore, partnerships with federal and state agencies and adjacent landowners are critical to effectively understand and manage the many resources and threats that extend beyond park boundaries, but these partnerships (and the appropriate ecological indicators and methodologies involved) differ for parks throughout the national park system.

The amount of funding available for vital signs monitoring allows most parks to monitor only a few indicators. The Park Service has adopted a strategic approach to maximize the use and relevance of the monitoring data at the park level by allowing each network of parks to determine what they will monitor based on their most critical data needs and local partnership opportunities. Parks are encouraged to use or modify standard protocols and partner with existing

programs wherever possible to allow comparability and synthesis of data. The Servicewide monitoring program will coordinate the development of standardized protocols and approaches where appropriate, but decisions on what should be monitored and the most appropriate protocols to follow are made at the network level.

The most common park vital signs and the number of parks identified by 24 networks as a top priority are summarized in the adjacent table. In these networks, the following categories of vital signs predominated: land use/cover change, weather and climate, water chemistry, surface water dynamics, bird distribution and abundance, and mammal populations. However, these vital signs will not be finalized until all networks have completed the protocol design phase and negotiations with partners on options for implementation are completed. Only the first 12 networks have fully completed this process.

As of the end of FY 2005, 24 of the 32 networks had been funded for condition monitoring, and the remaining 8 networks received initial planning funds. The resulting scientifically sound information is critical for designing strategies to protect and restore natural resources, for working with others whose actions influence resource conditions, and for measuring the condition of park resources.

The Vital Signs Monitoring component of the I&M Program reports to two NPS Strategic Planning Goals concerned with Vital Signs Identification and Vital Signs Implementation. Both goals were exceeded. By the end of FY 2005, as a direct result of the strategy of organizing parks into 32 vital signs monitoring networks, 222 parks (82 percent, compared to the goal of 80 percent) had identified their vital signs and 104 parks (38 percent) had implemented vital signs monitoring. The planning and design efforts involved with the vital signs monitoring program are seen as a unifying program within the National Park Service that brings parks and programs together to promote consistency and cost-effectiveness. Some major accomplishments associated with park vital signs monitoring in FY 2005 included:

- providing funding, guidance, and technical support to 24 vital signs monitoring networks (207 park units) for development of an integrated monitoring program;
- providing start-up funding to the remaining 8 networks to allow them to hire a network coordinator and data manager for inventories and begin working with network parks on initial monitoring planning activities;

- providing full funding to the 11 prototype monitoring programs (22 park units); and
- continued development and implementation of an activity-based accountability report for all monitoring networks, including a budget-tracking component.

Inventory and monitoring are critical for cost-effective, accountable resource management informed by scientific information. For most parks, vital signs monitoring is the primary means of measuring the status and trends in the condition of park resources and determining progress towards natural resource performance goals. Thus, long-term monitoring is a central component of an effective natural resource management program. Profiled below are examples of how these studies have benefited parks during FY 2005.

- The Gulf Coast Network was able to acquire new imagery and LIDAR (Light Distance And Ranging) data shortly after hurricane Katrina passed over the coast of Mississippi. The USGS provides GIS-ready data sets and conducts change analyses to evaluate the impacts of those storms on the coastal barrier islands. Analysis of this data can provide information on the impact of the storms on island vegetation, dune morphology, and dune volume. These data will be used not only by the natural resource staff and as part of the long-term monitoring of this park, but will provide elevation data which can be used to plan reconstruction of park infrastructure.
- Raptor monitoring at **Pinnacles National Monument** in the San Francisco Bay Area Network led to the discovery of a peregrine falcon pair successfully nesting at the park, producing three fledglings (first time in 48 years), a Cooper's hawk nest was found (first time in 13 years), sharp-shinned hawk nests were found for the second and third time, long-eared owl breeding was confirmed with three fledglings observed (first time in 19 years), and ten raptor species—the highest ever recorded in a season—were confirmed breeding in the park in 2005.
- The Southwest Alaska Network developed a database of 950 historic landscape photographs spanning the period of 1898 to 1976, including 81 repeat photographs at 63 sites originally taken during the Griggs expeditions (1915–1922) and during several other expeditions near the turn of the 20th century (1895–1912). Comparison of historical and 2005 photographs is revealing the nature and rate at which Katmai's landscape is changing due to the retreat of glaciers, recovery of vegetation (particularly alders) after the volcanic eruption

Level 1 Category	Level 2 Category	Level 3 Category	Example Measures	Networks	Parks
Air and Climate	Air Quality	Ozone	Atmospheric ozone concentration, damage to sensitive vegetation	12	68
		Wet and Dry Deposition	Wet deposition chemistry (pH, NO ₃ ⁻ , SO ₄ ⁻²), continuous sulfur (SO ₂) dioxide concentrations	12	58
		Visibility and Particulate Matter	IMPROVE network; visibility and fine particles	13	52
	Air Contaminants	Concentrations of mercury, benzene, toluene, ethylene chloride, atrazine	6	40	
	Weather and Climate	Weather and Climate	Temperature, precipitation, wind speed, ice on/off	17	125
Geology and Soils	Geomorphology	Stream Channel Characteristics	Erosion/sedimentation, channel change, rate of scouring, stream profiles, coarse woody debris	6	57
	Soil Quality	Soil Function and Dynamics	Biological soil crusts, aggregate stability, soil surface condition, nutrients, organic matter	8	59
Water	Hydrology	Groundwater dynamics	Depth to groundwater, well recharge rate	6	49
		Surface water dynamics	Discharge/flow rates, gauge/stage height, lake elevation, spring/seep volume, sea level rise	13	95
	Water Quality	Water Chemistry	pH, temperature, dissolved oxygen, conductivity	17	136
		Aquatic Macroinvertebrates	Species richness, diversity, IBI of stream macroinvertebrates, relative abundance	10	56
Biological Integrity	Invasive Species	Invasive/Exotic Plants	Early detection (predictive search models); presence/absence, area covered by exotic species	12	115
		Focal Species & Communities	Vegetation Communities	Species richness and diversity, rates of mortality and regeneration, stand structural dynamics	9
		Forest Vegetation	Species composition, percent cover by species & layer, tree growth & mortality, regeneration	7	49
		Birds	Species composition, distribution, abundance	14	82
		Mammals	Species composition, distribution, abundance	9	46
		Fishes	Species composition, distribution, abundance	9	42
		At-risk Biota	T&E species and communities	Distribution, abundance, age and sex composition	7
Human Use	Visitor & Recreation Use	Visitor Usage	Numbers of visitors by location, activity, season	8	58
Ecosystem Pattern and Processes	Land Cover and Use	Land Cover and Use	Area in each land cover and use type; patch size and pattern (from satellite and aerial imagery)	17	137

of 1912, and uplifted shorelines after the 1964 earthquake.

- Monitoring data helped the San Francisco Bay Area Network establish rock climbing advisories around active raptor nest sites and steered climbers to nest free areas.
- Staff from the Upper Columbia Basin Network coordinated two “hands-on” field ecology projects during 2005. Students from the Oregon Museum of Science and Industry summer camp series conducted baseline sampling of quaking aspen populations at **City of the Rocks National Reserve**. The group also traveled to **Craters of the Moon National Monument** to assist with collecting data on vegetation plots. The second project offered Native American high school students the opportunity to assist researchers with a camas lily monitoring project initiated at the Weippe Prairie site of **Nez Perce National Historical Park**.
- The Central Alaska Network’s Golden Eagle monitoring project is currently the only long-term monitoring program for a migratory population of this species in North America. Hence, this project generates an important dataset for monitoring populations of Golden Eagles in North America.
- Recent contaminants analyses of Peregrine Falcon eggs from **Yukon-Charley National Park and Preserve** suggest that mercury is currently at levels that may affect reproduction, and trends suggest that mercury levels may be increasing.
- The Sonoran Desert Network and Sonoran Institute developed a series of identification cards, consisting of key characteristics, photographs, and descriptions, for each of the 74 exotic plants identified through the multi-agency Arizona Wildlands Invasive Plant Working Group/Sonoran Desert Network exotic plants list. These cards are currently being used to train field botanists and park staff, and have been shared extensively with partners. Network staff are investigating options for publishing the cards in book-form to promote public awareness of exotic plants in the region.
- The Central Alaska Network partnered with the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service, the Arctic Network and Western Arctic Parklands to develop an internet tool to analyze moose survey data. Completion of this internet tool will allow biologists to upload data for analysis in near “real time.” This will provide population estimates to park and refuge managers to quickly facilitate management decisions.
- The NPS I&M Program initiated the inter-agency *Natural Resource Monitoring Partner-*

ship involving more than 60 State, Federal and Provincial governments (including agencies in Canada and Mexico) to promote collaboration and sharing of monitoring protocols and methodologies among agencies. This effort is also led by the Association of Fish and Wildlife Agencies and USGS. Two online tools, a *Monitoring Protocol Library* and a GIS-based *Monitoring Locator*, will be hosted by the USGS NBII (National Biological Information Infrastructure).

- The NPS I&M Program’s monitoring website was visited during 2005 by an average of 30,000 users per month who spent time reading or downloading documents. The website was particularly popular with the State fish and game agencies, who are developing monitoring programs as part of the Wildlife Grants program. The I&M program shares its guidance, protocols and “good examples” with other agencies to promote collaboration and partnerships with other agencies and institutions.

NATURAL RESOURCE DATA AND INFORMATION PROGRAM

FY 2005 Allocation: \$1,521,000

Available: \$1,505,000

The purpose of the Natural Resource Data and Information Program is to develop guidelines, technical solutions, and procedures for using and managing GIS, remote sensing, and other natural resource data in parks. This program operates and maintains a variety of relational database solutions that support efficient and consistent programmatic workflow, document and track resource inventories and assessments, and provide the analyses needed to effectively plan and manage a broad range of natural resource stewardship activities. Funds also support production of the annual edition of *Natural Resource Year in Review* and the journal *Park Science*. The development and dissemination of information for the public, NPS managers and interpreters, students, teachers, and the media, including administration of the NPS Nature and Science website and the Natural Resources Intranet is also handled through this program. The infusion of funds from the Natural Resource Challenge initiative, combined with the periodic allocation of project funding, provides the means for this program to maintain and refine Internet-based information technology solutions to successfully gather and share data and information with a vast internal and external audience.

Highlights of FY 2005 activities are summarized below:

- Software research and development in FY 2005 focused extensively on an e-Authen-

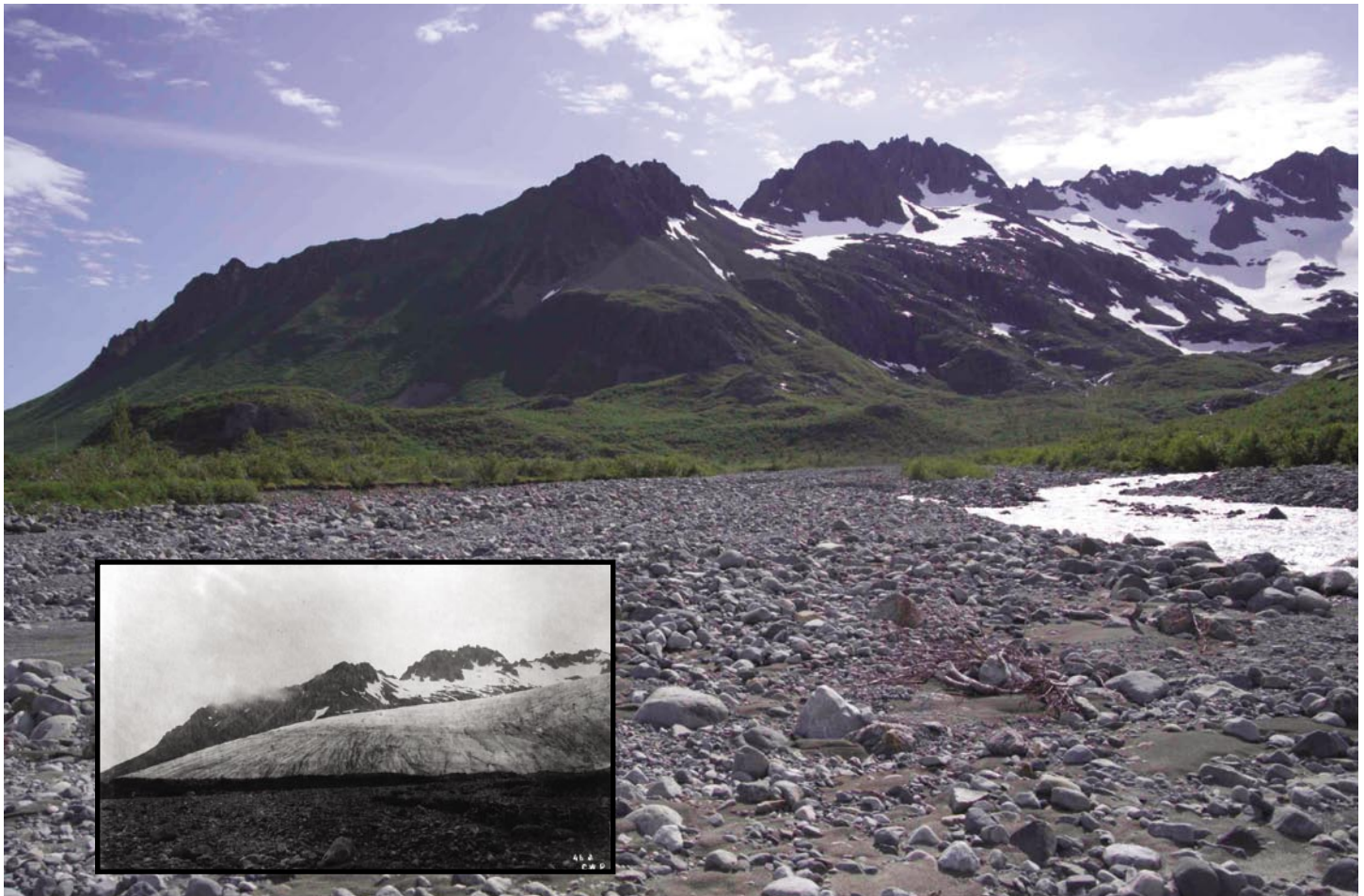
tication pilot project for the Department of the Interior (DOI). The Department uses the e-Authentication pilot project to help the federal government progressively respond to the President's E-Government Initiative. This system maintains support for the receipt of more than 3,400 electronic permit applications and 3,500 research study accomplishment reports submitted by the public.

- More than 2,000 pesticide use proposals were approved and tracked during FY 2005 using a redesigned Integrated Pest Management (IPM) system. The redesign of the tracking system allows for more effective and efficient tracking of the preparation, processing, and reporting of pesticide use proposals. The new system enables park IPM coordinators to more accurately and consistently determine and report specific amounts of active chemical ingredients applied within parks to control pest species.
- The Environmental Quality Division's *Planning, Environment and Public Comment* system (PEPC) was launched in March 2005. PEPC is an on-line collaborative tool supporting the National Park Service's project tracking, compliance process, comment analysis and response, as well as public communication efforts. As of November 1, 2005, the PEPC system had nearly 4,000 projects and hundreds

of users within the Park Service. The system is also accessible by contractors and other federal partners such as the Federal Highway Administration (FHWA). PEPC facilitates the National Environmental Policy Act (NEPA) process in conservation planning, environmental impact analysis and informed decision-making. PEPC currently integrates with other informational databases and PEPC staff plan to continue to build better integration methods so park users will not have to enter data redundantly within NPS applications. PEPC was designed by parks to allow better project communication, planning, tracking and reporting, and to give the public a more efficient way to comment on park projects and plans. PEPC's biggest success for public commenting, to date, was the 'Proposed petroleum exploration well in **Glen Canyon National Recreation Area**' project which received almost 80,000 comments during the public review.

- Enhancements were made to the NPS Nature & Science website to provide public web users with increased information on natural resources in park units. Enhancements include the addition of a Global Climate Change website and the addition of Fire Management as a major section of the NPS Nature & Science website. Staff worked across Directorates to

Recession of the Spotted Glacier in Katmai National Park and Preserve as revealed by repeat historic photography. The background photo, taken in 2005, repeats the location of the inset photograph which was taken in 1895. The Southwest Alaska Network developed a database of 950 historic landscape photographs.



add the Fire Management section that explains the Park Service's goal to restore fire's role as a dynamic and necessary natural process.

- The 3rd annual Communications Workshop was held in conjunction with the National Science Teachers Association convention. This year's topic was "Communicating Critical Air Resource Issues with the Public" and was conducted jointly with the NRPC Air Resources Program. The workshop successfully brought interpreters together with educators and resource managers from parks across the country.
- The first phase of a communications plan for the Heartland Network was accomplished by Colorado State University graduate students who are studying interpretation. Their goal was to develop a comprehensive user-friendly communications product that the Heartland Network I&M program can use to promote internal and external understanding of inventory and monitoring activities.
- A broadcast quality film on invasive species was produced cooperatively with Montana State University. The film highlights Exotic Plant Management Teams working in national parks.
- Two traveling exhibits were developed and showcased during 2005. An exhibit describing coral reefs within parks was presented at a Coral Reef Task Force meeting and an exhibit focused on the role of Research Learning Centers was presented at the National Council for Science and the Environment 5th Annual Conference on Forecasting Environmental Changes.
- Six existing *Views* modules were selected for inclusion in the National Science Foundation sponsored educational resources website. This site is designed to highlight the best science-based websites on the internet. The following modules were selected: Glaciers, Coastal Geology, Volcanism, Caves and Karst, **Timpanogos Cave National Monument**, and **Florissant Fossil Beds National Monument**. In addition, four Views modules were selected for inclusion in the DLESE (Digital Library for Earth Science Education) website. The website is designed to collect high-quality earth science websites for educators.

RESEARCH LEARNING CENTERS

Cumulative Increases: \$2,698,000 (FY 2001 and FY 2002)

The National Park Service has established 16 Research Learning Centers (RLC) to strengthen park partnerships with the scientific community and the public. Their mission is to increase the effectiveness and communication of research and science results in the national parks through

four common goals:

- Facilitate use of parks for scientific inquiry
- Support science-informed decision making
- Communicate relevance and provide access to research knowledge
- Promote resource stewardship through partnerships

Except as noted, each of the Centers in the table received \$225,000 in Challenge funding the year that they were funded (see next page). Because in many cases parks and others have contributed other funding to the operation of the centers, erosions or additions to the funding are not available.

Each Center is located at a host park but serves a network of associated parks. Together, the existing Research Learning Centers serve over 100 of the 388 units in the National Park System. All Centers help initiate, support, and implement a wide range of research projects in parks that meet management needs for quality information about park resources. As part of the Natural Resource Challenge, Research Learning Centers are making great strides toward reducing park backlogs of high priority research needs in innovative ways.

In FY 2005, the Centers and their partners helped parks address 20 of the Service's 30 Legacy Plan goals by attracting and facilitating research on over 660 projects. These efforts are increasing the ability of park managers to make resource decisions that are informed by sound science. Many Research Learning Centers advertise their backlog of high priority research needs through multiple media venues to reach a large scientific audience. Some Centers are working with partners to fund restoration of park facilities, thereby decreasing the maintenance backlog. In FY 2005, Research Learning Centers provided bunk space, camp sites, laboratory and office space, and other amenities that enable researchers to make maximum use of their time and project funds.

Research topics supported by Research Learning Centers address natural, historic, and cultural resource issues, visitor use and satisfaction, effectiveness in education and community outreach, and park operations and safety. Natural resource issues focus on a range of topics including plant and animal inventories, wildlife ecology, fire behavior and effects, predicting the occurrence of invasive species, and climate change impacts. Cultural and historic topics include ethnographic studies, traditional use of the landscape by Native Americans, impacts



San Juan Island students help plant native grasses in the restored prairies of San Juan Island National Historical Park, a project facilitated by a Research Learning Center: North Coast and Cascades Research Learning Network.

California Mediterranean Research Learning Center facilitated research to track the survival rate of mountain lion kittens, to have a better understanding mortality rates and managing the species

to visitors from maintenance renovations, and reconstruction of historic roads and buildings. Education specialists at the Centers are involved in projects that utilize multi-media approaches for communicating research results widely, and critically evaluate the effectiveness of these education and outreach strategies. By leveraging facility and staff resources, Research Learning Centers are reaching outside park boundaries to acquire new knowledge for parks.

A critical role of research is the application of results. On a daily basis, park managers and staff must make decisions regarding resource protection, planning, public outreach, and visitor experience. Congress, the Service, and numerous advisory panels have encouraged the application of current knowledge to management decisions. Research Learning Centers are helping move research results to managers through a number of venues including formal presentations and seminars, reports and briefing statements, workshops and discussion sessions, and management meetings. In FY 2005, Research Learning Centers held more than 40 events to connect researchers and research results directly with park managers and staff.

Research Learning Centers are also actively engaged with students and teachers. Elementary through high school students have participated

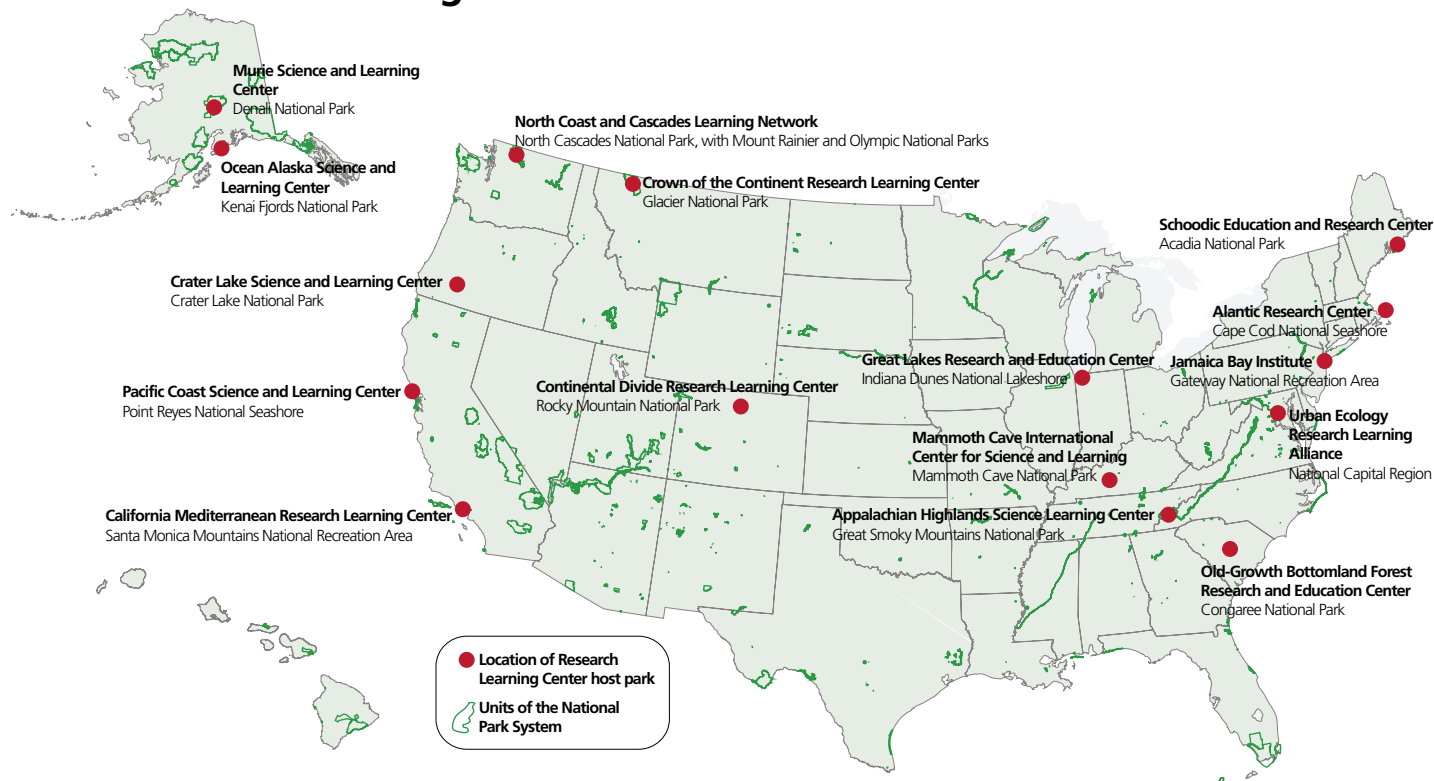
in more than 65 events, including Citizen Science projects, science seminars, field trips, writing newspaper articles for a metropolitan paper, training sessions, and round-table science discussions. College-level students supported by, or involved in, Research Learning Center projects include 90 undergraduates, 193 Masters degree candidates, 2 post-Masters projects, 42 Ph.D. candidates, and 11 post-doctoral positions.

The range of partners engaged in Research Learning Center activities includes non-profit organizations, volunteers, Civilian Conservation Corps, internal park service partners such as Inventory and Monitoring Networks and Cooperative Ecosystem Studies Units, as well as a vast array of federal, state, and tribal agencies and universities. In FY 2005 Research Learning Centers worked with 255 internal and external partners. The partnering mechanisms and relationships are efficient and the leveraged results fiscally responsible. The \$2 million of Natural Resource Challenge funding for Research Learning Centers has leveraged \$8M in direct match and in-kind assistance, plus millions more in research supported solely by outside funding agencies. The added value of improved community relations, informed management decisions, and enhanced knowledge about park resources cannot be measured in dollars.

Location	Research Learning Center Name	Funding First Received:	
		FY 2001	FY 2002
Acadia NP	Schoodic Education and Research Center		X
Cape Cod NS	Atlantic Research Center	X	
Congaree NP	Old-Growth Bottomland Forest Research and Education Center		X
Crater Lake NP	Crater Lake Science and Learning Center*		
Denali NP	Murie Science and Learning Center*		
Gateway NRA	Jamaica Bay Institute		X
Glacier NP	Crown of the Continent Research Learning Center		X
Great Smoky Mountain NP	Appalachian Highlands Science Learning Center	X	
Indiana Dunes NL	Great Lakes Research and Education Center		X
Kenai Fjords NP	Ocean Alaska Science and Learning Center	X*	
Mammoth Cave NP	Mammoth Cave International Center for Science and Learning*		
National Capital Region	Urban Ecology Research Learning Alliance		X
North Cascades, Mount Rainier & Olympic NPs	North Coast and Cascades Research Learning Network		X
Point Reyes NS	Pacific Coast Science and Learning Center	X	
Rocky Mountain NP	Continental Divide Research Learning Center	X	
Santa Monica Mountains NRA	California Mediterranean Research Learning Center		X

*Did not receive Natural Resource Challenge funding, but was developed in response to the Challenge.

NPS Research Learning Centers



Research Learning Centers began to be developed in 2001 through congressional funding: the Natural Resources Challenge. There are now 15 RLCs and 2 more being developed, one at Crater Lake National Park and one for the Northern Colorado Plateau parks. RLCs facilitate research and disseminate that information to managers, staff, visitors, schools and the community.

Research Learning Centers are an example of how the Service is creatively meeting the information needs of staff and managers. The ability of each Center to respond and adapt is due, in part, to their unique characteristics. As such, they are evolving to both meet the needs of their particular area and to provide models of excellence in specific capacities for the Research Learning Center Network, as well as the Service as at large. After 5 years of development, the Network of Research Learning Centers is undergoing a self examination to evaluate successes, development needs, and to collectively chart future direction. One mechanism for accomplishing this is by defining a role for servicewide coordination across the Centers. Another mechanism is the collective definition of the common mission and set of goals given at the beginning of this article. Greater collaboration and communication across the Centers over the next 2 to 3 years will capitalize on gains made to date and mature the Centers' abilities to facilitate research, increase partnerships, leverage funds, and serve a broader range of park units.

Research Learning Centers made great strides in FY 2005 and highlights of accomplishments are summarized below.

- A Research Learning Center facilitated a study to address the management of invasive feral hogs at Congaree Swamp National Monument. The Old Growth Bottomland Forest Research and Education Center worked with

USGS and Clemson University to document feral hog movement patterns and population dynamics across the Congaree floodplain. This type of wildlife study is the first of its kind at Congaree, and the results will have both specific and broad applicability for both public and private lands. Informational products will be available to park resource management and will contribute directly to the development of a long-term management plan for feral hogs.

- Partnering with neighboring tribes and university scientists in Montana and Alberta, the Crown of the Continent Research Learning Center is undertaking a cultural use study for Chief Mountain, a sacred site in **Waterton-Glacier International Peace Park** that is used for ritual and ceremonial purposes by the Blackfoot People. Indigenous use of the park's mountain landscapes goes back for millennia and involves many tribes. The cultural significance of Chief Mountain is being documented primarily through oral histories. The project is collaborative with Waterton Lakes National Park in Alberta, Canada and the tribes of the Blackfoot Confederacy in the U.S. and Canada. Results will inform resource management, interpretation, and will contribute to initiating a listing of Chief Mountain in the National Historic Registry.
- The loss of marshland in Jamaica Bay, located within **Gateway National Recreation Area**, is an example of how sound science is informing park management decisions. Anecdotal information from concerned local residents

and fisherman regarding the shrinking of marshes prompted the Jamaica Bay Institute, a Research Learning Center, to facilitate analysis of historical and current aerial photography. The analysis showed that approximately 50 acres of wetlands are disappearing annually and if this trend continues it is estimated that by 2025 most of the marsh islands will vanish. Such credible information prompted many actions within and beyond Gateway's boundaries. A Blue Ribbon Panel was convened to address the critical loss of wetlands and several research projects were funded based on the panel's recommendations. A marsh loss symposium, hosted by the Jamaica Bay Institute, provided land managers and policy officials with up-to-date information on the evaluation of salt marsh loss. The prominence of this issue has guided large scale restoration efforts in Jamaica Bay. It is clear that scientific data collected from this analysis will be a critical component of a Watershed Management Plan that is in development.

- The Atlantic Research Center, based at **Cape Cod National Seashore**, facilitated research on the effects of hunting on cottontail rabbit populations. Hunting on outer Cape Cod is a complex scientific, cultural, emotional, and legal issue for the park, its neighboring communities, agency partners, animal rights groups, and the general public. Incorporating robust scientific information into the decisionmaking process for management of rabbit populations is essential. This research project is expected to produce a much more detailed understanding of how hunting interacts with other sources of mortality to affect rabbit populations. The results of this study will be incorporated directly into all aspects of compliance with the National Environmental Policy Act process, public information and comment, assessment of impacts, evaluating alternatives, decision-making, and documentation.
- The Urban Ecology Research and Learning Alliance, based in the National Capital Region, communicates with many different audiences to communicate research results. In July 2005, the Science Education Coordinator collaborated with Hispanic Self Reliance Network for the radio program *Pulse of the Planet* to produce eight news briefs on the results of the urban forest tree inventory and assessment of ecological services in the national parks and the city of Washington, D.C. These news capsules were taped in Spanish and will be distributed to a large network of Hispanic radio stations throughout the country.
- At Schoodic Education and Research Center, in **Acadia National Park**, citizen scientists helped perform a Coleoptera Blitz, a taxonomic inventory event. Over a weekend in July 2005, 55 citizens spent 2,242 hours collecting, sorting, pinning, and identifying beetles that were found on the Schoodic Peninsula portion of Acadia National Park. This was Acadia's third consecutive bio-blitz focusing on invertebrates.
- The Great Lakes Research and Education Center, hosted by **Indiana Dunes National Lakeshore**, is facilitating research on purple loosestrife, an invasive plant species, with the help of many volunteers. The Research Learning Center, in partnership with USGS, held a workshop and trained 25 local volunteer citizens and recruited 3 international volunteers. The volunteers make possible the logistically difficult task of collecting worldwide data on a widespread species in both its invasive and native habitats. The program also educates the public in the environmental problems posed by invasive species, and gives them an appreciation for the importance of research.
- The Murie Science and Learning Center, hosted by **Denali National Park**, joined the ALISON project, a product of the Alaska Lake Ice and Snow Observatory Network (ALISON). For the third year, students from Denali Borough School District in partnership with University of Alaska, Fairbanks, visited Horseshoe Lake to measure and record lake ice and snow. Thirty-two students (in third, fourth and fifth grade) braved snow and cold temperatures to make the 1.5 mile hike to the lake and back twice per month. The Horseshoe Lake site is one of 16 sites across the state that make up the Alaska Lake Ice and Snow Observatory Network. Through this citizen science program students provide data that may help detect changes in the ice and snow levels throughout the state over time.
- The Pacific Coast Science and Learning Center, located in **Point Reyes National Seashore**, collaborated with the Tomales Environmental Learning Center at Tomales High School to teach students skills in using GIS (Geographic Information Systems) and GIT (Geographic Information Technology) in characterizing their local watershed for future water quality analysis projects in the community. Over a three month period, students met with a GIS database manager to focus their studies on the interrelationship between people, software, hardware, methodologies and data in a GIS project. Their project goal was to map the watershed of a tributary of Keyes Creek which includes the Tomales High School Campus. The result was a final map of their local sub-watershed that included their high school campus.



Chapter Five: Financial Details

This chapter presents financial details for Service-wide natural resource programs. Information in Chapters Three and Four describe program accomplishments and highlight which of the programs have benefited from the Natural Resource Challenge funding provided between FY 2000 and FY 2005, and how the programs were affected.

The Natural Resource funding is requested as a series of discrete programs, including 14 Service-wide programs, Everglades restoration elements, and the Glen Canyon Adaptive Management Program. Funding for the set of actions that make up the Natural Resource Challenge in some cases was requested as new programs, but also was requested under appropriate program budgets. Since many Challenge increases resulted in expansions of existing programs, only some of the Challenge budget increases are easily identifiable separate line items. In other cases, the

Challenge funds are mixed with previous park or program bases. Therefore, the Challenge funding cannot be distinguished in most of the program-by-program financial information. Details of the history of Challenge funding are included in Appendix A.

Likewise, parks receive a single allocation for their operations funding and neither Challenge funding, nor natural resource management generally, are separately identified. For parks, funding is shown only for parks that received Natural Resource Challenge funding; funding for their entire natural resource programs is as reported by the parks.

Below are details of funding changes by program between FY 2004 and FY 2005. In addition, where appropriate, additional detail is provided regarding how funding within these programs has been allocated.

Natural Resource (NR) Funding of Parks Receiving NR Challenge Increases

Park	FY 01 or FY 02	FY 2002	FY 2003	FY 2004	FY 2005
	Challenge Increase	NR Total	NR Total	NR Total	NR Total
Acadia National Park	345,000	849,827	794,395	755,087	752,395
Antietam National Battlefield	150,000	319,965	316,723	314,900	353,000
Appalachian National Scenic Trail	142,000	263,638	256,603	258,337	298,642
Big Cypress National Preserve ¹	399,000	1,033,640	1,010,000	1,108,140	1,108,140
Buck Island Reef National Monument ²	100,000	270,000	216,450	216,000	216,000
Catoctin Mountain Park*	89,000	254,400	231,900	232,200	272,414
Channel Islands National Park ³	498,000	1,406,622	1,406,622	1,440,607	1,891,222
Coronado National Memorial	60,000	94,993	105,231	95,236	108,000
Curecanti National Monument	141,000	657,500	690,600	719,300	724,000
Dinosaur National Monument	189,000	501,800	559,375	568,874	571,152
Gates of the Arctic National Park & Preserve	148,000	362,401	363,039	349,164	377,345
Great Basin National Park	126,000	331,450	315,756	375,939	367,080
Great Sand Dunes National Park	180,000	291,700	287,500	281,300	281,300
Great Smoky Mountains National Park	402,000	1,245,100	1,152,700	1,003,200	1,231,700
Haleakala National Park	480,000	1,561,660	1,372,200	1,196,400	1,196,400
Homestead National Monument of America	82,000	104,500	104,500	81,198	82,460

An eastern red bat (*Lasiurus borealis*) captured in a mist net by University of Maryland Researchers during a Northeast Coastal and Barrier Network sponsored bat inventory, Assateague Island National Seashore, July 2005.

¹ Part of increase to another program for contract support; part of balance of change from pre-Challenge increase due to realigned position

² Also received \$65,000 Coral Reef Initiative increase in FY 2001

* Information provided by parks for FY 2003 report included discrepancies with previously provided information or did not add or subtract correctly; attempts to resolve were unsuccessful

³ Received NRC money in FY2002 (\$498k for Santa Cruz Island restoration) and a non-NRC increase in FY2005 (\$477k for island fox recovery).

Natural Resource (NR) Funding of Parks Receiving NR Challenge Increases					
Park	FY 01 or FY 02	FY 2002	FY 2003	FY 2004	FY 2005
	Challenge Increase	NR Total	NR Total	NR Total	NR Total
Hopewell Culture National Historical Park*	105,000	95,000	79,322	103,047	99,953
Jewel Cave National Monument	50,000	168,500	168,500	167,140	159,203
John Day Fossil Beds National Monument	95,000	129,000	130,000	115,000	127,101
Kalaupapa National Historical Park	211,000	549,000	549,000	549,000	499,000
Lake Clark National Park & Preserve	147,000	321,500	319,810	250,000	262,600
Little River Canyon National Preserve ⁴	85,000	182,426	174,027	112,900	1171,275
Mojave National Preserve*	470,000	1,264,000	1,219,073	1,177,488	1,178,297
Monocacy National Battlefield*	118,000	120,000	116,000	116,000	116,000
Obed Wild & Scenic River	195,000	245,000	193,318	188,775	188,775
Padre Island National Seashore	95,000	408,000	403,825	543,000	471,896
Pictured Rocks National Lakeshore	55,000	194,650	207,000	211,000	237,000
Rock Creek Park*	163,000	436,522	393,168	359,104	299,000
San Juan Island National Historical Park	95,000	124,600	125,050	124,600	124,600
Saugus Iron Works National Historic Site	58,000	58,000	58,000	69,900	58,000
Sequoia & Kings Canyon National Parks* ⁵	112,000	1,446,000	1,424,400	1,424,400	1,457,400
Stones River National Battlefield	132,000	132,000	137,100	127,924	132,000
Sunset Crater, Walnut Canyon, & Wupatki National Monuments	100,000	166,762	171,227	186,341	191,683
Theodore Roosevelt National Park	133,000	302,500	292,500	282,500	281,500
Virgin Islands National Park ⁶	399,000	1,077,234	1,002,726	941,500	877,234
Zion National Park	246,000	536,300	515,872	518,774	485,274
Totals	6,595,000	17,506,190	16,863,512	16,564,275	15,047,667
Air Quality Program					
FY 2004 allocation					8,890,000
Net FY 2004 Decrease ⁷					<u>-14,000</u>
Total Available in FY 2004					8,876,000
FY 2005 allocation					8,890,000
Classified Pay Increase					11,000
Net FY 2005 Decrease ⁸					-128,000
Total available in FY 2005					8,773,000
Change from FY 2004					-103,000

⁴ Figures shown for FY 2001 and 2002 reflect a correction to those reported in last year's report.

⁵ Also received a non-Challenge \$367,000 base increase in FY 2001

⁶ Also received Coral Reef Initiative base increase of \$300,000 and Prototype Monitoring increase of \$230,000 in FY 2001

⁷ The FY 2004 net decrease is the sum of funding changes contained in the Operation of the National Park Service (ONPS) appropriation [general reduction, travel reduction, across-the-board recission reductions, and information technology (IT) reduction].

⁸ The FY 2005 net decrease is the sum of funding changes in response to both a bureau-determined information technology (IT) assessment and travel reduction adjustment.

Air Quality Program Funding by Categories	
Air emissions inventory	200,000
Air quality monitoring, analysis, & technical assistance	8,573,000
Total available in FY 2005	8,773,000
Biological Resources Management Program	
FY 2004 allocation	8,575,000
Net FY 2004 Decrease ⁷	-19,000
Total Available in FY 2004	8,556,000
FY 2005 allocation	8,575,000
Classified Pay Increase	23,000
Net FY 2005 Decrease ⁸	-123,000
Total available in FY 2005	8,475,000
Change from FY 2004	-81,000
Biological Resources Management Program Funding by Categories	
Biological Resource Projects-National Level Support	633,000
Ecological Restoration	260,000
Endangered Species Program	360,000
Exotic Plant Management Teams	5,149,000
Integrated Pest Management Program	240,000
Invasive Animal Program	295,000
Invasive Plant Program	295,000
Migratory Bird Program	143,000
Wildlife Management and Health Program	1,100,000
Total available in FY 2005	8,475,000
Cave and Karst Research Institute	
FY 2004 allocation	344,000
Net FY 2004 Decrease ⁷	-6,000
Total Available in FY 2004	338,000
FY 2005 allocation	344,000
Base change ⁹	-6,000
Net FY 2005 Decrease ⁸	-5,000
Total available in FY 2005	333,000
Change from FY 2004	-5,000
Cooperative Ecosystem Studies Units	
Funding available in FY 2004 ¹⁰	131,000
Net FY 2005 Decrease ⁸	-2,000
Total allocation/available in FY 2005	129,000

⁹ The base increase noted represents the correction to reflect prior year travel reductions properly in various Natural Resources accounts, it is not an actual increase in available operating funds over FY2004.

¹⁰ \$1,596,000 received in FY 2001; \$1,550,000 transferred to regions. In FY 2003, \$310,000 transferred to the region for use during FY 2003. In FY 2004, the same amount less an across-the-board decrease, or \$306,000, was permanently transferred to regions.

Cooperative Ecosystem Studies Units Funding Distribution¹¹

Californian CESU—no Challenge funding	
Chesapeake Watershed CESU	155,000
Colorado Plateau CESU	155,000
Desert Southwest CESU	155,000
Great Basin CESU	155,000
Great Lakes-Northern Forest CESU	153,000
Great Plains CESU	155,000
Gulf Coast CESU	153,000
Hawaii-Pacific Islands CESU—no Challenge funding	
North and West Alaska CESU—no Challenge funding	
North Atlantic Coast CESU	155,000
Pacific Northwest CESU	155,000
Piedmont-South Atlantic Coast CESU—no Challenge funding	
Rocky Mountains CESU	155,000
South Florida-Caribbean CESU	155,000
Southern Appalachian Mountains CESU	155,000
Upper and Middle Mississippi Valley CESU—no Challenge funding	

Geographic Information System Program

FY 2004 allocation	1,291,000
Net FY 2004 Decrease ⁷	<u>-1,000</u>
Total Available in FY 2004	1,290,000
FY 2005 allocation	1,291,000
Net FY 2005 Decrease ²	-18,000
Total available in FY 2005	1,273,000
Change from FY 2004	-17,000

Geologic Resources Program

FY 2004 allocation	2,651,000
Net FY 2004 Decrease ^{7 & 12}	<u>+10,000</u>
Total Available in FY 2004	2,661,000
FY 2005 allocation	2,651,000
Base Change ¹³	25,000
Classified Pay Increase	11,000
Net FY 2005 Decrease ⁸	-40,000
Total available in FY 2005	2,647,000
Change from FY 2004	-14,000

¹¹ Distribution of initial funding from Natural Resource Challenge increases for CESUs shown; other CESUs funded through general regional base funds. Does not show changes to base that may have occurred to funds transferred to regions.

¹² In FY 2004 the Geological Resources Program received a Travel increase of \$10,000 instead of a reduction.

¹³ The base increase noted represents the correction to reflect prior year travel reductions properly in various Natural Resources accounts, it is not an actual increase in available operating funds over FY2004.

Geologic Resources Program Funding by Categories

Cave & Karst	265,000
Coastal Geology	269,000
Disturbed Lands/AML	512,000
Geologic Hazards	125,000
Geologic Resource Evaluation	590,000
Minerals Management	620,000
Paleontology	120,000
Soil Resources	146,000
FY 2005 Total	2,647,000

Inventory and Monitoring Program

FY 2004 allocation	36,932,000
Net FY 2004 Decrease ⁷	-36,000
Total Available in FY 2004	36,896,000
FY 2005 allocation	36,932,000
FY 2005 increase	3,111,000
Classified Pay Increase	41,000
Net FY 2005 Decrease ⁸	-562,000
Total available in FY 2005	39,522,000
Change from FY 2004	+2,626,000

Inventory and Monitoring Program Funding by Categories

Database Development	2,341,500
Monitoring Projects	30,000
Program Administration	1,859,800
Prototype Monitoring	1,000,000
Regional Coordinators	852,000
Resource Inventory Projects	11,220,000
Vital Signs Monitoring	22,218,700
Total available in FY 2005	39,522,000

Allocation of Funding among Basic Natural Resource Inventories

Air Quality Related Values	325,000
Base Cartography Data	1,247,000
Biological Inventories	376,000
Geology Inventories	1,500,000
Meteorology	250,000
Soil Surveys	1,950,000
Species Lists	25,000
Vegetation Mapping—Alaska	500,000
Vegetation Mapping—Outside of Alaska	4,547,000
Water Resource Data	500,000
Total	11,220,000

Inventory and Monitoring Expenditures by Non-NPS Performers					
Inventories	Universities	Other Non-Fed	USGS	Other Fed	Total
AQRV's	270,200			55,600	325,800
Base Carto		1,050,000	190,000		1,240,000
Biol. Inv.	281,200	115,100		4,700	401,000
Geology	752,000	60,000	193,000		1,005,000
Landcover (Alaska)	98,200	228,300	2,000		328,500
Meteorology				250,000	250,000
Monitoring					
Soils				2,067,250	2,067,250
Veg. Mapping	683,000	2,500,000	756,000	421,000	4,360,000
Water Resources			500,000		500,000
Totals	2,084,600	3,953,400	1,641,000	2,798,550	10,477,550

Allocation of Monitoring Funding among Networks and Prototypes	
North Coast and Cascades	345,100
Northeast Coastal and Barrier	778,000
Heartland	702,000
Sonoran Desert	671,300
Cumberland/Piedmont	477,700
Central Alaska	1,245,100
National Capital	747,000
Northern Colorado Plateau	567,000
San Francisco Bay Area	747,200
Greater Yellowstone	726,700
Appalachian Highland	417,400
Mediterranean Coast	303,200
Southwest Alaska	1,449,700
Northeast Temperate	632,000
Southern Colorado Plateau	1,209,000
Pacific Island	1,573,100
Great Lakes	1,289,500
Gulf Coast	929,100
Rocky Mountain	663,500
Sierra Nevada	656,600
Eastern Rivers and Mountains	656,500
Klamath	1,564,700
Arctic	796,200
Southeast Coast	1,266,900
Upper Columbia Basin	225,000
Southern Plains	225,700
Mojave Desert	225,300
Southeast Alaska	225,000
South Florida/Caribbean	226,400
Mid-Atlantic	225,100
Chihuahuan Desert	225,700
Northern Great Plains	226,000
Olympic NP Prototype Program	200,000
North Cascades NP Prototype Program	200,000
Mammoth Cave NP Prototype Program	200,000
Northern Colorado Plateau Prototype Program	400,000
Total	24,012,500

Natural Resources Data and Information Program	
FY 2004 allocation	1,521,000
Net FY 2004 Decrease ⁷	-8,000
Total Available FY 2004	1,513,000
FY 2005 allocation	1,521,000
Classified Pay Increase	5,000
Net FY 2005 Decrease ⁸	-21,000
Total available in FY 2005	1,505,000
Change from FY 2004	-13,000

Natural Resources Preservation Program (NRPP)	
FY 2004 allocation	12,484,000
Net FY 2004 Decrease ⁷	-15,000
Total Available FY 2004	12,469,000
FY 2005 allocation	12,484,000
Base Change	-16,000
Net FY 2005 Decrease ⁸	-173,000
Total available in FY 2005	12,295,000
Change from FY 2004	-174,000

Allocation of NRPP Among Project Categories and Projects Funded

	Allocation	Projects
Alaska Projects	482,000	6
Disturbed Land Restoration	816,000	13
Natural Resource Management	6,780,000	53
Regional Block Allocation	1,346,000	69
Servicewide	1,182,000	28
Small Park	963,000	62
Threatened & Endangered Species	482,000	12
USGS/BRD Technical Assistance	244,000	31

Natural Sound Program	
FY 2004 allocation	921,000
Net FY 2004 Decrease ⁷	-3,000
Total Available in FY 2004	918,000
FY 2005 allocation	921,000
Classified Pay Increase	2,000
Net FY 2005 Decrease ⁸	-14,000
Total available in FY 2005	909,000
Change from FY 2004	-9,000

Resource Damage Assessment and Restoration Program¹⁴	
FY 2004 allocation	1,265,000
Net FY 2004 Decrease ⁷	-6,000
Total Available in FY 2004	1,259,000
FY 2005 allocation	1,264,000
Reallocation of Funds ¹⁵	94,000
Classified Pay Increase	4,000
Net FY 2005 Decrease ⁸	-21,000
Total available in FY 2005	1,341,000
Change from FY 2004	+82,000
Resource Protection Fund	
FY 2004 allocation	294,000
Total Available in FY 2004	294,000
FY 2005 allocation	294,000
Net FY 2005 Decrease ⁸	-4,000
Total allocation/available in FY 2005	290,000
Change from FY 2004	-4,000
Water Resources Program	
FY 2004 allocation	12,071,000
Net FY 2004 Decrease ⁷	-22,000
Total Available in FY 2004	12,049,000
FY 2005 allocation	12,071,000
Classified Pay Increase	19,000
FY 2005 increase	528,000
Net FY 2005 Decrease ⁸	-182,000
Total available in FY 2005	12,436,000
Change from FY 2004	+387,000
Water Resources Program Funding by Categories	
Water Resource Projects	
Water Resource Protection	1,068,600
Competitive Projects	224,000
Other Projects	14,700
Water Quality Monitoring	2,837,800
Water Resource Protection—Aquatic Resource Professionals	1,205,000
Watershed Condition Assessment Program	
Competitive Projects	1,272,000
Critical Projects	275,500
Coastal Projects	534,400
Other Projects	680,900
Water Resource Technical Assistance	4,323,100
Total	12,436,000

¹⁴ Combines two former line items: Oil Pollution Act and Resource Protection Act

¹⁵ Base funding reprogrammed from Visitor and Resource Protection to Natural Resource Stewardship & Science

Allocation of Water Quality Monitoring Funding

Network

Central Alaska	96,600
Heartland	80,900
Northeast Coastal and Barrier	88,700
National Capital	70,000
Cumberland/Piedmont	58,200
Appalachian Highlands	69,000
Northern Colorado Plateau	106,500
Greater Yellowstone	70,000
Sonoran Desert	63,100
North Coast and Cascades	80,900
San Francisco Bay	69,000
Mediterranean Coast	74,900
Southwest Alaska	137,100
Northeast Temperate	59,200
Southern Colorado Plateau	122,300
Pacific Island	148,900
Great Lakes	121,300
Gulf Coast	87,800
Rocky Mountain	60,100
Sierra Nevada	62,100
Eastern Rivers and Mountains	62,100
Arctic	148,900
Klamath	74,900
Southeast Coast	119,300
Upper Columbia Basin	49,300
Southern Plains	28,600
Mojave Desert	78,900
Southeast Alaska	41,400
South Florida/Caribbean	144,900
Mid-Atlantic	43,400
Chihuahuan	72,000
Northern Great Plains	79,900
Servicewide Data Management	1,676,600
Total	2,837,800



BRICE LEECH

Appendix A: Natural Resource Challenge Funding History^A

Challenge Elements ^B	Increase FY 2000	Increase FY 2001	Increase FY 2002	Increase FY 2003	Increase FY 2004	Increase FY 2005	Increase/ Change FY 2006	Cum. Funding FY00-06	Request FY 2007	Total through FY 2007
Inventory and Monitor Resources										
Basic inventories (except vegetation mapping)	7,309			1,987				9,296		9,296
Vegetation mapping (with USGS)		1,746		2,235				3,981		3,981
Park air emissions inventory		200						200		200
Monitor vital signs in park networks		4,191	4,200	6,855	4,939	3,068	3,931 ^C	23,253	1,000	24,253
Monitor water quality in park networks		1,272		497	592	521		2,882		2,882
Watershed assessment				3,080				3,080		3,080
Expand air quality monitoring and related activities			2,600					2,600		2,600
Make natural resources data useable		1,098						1,098		1,098
Fix Critical Problems										
Natural Resource Preservation Program project funding	2,875		4,000				[3,931] ^C	2,944		2,944
Alaska Natural Resource Projects				497				497		497
Establish resource protection fund			300					300		300
Water resource protection & restoration/project funds		823						823		823
Water resource protection & restoration/ field specialists			1,000	200				1,200		1,200
Native/nonnative species mgt & Exotic Plant Mgt Teams	3,449		2,400	2,136				7,985		7,985
Implement Resource Protection Act/restore resources			500					500		500
Protect geologic resources	696							696		696
Park invasive species control/ T&E species recovery		3,395	3,200					6,595		6,595
Attract Scientists										
Establish learning centers		898	1,800					2,698		2,698
Establish Cooperative Ecosystem Studies Units		1,596		397				1,993		1,993
Annual Increase	14,329	15,219	20,000	17,884	5,531	3,589	0		1,000	77,552
Total Annual Funding	14,329	29,548	49,548	67,432	72,963	76,552	76,552		-	77,552

^A Appropriated funds before any rescissions or permanent assessments.

^B All dollars in thousands.

^C Reprogramming of existing NRPP base funds to monitoring vital signs in park networks.

At Mammoth Cave National Park resource managers are collecting American Butternut seeds as part of an initiative to restore them to the park. This project is made possible by Natural Resource Preservation Program project funding.



Appendix B: Natural Resource Preservation Program Funded Projects

NRPP - Disturbed Lands Restoration fully funded projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
AKR	AK	Denali National Park and Preserve	Reclamation of Placer-Mined Glacier Creek	\$198,000	\$67,000
IMR	UT	Timpanogos Cave National Monument	Restore Natural Cave Drainage	\$114,000	\$35,000
PWR	CA	Sequoia and Kings Canyon National Parks and Whiskeytown National Recreation Area	Restore Hydrology & Soil Disturbance in Marijuana Gardens	\$91,600	\$91,600
PWR	CA	Yosemite National Park	Happy Isles Dam Removal	\$52,800	\$7,000
Total				\$456,400	\$200,600

NRPP - Disturbed Lands Restoration new and ongoing projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
IMR	AZ	Glen Canyon National Recreation Area	Restoration of Springs on Navajo Point	\$66,000	\$35,500
MWR	AR	Buffalo National River	Stream Corridor Restoration within Newly Acquired Properties	\$157,800	\$59,300
MWR	IN	Indiana Dunes National Lakeshore	Complete Restoration of 500 Acres of Wetland at Derby Ditch-Great Marsh	\$223,700	\$67,900
MWR	WI	Saint Croix National Scenic River	Protecting genetic diversity through prairie restoration	\$57,800	\$32,800
NCR	VA	Prince William Forest Park	Disturbed Land Restoration of the Bradford Tract	\$107,600	\$9,000
PWR	WA	Olympic National Park	Restore Hydrologic Function, Fish, Wildlife, Veg - Upper Hoh River	\$250,000	\$48,000
PWR	CA	Pinnacles National Monument	Old Pinnacles Road Removal (Final Phase)	\$174,700	\$158,300
PWR	CA	Presidio of San Francisco	Restore Disturbed Coastal Areas Following Remediation	\$250,000	\$135,600
PWR	CA	Yosemite National Park	Ecological Restoration of Gaylor Pit	\$167,200	\$61,000
Total				\$1,454,800	\$607,400

NRPP—Small Park Projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
AKR	AK	Klondike Gold Rush National Historical Park	Provide GIS Support for Dyea VERP and Social Science Survey	\$30,000	\$9,504
AKR	AK	Sitka National Historical Park	Complete a Non-vascular Plant Survey	\$30,000	\$9,504

Crew leader Mike Ade hand pulls Miconia at Haleakala National Park on Maui, Hawaii. NRPP funding supported work to prevent the highly invasive Miconia from displacing native Haleakala rainforest.

NRPP—Small Park Projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
IMR	UT	Arches National Park	Analyze Vegetation Changes from late 1800's to Present Using Historic Photography	\$17,000	\$17,000
IMR	NM	Capulin Volcano National Monument	Propagate Native Vegetation for Restoration of Disturbed Areas	\$32,800	\$16,400
IMR	WY	Devils Tower National Monument	Control/Eliminate Non-native Invasive Plant Species-Next Phase	\$39,500	\$19,500
IMR	WY	Devils Tower National Monument	Control/Eliminate Non-native Invasive Plant Species	\$20,000	\$20,000
IMR	NM	El Malpais National Monument and Conservation Area	Continue Fence Construction	\$19,300	\$19,300
IMR	AZ	Fort Bowie National Historic Site	Analyze and Rehabilitate Apache Spring Watershed	\$35,200	\$16,700
IMR	WY	Fossil Butte National Monument	Assess Paleobotanical Resources	\$12,000	\$12,000
IMR	UT	Hovenweep National Monument	Acoustic Monitoring	\$26,800	\$20,000
IMR	UT	Hovenweep National Monument	Re-establish Historic Vegetation Long-term Monitoring Plots	\$8,400	\$8,400
IMR	TX	Lyndon B. Johnston National Historical Park	Replace East Boundary Fence	\$20,000	\$20,000
IMR	TX	Lyndon B. Johnston National Historical Park	Evaluate invasive plant response to alternative treatments	\$6,500	\$3,500
IMR	CO	Mesa Verde National Park	Investigate Paleoecological Fire History	\$5,100	\$5,100
IMR	UT	Natural Bridges National Monument	Acoustic Monitoring	\$24,600	\$20,400
IMR	UT	Timpanogos Cave National Monument	Restoring Cave Resources	\$38,500	\$20,000
IMR	AZ	Tumacácori National Historical Park	Fence New Park Lands	\$40,000	\$20,000
MWR	AR	Arkansas Post National Memorial	Hunting boundary demarcation at the memorial unit	\$3,038	\$3,038
MWR	IA	Effigy Mounds National Monument	Control and Monitor Garlic Mustard Multi-Year	\$20,000	\$20,000
MWR	IA	Effigy Mounds National Monument	Begin Research Analysis on Driftless Area Paleo-Landscape	\$15,000	\$15,000
MWR	ND	Fort Union Trading Post National Historic Site	Digitize cartographic, vegetation, and other historic park data	\$8,000	\$8,000
MWR	MO	George Washington Carver National Monument	Implement Vegetation Management Plan (yr 1)	\$3,000	\$3,000
MWR	MN	Grand Portage National Monument	Bark Beetle Survey of Grand Portage Trail Corridor	\$19,970	\$19,970
MWR	IA	Herbert Hoover National Historic Site	Develop Plan to Convert 3 acres of turf to transitional landscape near Gravesite	\$10,000	\$10,000
MWR	OH	Hopewell Culture National Historical Park	Control Exotic Vegetation at Mound City Group Unit (2of2)	\$15,000	\$15,000

NRPP—Small Park Projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
MWR	SD	Jewel Cave National Monument	Assess Jewel Cave Public Drinking Water Supply	\$8,800	\$8,800
MWR	MI	Keweenaw National Historical Park	Complete resource stewardship plan	\$10,000	\$10,000
MWR	ND	Knife River Indian Villages National Historic Site	Assessment of Prairie Vegetation Management at KNRI	\$8,000	\$8,000
MWR	NE	Midwest Regional Office	RAMS and PMIS training for small parks	\$26,800	\$26,800
MWR	MN	Pipestone National Monument	Control Exotic Weeds and Native Plant Restoration on Disturbed Lands	\$10,000	\$10,000
MWR	NE	Scotts Bluff National Monument	Remove Old Fence Posts within Scotts Bluff National Monument	\$11,628	\$11,628
NCR	VA	George Washington Memorial Parkway	Subterranean explorations: Ground water amphipods of the GWMP	\$10,000	\$10,000
NCR	VA	Prince William Forest Park	Develop Management Plan for <i>Isotria medeoloides</i> , a Federally Listed Threatened Species	\$9,900	\$9,900
NER	MA	Boston Harbor Islands National Recreation Area	Develop IPM Plans and Map Exotics	\$61,974	\$61,974
NER	VA	Colonial National Historical Park	Control Phragmites	\$10,000	\$10,000
NER	PA	Gettysburg National Military Park	Identify collected invertebrates	\$28,366	\$28,366
NER	PA	Gettysburg National Military Park and Eisenhower National Historic Site	Develop IPM Plans	\$10,795	\$10,795
NER	PA	Valley Forge National Historical Park	Catolog/Archive natural resource files	\$6,713	\$6,713
NER	PA	Valley Forge National Historical Park	Turbidity optical stick and auto-sampler	\$6,100	\$6,100
PWR	CA	Eugene O'Neill National Historic Site	Plan for Cattle Pond Restoration	\$300	\$300
PWR	CA	John Muir National Historic Site	Control Yellow Star Thistle	\$14,400	\$14,400
PWR	HI	Kaloko-Honokohau National Historical Park	Determine Revegetation Strategies Through Pollen Analysis	\$17,778	\$17,778
PWR	OR	Lewis and Clark National Historical Park	Control Noxious Weeds in Newly Acquired Lands	\$16,000	\$16,000
PWR		Multiple Parks	Assess Invasive Marine Plant Threat to Pacific Island Small Parks	\$50,000	\$50,000
PWR		Multiple Parks	Develop Weed Free Feed/Mulch Program in California Parks	\$14,600	\$14,600
PWR	AS	National Park of American Samoa	Initiate Control of Invasive Tree	\$22,420	\$22,420
PWR	GU	War in the Pacific National Historical Park	Assess Coral Recruitment/ Sedimentation Rates	\$15,750	\$15,750
PWR	WA	Whitman Mission National Historic Site	Revegetate Restored Doan Creek Streambanks	\$12,452	\$12,452
SER	KY	Abraham Lincoln National Historic Site	Restoration American Chestnut	\$22,100	\$12,000
SER	KY	Abraham Lincoln National Historic Site	Restore American Elm	\$12,000	\$12,000

NRPP—Small Park Projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
SER	LA	Cane River Creole National Historic Site	Conduct A Baseline Inventory Of The Vascular Plants At CARI	\$24,000	\$12,500
SER	NC	Carl Sandburg Home National Historic Site	Prepare an Inventory and Management Plan for Low Elevation Granitic Domes at CARI	\$14,400	\$14,400
SER	SC	Charles Pinckney National Historic Site	Re-establish Native Grasses	\$14,400	\$14,400
SER	GA	Chattahoochee River National Recreation Area	Increase Reproductive Productivity of Georgia Aster, a Federal Candidate Species	\$15,600	\$6,700
SER	GA	Chattahoochee River National Recreation Area	Out compete Invasive Microstegium Using Native Grass Species (<i>Chasmanthium</i>)	\$15,600	\$6,000
SER	GA	Chickamauga and Chattanooga National Military Park	Control Exotic Plants On Lookout Mountain Battlefield	\$24,000	\$24,000
SER	GA	Fort Pulaski National Military Park	Privet Removal and Replanting at Significant Civil War Battlefield Site	\$9,600	\$9,600
SER	GA	Fort Pulaski National Military Park	Baseline Monitoring & Analysis of Health of the Salt Marsh Ecosystem	\$7,500	\$7,500
SER	SC	Kings Mountain National Military Park	Provide Term Resource Management Assistance at KIMO and COWP	\$113,400	\$36,600
SER	SC	Kings Mountain National Military Park	Inventory and Treat Invasive Exotic Plant Species at KIMO	\$43,000	\$12,000
SER	TN	Obed Wild and Scenic River	Survey of Developed Areas for Threatened and Endangered Plant Species	\$9,600	\$9,600
SER	GA	Ocmulgee National Monument	Eradicate Exotic Fauna	\$14,400	\$14,400
SER	FL	Timucuan Ecological & Historic Preserve	Prepare Forestry Management Plan for TIMU Pinelands and Plantation	\$19,200	\$19,200
TOTAL				\$1,241,284	\$944,992

NRPP—Natural Resource Management fully funded projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
AKR	AK	Glacier Bay National Park and Preserve	Evaluating Campsites: Predicting Bear-Human Conflicts and Bear Displacement Potential	\$215,000	\$107,000
AKR	AK	Lake Clark National Park and Preserve	Refine Techniques to Survey Harvested Brown Bear Populations	\$285,000	\$67,000
AKR	AK	Western Arctic National Parklands	Inventory and status assessment of lichens in Noatak NPres	\$74,000	\$55,000
IMR	UT	Bryce Canyon National Park	Protect Dark Night Skies	\$272,000	\$92,000
IMR	WY	Grand Teton National Park	Bison Demographic Monitoring, Disease Surveillance	\$796,000	\$236,000
IMR	NV	Lake Mead National Recreation Area	Continue saltcedar control	\$153,000	\$51,000
IMR	CO	Rocky Mountain National Park	Implement Interim Actions for CWD Management	\$428,000	\$167,000

NRPP—Natural Resource Management fully funded projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
IMR	CO	Rocky Mountain National Park	Prepare a situation assessment for elk mgmt. EIS	\$122,000	\$36,000
IMR	AZ	Walnut Canyon National Monument	Fence Remaining Boundary of Expansion	\$88,000	\$88,000
IMR	WY	Yellowstone National Park	Multi-trophic level ecology of wolves, elk, and vegetation	\$175,000	\$58,000
IMR	UT	Zion National Park	Restore Highly Impacted Backcountry Areas	\$327,000	\$118,000
MWR	SD	Badlands National Park	Document significant fossil localities within the Poleslide Member	\$290,000	\$94,000
MWR	OH	Cuyahoga Valley National Recreation Area	Control invasive plant species and sensitive resource areas	\$180,000	\$51,000
MWR	MI	Pictured Rocks National Lakeshore	Enumerate Black Bear Population at Pictured Rocks National Lakeshore Using DNA from Hair Samples	\$99,000	\$99,000
MWR	ND	Theodore Roosevelt National Park	Evaluate factors influencing the distribution and movement of elk	\$162,000	\$15,000
MWR	SD	Wind Cave National Park	Monitor for Chronic Wasting Disease	\$246,000	\$35,000
NCR	DC	National Capital Region	Assess condition and identify stressors of aquatic resources in NCR	\$248,000	\$8,000
NER	NY	Gateway National Recreation Area	Investigation and restoration of the Jamaica Bay saltmarsh ecosystem	\$598,000	\$67,000
NER	WV	New River Gorge National River	Fecal bacterial source tracking	\$205,000	\$35,000
NER	PA	Valley Forge National Historical Park	Control invasive non-native woody vegetation in forested areas	\$180,000	\$180,000
PWR	CA	Channel Islands National Park	Reintroduce Island fox on San Miguel and Santa Rosa Islands	\$826,000	\$251,000
PWR	HI	Haleakala National Park	Prevent miconia invasion from displacing Haleakala rainforest	\$878,000	\$296,000
PWR	HI	Kalaupapa National Historical Park	Exclude Ungulates from Pu'u Ali'i Plateau	\$663,000	\$190,000
SER	KY	Mammoth Cave National Park	Propagation and restoration of endangered mussels in the Green River	\$526,000	\$117,000
Total				\$8,036,000	\$2,513,000

NRPP—Natural Resource Management new and ongoing projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
AKR	AK	Western Arctic National Parklands	Assess the potential for heavy metal bioaccumulation in terrestrial biota in Cape Krusenstern NM	\$235,000	\$199,000
IMR	TX	Amistad National Recreation Area	Survey and Monument 41 Miles of Impacted Park Boundary	\$123,000	\$44,000
IMR	TX	Big Bend National Park	Protect Big Bend Slider	\$35,000	\$35,000

NRPP—Natural Resource Management new and ongoing projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
IMR	CO	Black Canyon of the Gunnison National Park	Survey Boundary to Protect Park Resources	\$180,000	\$60,000
IMR	UT	Canyonlands National Park	Acoustic Monitoring of Natural Soundscape	\$206,000	\$80,000
IMR	NM	Carlsbad Caverns National Park	Assess Mexican Free-tailed Bat Population at CAVE	\$368,000	\$87,000
IMR	MT	Glacier National Park	Evaluate the Prey Base for Lynx: Snowshoe Hare Abundance, Habitat Use, and Population Dynamics	\$433,000	\$168,000
IMR	CO	Great Sand Dunes National Park & Preserve	Determine Grazing Ecology and Management Of Elk and Bison In Great Sand Dunes National Park and Preserve	\$450,000	\$185,000
IMR	CO	Mesa Verde National Park	Investigate Paleoecological Fire History	\$108,000	\$66,000
IMR	TX	Padre Island National Seashore	Protecting Endangered Kemp's Ridley Sea Turtle Nests from Vehicular Traffic	\$295,000	\$106,000
IMR	AZ	Petrified Forest National Park	Excavation of Threatened Fossil Bone-bed	\$82,000	\$22,000
IMR	AZ	Saguaro National Park	Remove Invasive Exotic Plants from Critical Habitats at Saguaro National Park	\$196,000	\$94,000
IMR	WY	Yellowstone National Park	Conserve Declining Yellowstone Pronghorn Population	\$376,000	\$139,000
MWR	WI	Saint Croix National Scenic River	Document Habitat Requirements of the Winged Mapleleaf Mussel: Potential Habitat Degradation and Decline	\$219,000	\$71,000
MWR	MN	Voyageurs National Park	Assess the Impacts of International Lake Level Management by Using an interdisciplinary Approach	\$899,000	\$277,000
MWR	MN	Voyageurs National Park	Assess Impacts of Forest Fires on Levels of Mercury in Lake and Forest Environments	\$150,000	\$50,000
NER	MA	Boston Harbor Islands National Historical Park	Boat Wake Impacts and their Role in Shore Erosion Processes	\$411,000	\$131,000
NER	NY	Gateway National Recreation Area	Efficient Surveillance, Targeted Management, Natural Transmission Dynamics of West Nile Virus	\$292,000	\$110,000
NER	VA	Shenandoah National Park	Identify and Assess Cliff Resources and Visitor Use, Develop and Implement Cliff Management Planning	\$520,000	\$343,000
NER	VA	Shenandoah National Park	Assess Hydrology for Sensitive Wetland System at Big Meadows	\$132,000	\$58,000
NER	PA	Upper Delaware Scenic and Recreational River	Identify Threatened Bald Eagle Habitat and Develop Management Plan	\$145,000	\$93,000
PWR	CA	Channel Islands National Park	Establish Baseline of Newly Established Marine Reserves	\$564,700	\$198,000
PWR	WA	Olympic National Park	Atmospheric Pollutant Loading: Link to Trans-Pacific Airmass	\$287,000	\$76,000

NRPP—Natural Resource Management new and ongoing projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
PWR	CA	Pacific West Region	NPS Western Airborne Contaminant Assessment Project	\$642,000	\$311,000
PWR	CA	Pinnacles National Monument	Eradicate feral pigs	\$767,000	\$333,000
PWR	CA	Point Reyes National Seashore	Cape Ivy Removal in GOGA and PORE	\$770,000	\$301,000
SER	VI	Buck Island Reef National Monument	Test Effectiveness of Buck Island Reef NM Expanded Marine Reserve	\$300,000	\$105,000
SER	GA	Cumberland Island National Seashore	Establish Exotic Plant Management Program for Southeast Coast Network Parks	\$661,000	\$236,000
SER	TN	Great Smoky Mountains National Park	Support for Predator Beetle Facility Needed to Control Exotic Hemlock Woolly Adelgids	\$396,000	\$222,000
Total				\$10,242,700	\$4,200,000

NRPP—Regional Block Allocation projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
AKR	AK	Alaska Regional Office	Alaska Park Science Journal	\$105,000	\$32,700
AKR	AK	Alaska Regional Office	Alaska Park Cooperative and Technical Assistance Projects	\$75,000	\$24,750
AKR	AK	Alaska Regional Office	Natural Resource Employees Professionalization and Technical Competency Enhancement	\$60,000	\$19,800
AKR	AK	Alaska Regional Office	Alaska Park Science Conference	\$50,000	\$9,900
AKR	AK	Alaska Regional Office	Develop and Implement BMPs for OHV Trail Management AK Park Units	\$50,000	\$49,500
AKR	AK	Alaska Regional Office	Alaska Park Technical Reports	\$30,000	\$9,900
AKR	AK	Denali National Park and Preserve	Develop Regional Integrated Pest Management (IPM) Program to Insure Health of Natural Resources	\$15,750	\$6,435
AKR	AK	Gates of the Arctic National Park and Preserve	Assess Moose Population Health in Areas of High Human Controversy and Harvest	\$57,040	\$28,235
AKR	AK	Gates of the Arctic National Park and Preserve	Coarse-Scale Wolverine Distribution and Habitat in Interior Alaska	\$18,500	\$9,158
IMR	NM	Bandalier National Monument	Measure Combined Impacts of Fire and Browsing on Vegetation	\$40,000	\$20,000
IMR	TX	Big Bend National Park	Protect Big Bend Slider	\$33,000	\$33,000
IMR	CO	Dinosaur National Monument	Monitor Peregrine Falcon Population After Delisting From Endangered Species List	\$20,000	\$20,000
IMR	MT	Glacier National Park	Establish Baseline Survey of Priority Rare Plant Populations and Communities	\$30,000	\$10,000
IMR	AZ	Grand Canyon National Park	Control of Ten High Priority Exotic Plant Species	\$19,900	\$19,900

NRPP—Regional Block Allocation projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
IMR	CO	Great Sand Dunes National Park	Evaluate Habitat and Conduct Baseline Fisheries Study of the Sand Creek Drainage	\$20,000	\$20,000
IMR	TX	Padre Island National Seashore	Assessment of Impacts from Oil and Gas Activities on Grassland Birds	\$37,000	\$17,300
IMR	AZ	Petrified Forest National Park	Survey Wilderness Paleontological and Biological Resources For Management Planning	\$20,000	\$20,000
IMR	WY	Yellowstone National Park	Documenting the Presence and Distribution of Lynx	\$20,000	\$20,000
IMR	UT	Zion National Park	End Wildlife Access to Human Foods to Resolve Visitor Safety Issues-Education and Waste Management	\$39,600	\$19,800
MWR	WI	Apostle Islands National Lakeshore	Determine Appropriate Harvest Levels of deer to protect unique vegetation form overbrowsing (year 1)	\$20,900	\$20,900
MWR	AR	Buffalo National River	River Use Monitoring Program	\$18,000	\$18,000
MWR	NE	Homestead National Monument of America	Develop Compliance, Planning and Implementation for Woodlands Project, year 2.	\$9,000	\$9,000
MWR	SD	Jewel Cave National Monument	Impact of wildfire on composition, abundance, and distribution of exotic plants at JECA	\$23,542	\$23,542
MWR	NE	Midwest Regional Office	Development of Park Resource Management Programs	\$28,600	\$28,600
MWR	NE	Midwest Regional Office	Train Park Resource management staff in new RMP guidelines	\$25,915	\$25,915
MWR	MI	Pictured Rocks National Lakeshore	Inventory, Mass, and Assess Recreation Impacts in the Pristine Zone	\$24,700	\$24,700
MWR	MI	Pictured Rocks National Lakeshore	Evaluate Avian Response to Hikers at PIRO	\$24,000	\$24,000
MWR	SD	Wind Cave National Park	Inventory Wind Cave Biota	\$19,000	\$19,000
NCR	MD	Catoctin Mountain Park	Prepare Natural Resource Planning Documents	\$9,600	\$9,600
NCR	MD	Chesapeake & Ohio Canal National Historical Park	Protect Rare, Threatened & Endangered species at CHOH during removal of exotic plants	\$2,000	\$2,000
NCR	VA	George Washington Memorial Parkway	Survey Leaf Beetles at Great Falls Park & Turkey Run, VA	\$2,500	\$2,500
NCR	VA/MD	George Washington Memorial Parkway & Chesapeake and Ohio Canal National Historical Park	Assess Impacts of Deer Invasive Plant Interactions at Potomac Gorge	\$20,000	\$20,000
NCR	WV	Harpers Ferry National Historical Park	Install Bat Gate at John Brown's Cave in HAFE, Component B, only	\$3,200	\$3,200
NCR	WV	Harpers Ferry National Historical Park	Purchase Water Quality Sensor for HAFE	\$1,200	\$1,200
NCR	VA	Manassas National Battlefield	Collects data related to effects of deer exclosures	\$9,400	\$9,400

NRPP—Regional Block Allocation projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
NCR	VA	Manassas National Battlefield	Small Mammal Re-colonization of Restored Lands	\$3,000	\$3,000
NCR	VA	Manassas National Battlefield	Habitat Preferences of Birds Wintering in Restored Grasslands of the Mid-Atlantic Region	\$540	\$540
NCR	DC	National Capital Parks East	Survey of Grassland Birds within Anacostia, Fort Circle and Oxon Cove Parks	\$10,000	\$10,000
NCR	DC/MD	National Capital Parks East	Survey & Map gravel terrace sites	\$10,000	\$10,000
NCR	VA	Prince William Forest Park	Initiate park management Veg. Monitoring Program	\$9,300	\$9,300
NCR	VA	Prince William Forest Park	Stream Bank Assessment—First Order Streams	\$9,100	\$9,100
NCR	VA	Prince William Forest Park	Classifying land use and land change information from historic imagery	\$6,900	\$6,900
NCR	VA	Prince William Forest Park	Transition to E. coli Monitoring	\$6,500	\$6,500
NCR	DC	Rock Creek Park	Produce Video to Reduce Wildlife/Vehicle Collisions	\$4,200	\$4,200
NCR	DC	Rock Creek Park	Restore Meadow in ROCR	\$1,500	\$1,500
NER	PA	Allegheny Portage Railroad National Historic Site	Control exotic knotweed	\$4,060	\$4,060
NER	MA	Boston Harbor Islands National Recreation Area	Restore native diversity	\$24,500	\$24,500
NER	MA	Cape Cod National Seashore	Spade-foot toad breeding characterization study shortfall	\$19,600	\$19,600
NER	NY	Fire Island National Seashore	White-tailed Deer Monitoring	\$22,440	\$22,440
NER	PA	Gettysburg National Military Park	Identify collected invertebrates	\$4,940	\$4,940
NER		Multiple Parks	Maintain current science information from parks on NER website and in <i>Park Science</i>	\$44,739	\$44,739
NER		Multiple Parks	Assessment of long-term changes in coastal barrier ecology NER, SER, IMR	\$23,698	\$23,698
NER		Multiple Parks	Integrated Pest Management (IPM) plans for small parks (shortfall)	\$4,900	\$4,900
NER	VA	Richmond National Battlefield Park	Convert agricultural field to native grass meadow	\$7,000	\$7,000
NER	VA	Shenandoah National Park	Control Growing Mile-a-Minute Infestation at Shenandoah NP Utilizing SCA Native Plant Corps	\$19,500	\$19,500
NER	VA	Shenandoah National Park	Protect native butterflies and fauna at Big Meadows	\$15,000	\$15,000
PWR	CA	Channel Islands National Park	Develop Fecal Genotyping Methods for Fox	\$35,830	\$35,830
PWR	WA	North Cascades National Park	Conduct Applied Research on Control of Japanese Knotweed	\$32,000	\$32,000

NRPP—Regional Block Allocation projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
PWR	WA	Olympic National Park	Track Seasonal Movements of Bull Trout in Hoh Basin & Coastal Washington	\$50,000	\$50,000
PWR	CA	Santa Monica Mountains National Recreation Area	Contain and Eradicate Harding Grass and Revegetate	\$38,520	\$38,520
PWR	CA	Sequoia and Kings Canyon National Parks	Restore Mountain Yellow-Legged Frogs	\$35,950	\$35,950
SER	TN	Big South Fork National Recreation Area	Develop Natural Resource Interpretation Information At Big South Fork NRRRA	\$10,000	\$10,000
SER	FL	Biscayne National Park	Develop a Tool to Measure Combustion Over Engine Use Over Seagrass Flats	\$24,351	\$24,351
SER	VA	Blue Ridge Parkway	Acquire Digital Soil Maps along Blue Ridge Parkway for Park GIS	\$8,656	\$8,656
SER	GA	Chattahoochee River National Recreation Area	Chytrid Fungus Incidence Rates in Southeastern National Parks	\$15,610	\$5,610
SER	SC	Cowpens National Battlefield Park	NEPA Compliance For Prescribed Burning Effects on T&E Dwarf-Flowering Heartleaf at COWP	\$2,175	\$2,175
SER	TN	Great Smoky Mountains National Park	Accuracy Assessment of New GRSM Digital Vegetation Map	\$17,992	\$17,992
SER	FL	Gulf Islands National Seashore	An Inventory and Damage Assessment of Non-native mammals of Cat Island Mississippi (New Lands)	\$25,000	\$25,000
SER	KY	Mammoth Cave National Park	Restoration of American Butternut in Four NPS Units	\$25,000	\$25,000
SER	GA	Ocmulgee National Monument	Install Stream Filtering System to Remove Street Litter at OCMU	\$10,000	\$10,000
SER	GA	Southeast Regional Office	SER Parks Natural Resources/CESU Workshop	\$21,400	\$21,400
SER	VIIS	Virgin Island Coral Reef National Monument	Protection of Benthic Communities [in Virgin Island Coral Reef National Monument]	\$24,350	\$24,350
TOTAL				\$1,610,598	\$1,250,186

NRPP—Threatened and Endangered Species fully funded projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
IMR	CO	Rocky Mountain National Park	Re-establish, Stabilize, and Manage 19 Populations of Greenback Cutthroat Trout	\$66,000	\$27,000
MWR	SD	Badlands National Park	Develop Long-Term Translocation Guidelines for the Black-Footed Ferret Population at CB/ Badlands	\$87,000	\$3,000
PWR	CA	Channel Islands National Park	Restoration planning for Hoffman's rockcress	\$22,000	\$22,000
PWR	HI	Haleakala National Park	Critical Assessment of Habitat for Releasing Endangered Maui Parrotbill	\$149,000	\$74,000

NRPP—Threatened and Endangered Species fully funded projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
SER	KY	Mammoth Cave National Park	Restore Echo River Passage in Mammoth Cave	\$93,000	\$31,000
Total				\$417,000	\$157,000

NRPP—Threatened and Endangered Species new and Ongoing projects

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
IMR	AZ	Grand Canyon National Park	Foraging Ecology of Threatened Mexican Spotted Owls	\$150,000	\$19,000
IMR	TX	Padre Island National Seashore	Determining seasonal movements, habitat use, and abundance of piping plovers at Padre Island NS	\$144,000	\$73,000
MWR	SD	Wind Cave National Park	Reintroduction of black-footed ferrets to Wind Cave National Park - Phase II	\$146,000	\$34,000
NCR/ NER	DC	National Capital Region	Discovery of remnant populations of the endangered dwarf wedge mussel using GIS habitat analysis	\$70,000	\$35,000
PWR	CA	Channel Islands National Park	Develop recovery prescriptions for listed plants of Santa Cruz Island	\$150,000	\$93,000
PWR	HI	Hawaii Volcanoes National Park	Reintroduce 9 extirpated plant species	\$64,000	\$32,000
PWR	CA	Point Reyes National Seashore	Threatened Western Snowy Plover Recovery	\$150,000	\$34,000
Total				\$874,000	\$320,000

NRPP—Special Alaska park projects funded in FY2004

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
AKR	AK	Alaska Regional Office	NPS Western Airborne Containment Assessment Project	\$464,224	\$178,789
AKR	AK	Aniakchak National Monument	Escapement, population structure, genetics and morphology of sockeye salmon within Aniakchak	\$293,486	\$83,044
AKR	AK	Denali National Park and Preserve	Developing an intensive training program for landbird surveyors in Alaska's National Park Units	\$9,600	\$9,379
AKR	AK	Glacier Bay National Park and Preserve	Identify Marine Bird Distribution and Evaluate Visitor Impacts	\$386,291	\$110,400
AKR	AK	Wrangell-St. Elias National Park and Preserve	Evaluate effects of international caribou recovery program	\$148,950	\$48,507
AKR	AK	Wrangell-St. Elias National Park and Preserve	Maintain continuity in monitoring the declining Mentasta caribou herd.	\$48,170	\$47,061
TOTAL				\$1,350,721	\$477,180

NPS-USGS park-oriented biological support progress report—projects funded in FY2004

Region	State	Park	Project Title	Total Project Funding	FY 2005 Funding
--------	-------	------	---------------	-----------------------	-----------------

See Appendix C



Appendix C: USGS—Biological Resources

Title of Project	FY 2005 Report
PROJECTS AWARDED IN FY 2002, ACTIVE IN FY 2005, NO FY 2005 FUNDS	
Development of a model to evaluate impacts of fuels-reduction/prescribed fire in Pinyon-Juniper habitats on avian communities within Colorado Plateau National Parks	<p>For Zion NP, the project has</p> <ul style="list-style-type: none"> • completed a literature review of published and non-published works associated with breeding birds, • compiled detailed historical accounts regarding population dynamics of park breeding species, • updated species lists of all birds reported within mature, mid-aged and young-aged Pinyon-Juniper habitat and of resident, migrant, and vagrant non-breeding species, • established permanent transects prior to fuels reduction in mature and young vegetation types, • utilized park GIS vegetation data themes to permit later correlation of biotic and abiotic parameters with data from vegetation and avian population transects, • conducted baseline avian surveys in 2005, prior to any fuels reduction effort, • provided reports to park staffs and briefed other Colorado Plateau national parks and BLM districts • prepared GIS data themes of Pinyon-Juniper habitat for four parks, • presented to NPS staff preliminary results of the study, the proposed GIS model, and how to incorporate possible management alternatives resulting from the findings of this study. <p>In 2006, the project will complete the study by continuing to establish a baseline for comparison of avian communities in prescribed burned areas with unburned control areas; refining the model; preparing, with park assistance, a model for 32 other parks over the Colorado Plateau; and providing each Colorado plateau park having significant Pinyon-Juniper habitat with the GIS data theme and model for avian habitat responses to prescribed fire in differing Pinyon-Juniper habitat types. These findings will permit these parks to better assess potential impacts on avian community structure of prescribed burning.</p>
Estimating black bear abundance in Great Smoky Mountains National Park using DNA extracted from hair samples	<p>Genetic sampling for mark-recapture studies to estimate population abundance of wildlife populations often uses DNA extracted from hair collected at barbed-wire enclosures. This project studied the efficacy of various sampling regimes for estimating population abundance by investigating how density of sampling sites, number of samples analyzed (sub-sample intensity), and sampling duration affect accuracy and precision of population estimates. Using 2003 and 2004 field data from Great Smoky Mountains NP, the project identified 129 (2003) and 141 (2004) individual black bears using unique genetic profiles obtained from 9 to 10 microsatellite loci and found that reductions in site density, sub-sample intensity, or sampling duration tended to produce low and biased capture probabilities, resulting in unreliable population estimates. The results indicate that effective use of genetic sampling for black bear population estimation requires careful consideration of study design, particularly when population densities are high. Bias would be reduced by analyzing >25 sub-samples each from 4 hair-capture sites/female home range, using a sampling duration of 6–8 weeks. A final report with recommendations was submitted to the park and a scientific article will soon be submitted to an appropriate journal.</p>
Testing and evaluation of remote sensing methods for estimating refuge characteristics of karst wetlands	Submission of this report has been delayed due to Hurricane Wilma.

A 3 year study by the Yellowstone Center for Resources, USGS, and the University of Minnesota evaluated the rates and causes of elk calf mortality in Yellowstone National Park.

Title of Project	FY 2005 Report
Distribution, population dynamics, and herbivory impacts of a pioneering elk herd on Chaco Culture National Historical Park (CHCU)	<p>Elk were captured, radio-collared, and evaluated for physiological condition each April and November 2003–2005 and were monitored monthly for movements, home ranges, behavior, and survival. Calf elk were captured and radio-tagged June–July 2004 and 2005. Vegetation surveys, grazing surveys, browse surveys, and pellet group surveys were completed, summer 2004–2005.</p> <p>Elk numbers increased from approximately 20 in January 2000 to > 43 in December 2005, an average annual rate of increase of approximately 17%/year. For 2003 and 2004, adult cow survival was 1.00 and 0.94, respectively. In 2004, 60% of collared cows produced a calf that survived through November, making calf production high in 2004. Maximum potential population rate of increase was 21% for the elk population in 2004. Fat levels of lactating cows in November were 10.6–13.2%.</p> <p>Elk browsing was light on CHCU, despite elk use being >100% greater in the Use areas. Browse utilization was <14% for all species, rates much lower than observed in other national parks (>70–90%). No differences in plant cover, bare soil cover, or cryptogamic crust cover attributable to elk grazing were found between Use and Control areas. No grass species showed residual stubble heights indicative of over-utilization. No differences in cover of key increaser noxious plants (broom snakeweed, cheatgrass) were found that could be attributable to elk grazing. Water infiltration rate was faster on one Use area compared to another Use area and the Control area, a difference likely due to a suite of vegetation and soil characteristics.</p>
Baseline monitoring of floodplain vegetation and geomorphology prior to dam removal, Elwha River, Olympic National Park	<p>All project activities will be repeated in 2006.</p> <p>FY 2005 activity included:</p> <ul style="list-style-type: none"> • a field task to relate all sites to low streamflow condition accomplished through mid-August site visits when flows were ca. 400 ft³/s and water surface elevation could be surveyed in conjunction with known study transect points, • completion of tree ring analysis for all Olympic NP sites involving two independent assessments of over 170 tree cores, • compilation of data collected along transects (e.g., topographic surveying, line intercept, surficial soil type, woody seedling establishment) and within study plots (cover, basal area, density); preliminary analyses of line intercept data; and plot data preparation for multivariate analyses. <p>In addition, a collaborative study component on the diversity of herbaceous vegetation used existing transects and plots as its sampling template. This work will expand previous herbaceous transect vegetation sampling. In FY 2006, data analysis and writing will be completed.</p>
Water developments in Theodore Roosevelt National Park, North Dakota: Implications for ungulates and herbivory	<p>The National Park Service (NPS) maintains 12 unevaluated water developments in the South Unit of Theodore Roosevelt NP for ungulate water sources and to disperse impacts of herbivory. This project used a time-lapse video camera system to monitor wildlife and visitor use of 7 water developments that were functional during 2003–2004. The project observed >5000 visits by 10 wildlife species, hikers, and horseback riders, finding bison (49%) and feral horses (23%) were observed most frequently and elk (3%), deer (8%), pronghorn (3%), and pack stock (8%) less frequently. Bison, horse, pronghorn, and pack stock groups usually involved water use by >1 member of the observed group whereas only about half of elk and deer observations involved water use. The wide variation in use documented among species and sites provides information useful for prioritizing developments for maintenance or removal. The Park Service extended the project to include the park's North Unit.</p>

Title of Project	FY 2005 Report
<p>Habitat requirements of the endangered California freshwater shrimp (<i>Syncaris pacifica</i>) in streams on the Point Reyes National Seashore and Golden Gate National Recreation Area</p>	<p>This study assessed the habitat requirements of endangered California freshwater shrimp (<i>Syncaris pacifica</i>) in two coastal streams flowing through park lands. During 2003–2004, field sampling occurred in Lagunitas and Olema creeks at seasonal intervals. Ten glides, five pools, and five riffles served as fixed sampling sites, with eight glides, four pools, and four riffles located on Lagunitas Creek and the remainder located on Olema Creek. Shrimp were captured only in Lagunitas Creek, primarily in glides. In general, shrimp were most numerous in habitats containing overhanging streambank vegetation, submerged fine root masses, sandy substrate, and low current velocity where threespine stickleback (<i>Gasterosteus aculeatus</i>), California roach (<i>Hesperoleucus symmetricus</i>), signal crayfish (<i>Pacifastacus leniusculus</i>), and rough-skinned newts (<i>Taricha granulosa</i>) also occurred. Analysis of gut contents from selected fish species indicated that prickly sculpin (<i>Cottus asper</i>) and riffle sculpin (<i>Cottus gulosus</i>) preyed on shrimp. These findings may be useful for creating in-stream habitat conditions that favor reestablishment and long-term survival of shrimp in Olema Creek and other nearby streams that historically supported this species.</p>
<p>Assessing the risk of aerially borne pesticides to declining amphibian species in the national parks of the Sierra Nevada Mountains, California</p>	<p>This study, designed to further determine dose/response relationships of pesticides on amphibian larvae, involved three experiments. The first used environmentally realistic concentrations of chlorpyrifos, diazinon, malathion and their combinations on Pacific treefrogs, was conducted in 2003, and analysis of the results is in progress. The second experiment examined the comparative sensitivity of Pacific treefrog and Foothills yellow-legged frog larvae to parts per billion concentrations of endosulfan and chlorpyrifos and found that biological concentration factors were, for endosulfan, approximately 225 times and, for chlorpyrifos, about 30 times ambient concentration and that cholinesterase was significantly depressed by chlorpyrifos. This study has been completed, a manuscript is being prepared, and the first part of a follow-on study focusing on part per trillion concentrations of endosulfan on three species of California amphibians—western toads, foothills yellow-legged frog and Pacific treefrogs—was completed. The third experiment, which determined the sensitivity of foothills yellow-legged frog larvae to parent and oxon forms of diazinon, chlorpyrifos and malathion, the three most commonly found organophosphorus pesticides in the Sierra Nevada Mountains, has been completed and a manuscript is in preparation. The results identify risks to amphibians in the Sierra Nevada Mountains from pesticides (the sources of which lie outside park boundaries, most likely the Central Valley of California) that are toxic at environmentally realistic concentrations and inform decisions regarding regulation of the most toxic pesticides and restoration of amphibian populations in the Sierra Nevada Mountains.</p>

Title of Project	FY 2005 Report
Determining rates and causes of summer elk calf mortality in Yellowstone National Park	<p>During FY 2005, the Yellowstone Center for Resources, U.S. Geological Survey, and University of Minnesota continued a 3-year study (FY 2003–2005) of mortality in northern Yellowstone elk (<i>Cervus elaphus</i>) calves. The primary objectives are to: 1) estimate relative causes and timing of calf deaths; 2) estimate calf survival rates; and 3) evaluate factors that may predispose calves to death. During May/June 2005, 56 calves <6 days old were captured, fitted with ear-tag transmitters, and monitored daily. Thirty-five of these calves since have died (34 predation, 1 non-predation). Preliminary determinations of causes of death were 21 killed by grizzly and black bears, 6 by wolves, 4 by coyotes, 2 by wolves or coyotes, 1 by an unknown predator, and 1 non-predation death due to disease. Two other calves have unknown fates. From May 2003 to date, 151 calves were captured and 100 (66%) died within the first year of life. Bears and wolves accounted for 58–60 and 14–16 deaths respectively (depending on actual cause of 2 deaths recorded as “wolf or bear”). Results to date indicate some form of compensatory mortality is likely occurring as summer predation has increased (94%; 2003–2004) while winter malnutrition has decreased (0%; 2003–2004) compared to 1987–1990 (72% and 58%, respectively). No human injuries or safety mishaps occurred and no observable injuries or deaths were caused to elk calves during capture and handling. Monitoring of surviving radioed calves will continue through spring 2006. Study results inform resource managers of the Yellowstone ecosystem, the State in setting harvest quotas for local elk hunts, and the U.S. Fish and Wildlife Service regarding delisting of wolves (e.g., the Montana Department of Fish, Wildlife and Parks has proposed a reduction of antler-less elk permits from 1,100 to 100 for the Gardiner Late Hunt). Information regarding effects of wolves on ungulate population dynamics and, in turn, other interactions (such as elk – vegetation) is useful wherever wolves and other large predators (e.g. black bears) are re-colonizing and increasing in density and contributes to basic scientific knowledge about wolf-prey interactions and factors that predispose neonates to mortality. Monitoring of radio-tagged calves will continue through winter 2006. The results will enable comparison of survival rate and cause-specific mortality trends among years and evaluation of factors that may predispose calves to death and will be summarized in a Ph.D. dissertation and one or more publications in peer-reviewed scientific journals.</p>

Title of Project	FY 2005 Report
Amphibian habitat fragmentation in Salt Creek, Canyonlands National Park: implications for reproduction and distribution	<p>Six amphibian species have been identified in the Salt Creek study area, with a third species of spadefoot (<i>Spea intermontana</i>) possibly occurring as well. In May 2003, a <i>Pseudacris triseriata</i> was recorded calling in Salt Creek, the first time this species had been observed in Canyonlands NP. Numbers of toads caught in pitfall traps and seen in afternoon and evening visual encounter surveys declined from 2000 to 2004 at the four primary sites (upstream and downstream from end of open road; upstream and downstream from upper end of closed road) in June, probably as a result of drought conditions during this period. Differences between open and closed road sites diminished during the drought. The no-road segment generally had fewer toads than any of the other sites. <i>Ambystoma tigrinum</i> was found downstream from the end of the road closure area (mouth of Angel Arch) for the first time in May 2003, representing dispersal of about 200–300 m in approximately eight years. In 2004, salamanders had moved downstream approximately 50 m. Both larvae and adults were seen, indicating that the salamanders had become established in this section of Salt Creek. The experimental driving through pools containing known numbers of <i>B. woodhousii</i> eggs resulted in reductions in numbers of eggs left in the pool after a single vehicle passed through the pool at about 5 mph. Average loss was about 50%. Extrapolation of numbers lost after 24 passes (maximum of 12 vehicles allowed in each day, making a round trip) indicated essentially all eggs would be lost from these pools if vehicles were allowed to drive up Salt creek.</p>

PROJECTS AWARDED IN FY 2004, RECEIVED FY 2005 FUNDS

Effect of groundwater withdrawal on avian abundance and species richness in riparian areas of national parks in the desert southwest	<p>The objective of this research project is to evaluate the possible effect of a recently-proposed groundwater withdrawal on abundance and diversity of riparian birds in Saguaro NP (SAGU) and other park units in southern Arizona. Most parks in the region lack quantitative data regarding causal links between groundwater, riparian woodland health, and the unique avian communities they support. The National Park Service agreed to delay the start of field work until Spring 2006 so additional sources of funding could be located and project personnel recruited. Additional funding secured from both USGS and Arizona Game and Fish Department will allow expanding the project to additional NPS units having riparian woodlands facing similar types of threat (e.g., Tumacacori NHP). Subsequent project cooperator meetings have used a geographic information system and geologic and hydrologic variables such as stream order, area of watershed, depth of groundwater table, type of bedrock, and slope to identify replicate riparian woodland study plot locations. Project personnel are visiting riparian woodland in SAGU for field methods training.</p>
Measuring the impact of wastewater on concentration of nutrients, fecal bacteria, and human enteric virus in ground and surface waters in Dry Tortugas National Park	<p>Submission of this report has been delayed due to Hurricane Wilma.</p>

Title of Project	FY 2005 Report
Documenting current stream productivity and fish populations prior to dam removal in the Elwha River: Setting the stage for long-term monitoring of ecosystem responses.	Restoration of the Elwha River in Olympic NP involves a significant opportunity to restore important fish species, including Chinook salmon, coho salmon, and steelhead, after the removal of two large dams that have been in place for over 90 years. Determining the probable ecological effects and potential limits to success of salmon restoration to at least 70 miles of former spawning habitat within the park boundaries requires documenting existing conditions before dam deconstruction begins. Over the last two years, project activities involved 56 sites, representing mainstem, side channel, and tributary habitat in areas above, between, and below the dams. At most sites, collected samples included water chemistry, macroinvertebrates, periphyton, and fish. These efforts will provide baseline information of community composition, relative abundance, and fish genetics and will establish sampling protocols for determining ecosystem recovery and restoration. This work, involving at least seven entities including park fisheries biologists, has shared methods and research sites and has formalized and pilot-tested protocols for large river monitoring of juvenile and adult fish. The protocols will be provided to the park's Long-term Inventory and Monitoring program.
Monitoring avian community changes and habitat use in the Giacomini Wetland Restoration Project in the Golden Gate National Recreation Area and reference wetlands along Tomales Bay	The Giacomini Wetland Restoration Project will be one of the largest tidal marsh wetland restorations in coastal California, as well as one of the most significant changes in the Tomales Bay watershed. To date, this project has conducted spatially explicit area and point count surveys of the avian community on the Giacomini Ranch site and on three reference wetlands along Tomales Bay (Inverness, Walker Creek, and Olema Marsh). Surveys were designed to determine whether changes in the avian community can be attributed to the restoration using a Before After Control Impact (BACI) design based on 250 x 250 m grid cells to identify unique locations within habitat types. Results to date show the greatest number of birds was observed on mudflats, followed by marsh, pasture, and open water habitat types. Few birds were consistently observed on disturbed and ruderal areas across sites. During FY 2006, the project will complete data analyses and prepare a report that will provide baseline information on the avian community on the Giacomini Ranch restoration site and reference sites prior to restoration action. Monitoring based on the results of this project of avian community changes as restoration proceeds will be an integral part of assessing progress and providing a basis for adaptive management.
Estimating distribution and amphibian occupancy of vernal pool breeding habitat	The status and distribution of vernal pool breeding amphibians are not well documented. During FY 2005, this project used systematic and adaptive cluster sampling to determine vernal pond locations and estimate occupancy status of pond breeding amphibian species for 6 national parks, 11 national wildlife refuges, and 1 state park in the northeastern U.S. This project worked with park and refuge biologists to find and survey 533 vernal pools, approximately 75% of which were previously unmapped locations. In FY 2006, these data will be used to estimate the total number of vernal pools in each of the parks and refuges, determine the proportion of pools that are used by breeding amphibians, help guide long-term monitoring of amphibians at vernal pools on federal lands throughout the northeastern U.S.

Title of Project	FY 2005 Report
Impact of recreational and invasive species on resident aquatic species: Whiskeytown National Recreation Area	<p>This study seeks to determine presence and abundance of Foothill yellow-legged frog and Western pond turtle in the presence of invasive species. For frogs, 8 streams were sampled three times (late spring to early fall) in 2004 and 2005. In 2004, 38 egg masses were found at half of 8 streams surveyed as well as larvae at 7 sites. The only stream where they did not occur was also the only site with the invasive bullfrog present. In 2005, when there was spring flooding and eggs were difficult to observe, yellow-legged frogs were found at all 10 streams, but only 5 egg masses were found in 3 streams. Larvae were found in 7 of 10 streams. Foothill yellow-legged frogs were present in 6 creeks where we found no American bullfrogs. Some bullfrogs were found in 4 other streams, mostly in lower portions. Overall, there appeared to be a healthy population of Foothill yellow-legged frogs in the park unit, unlike elsewhere, where this species is declining. 115 Western pond turtles and 2 introduced Red-eared sliders were found at 6 sites around Whiskeytown Reservoir. Turtles appeared to be stable or not declining in the presence of invasive bullfrogs and a few introduced turtles. However, sliders can increase rapidly once they become established and they need to be removed whenever located. There is little information on the effects of invasive fish in the park unit, which is of concern as ca. 20 fish species have been introduced. Further monitoring of these and other (e.g., crayfish) invasive species is warranted and specific studies are needed on specific topics (e.g., effects of introduced species on native biota). This project has published or submitted 3 news items and 1 small book chapter and anticipates producing two scientific journal papers.</p>
Distribution of black bears in the Elwha Valley, Olympic National Park: Environmental baseline for assessing ecosystem effects of salmon restoration	<p>Beginning in 2008, Olympic NP will dismantle 2 hydroelectric dams on the Elwha River in an effort to restore anadromous fish to this pristine watershed. During 2004 and 2005, this project extended a study begun in 2002 to describe bear distribution patterns prior to dam removal by using Global Positioning System radio-collars to obtain detailed movement information on 7 black bears, thereby increasing our overall sample from 8 to 15 bears. Specific objectives are to determine annual patterns of habitat use of black bears as well as seasonal use of the river corridor and elevational gradients within the watershed. During early spring, bears select low-elevation riparian meadow and hardwood habitats before moving up in elevation as summer progresses. Bears focus activities in high-elevation sub-alpine meadows during late-summer, when they forage primarily on huckleberries, and the return to lower elevations during late fall. Follow-up funding has been obtained to support development of non-invasive methods of monitoring bear distribution over the longer term using barb-wire devices to sample bear hairs and using DNA analyses of bear hairs to document trends in bear distribution following dam removal.</p>
Evaluating vertebrate monitoring indicators for sound decision making: Technical assistance to the Sonoran Desert Network inventory and monitoring program	<p>The University of Arizona and the Sonoran Desert Network (SDN) of the National Park Service (NPS) cooperatively are surveying birds in five NPS units in southern Arizona to test the efficacy and merits of several survey techniques and monitoring indicators for a long-term monitoring program for landbirds in Sonoran Desert parks. Data from this effort will inform the development of the landbird monitoring protocol effort for the network, and potentially other networks of the NPS. In 2005, the project evaluated monitoring indicators and planned for design of a monitoring protocol. In 2006, final adjustments to sampling designs will be accomplished and a final monitoring protocol will be developed for the NPS Sonoran Desert Network Inventory and Monitoring Program.</p>

Title of Project	FY 2005 Report
Augmentation and expansion of endangered freshwater mussel populations in the Big South Fork National River and Recreation Area	Four species of freshwater mussels, Cumberland elktoe (<i>Alasmidonta atropurpurea</i>), Cumberland bean (<i>Villosa trabalis</i>), Cumberlandian combshell (<i>Epioblasma brevidens</i>), and painted creekshell (<i>Villosa taeniata</i>) were propagated for release in the Big South Fork NRRRA. Gravid adults of each species were collected and glochidia were extracted and used to infest several species of fish. During propagation, three new host fish for the Cumberland elktoe were identified, and fish hosts were confirmed for the other mussel species. Nearly 25,000 juveniles of the four mussel species were produced. Juveniles were cultured at the Freshwater Mollusk Conservation Center at Virginia Tech to ages ranging from 2 weeks to 2.5 months and released in the park during summer 2005. Plans for 2006 include continued efforts to produce and release artificially propagated juveniles into the Big South Fork Cumberland River, with the goal of restoring and maintaining the park's native mussel resources.
Assessing the relationship between acid precipitation, calcium depletion, and avian productivity in Great Smoky Mountains National Park	High elevations of the Great Smoky Mountains continue to receive some of the highest deposit rates of air-borne nitrate and sulfate in eastern North America. One effect of the resulting acidification is loss of calcium, which is an essential element to most life. This project is using the Black-capped Chickadee as a model for evaluating the effects of acid precipitation on the region's high elevation bird communities. Black-capped Chickadee populations have been declining in the southern Appalachians over the past two decades, and have disappeared as breeders from several high elevation sites where they once occurred. This project conducted a pilot season of field research in Great Smoky Mountains NP in spring 2005, and will continue field work beginning in March 2006.
Riparian vegetation response to tamarisk invasion and flow regulation in Dinosaur National Monument	Baseline vegetation data for the Green River riparian zone in Lodore Canyon, Dinosaur NM, indicates that at present, within Lodore Canyon, non-native Tamarisk is approximately equal in cover to native Box-elder, in all size classes, except for seedlings, where Tamarisk is significantly more important. In the absence of the large, pre-dam floods, tree-size Box-elder stems are projected to be lost over time from high, pre-dam surfaces. This study is evaluating the effectiveness of Tamarisk removal by comparing vegetation change in Tamarisk removal versus non-removal sites. Early monitoring results indicate that physical removal significantly reduced cover of Tamarisk but did not achieve complete elimination of the smaller size-classes because of sprouting from live root crowns and establishment of new seedlings. Additionally, the non-native herbaceous weed, Spotted Knapweed, increased by 23% on Tamarisk removal sites and several grass species also increased at these sites. Species richness remained the same at both removal and non-removal sites. Vertical vegetation volume, an important structural metric for riparian vegetation that is positively correlated with avian diversity, was significantly reduced following removal of Tamarisk from post-dam surfaces. Future vegetation development on these surfaces as well as avian diversity in these reaches will be followed through continued monitoring. Such monitoring will help park managers weigh financial costs of Tamarisk removal against any resulting ecological benefits.
Effects of road mortality on native anuran populations at Saguaro National Park	Previous studies at Saguaro NP found that at least 23,000 vertebrates were killed annually by vehicular traffic on roads through or surrounding the Park, with the most frequently killed class being anuran amphibians. Call surveys at night to locate breeding sites and daytime visual surveys of pools and streams for eggs, larvae, or new metamorphs, during the 2005 summer monsoon (July–September), revealed seven and eight potential breeding sites on the Rincon Mountain District and Tucson Mountain District of the Park, respectively. Live and dead individuals of three native (red-spotted toad, Couch's spadefoot, Colorado River toad) and one introduced (American bullfrog) anuran species were found on roads on or adjacent to the park. During the 2006 monsoon season, this project will estimate abundances and determine size and sex class distributions of all species breeding at sites near to and far from roads open at night and will also count the numbers of live and dead anurans on the roads nearest to those breeding sites to quantify direct losses to those anuran populations.

Title of Project	FY 2005 Report
Population status and ecology of ashy storm petrel in Channel Islands National Park assessing one of the most vulnerable endemic seabirds in the California Current	<p>Islands within the Channel Islands NP provide essential nesting habitat for Ashy Storm-Petrel. This species also depends upon marine prey resources throughout surrounding waters including several west coast National Marine Sanctuaries. Basic information regarding storm-petrels in the park is lacking, including current population sizes, diet, and quantitative information necessary to identify important oceanographic habitats. Such information is required for effective monitoring and management. The second year (2005) of this ongoing population study of Ashy Storm-Petrel in the park spent 29 nights capturing, measuring, banding, and radio-marking storm-petrels on three islands. The study captured 362 at Santa Barbara Island (SBI), 460 at Scorpion Rock (SR), and 150 at Prince Island (PI). Fifteen previously banded Ashy Storm-Petrels were recaptured at SBI, 9 at SR, and 6 at PI. Standardized Catch Per Unit Effort (CPUE) was 0.093 ± 0.058 SD birds min⁻¹ (183 net hours). The study radio-marked Ashy Storm-Petrels at three colonies: SR, SMI, and PI and between 23 July and 22 September 2004, and 5 July and 4 August 2005, flew 30 telemetry surveys and covered >72,000 km² of ocean. Storm-petrel observations (215 valid locations from 57 individuals) were aggregated over the continental shelf-break from Pt. Conception to Pt. Buchon, within the western Santa Barbara Channel, and over the deep basin separating Santa Cruz, San Nicolas, and Santa Barbara Islands. Individual birds ranged as far north as Gulf of the Farallones National Marine Sanctuary. To our knowledge, this is the first study to use radiotelemetry to document the at-sea distribution and habitat association for any of the world's storm-petrels. The study will continue mark-recapture efforts in 2006.</p>
Does food availability impede bird restoration in Hawaii Volcanoes National Park?	<p>The goal of this study is to determine whether the availability of arthropod prey affects the abundance and distribution of Hawaiian forest birds and whether arthropod abundance may limit bird recovery efforts. Activities completed in FY 2005 included semi-annual sampling of: 1) all bird species using variable circular plot counts and 2) arboreal arthropods on ohia (<i>Metrosideros polymorpha</i>) foliage and branches at eight study sites within mesic and wet ohia forests of Hawai'i Volcanoes NP. Additionally, the study surveyed potential competitors of birds (ants and parasitic wasps) using malaise traps (parasitic wasps) and baits (ants) and identified and enumerated all arthropod samples. Also, the study dried and weighed the ohia foliage associated with each sample and developed leaf-area-index data to facilitate scaling study results to landscape levels. All bird and arthropod data have been entered into electronic databases and are being analyzed and prepared for publication.</p>
The role of hybridization in cattail (<i>Typha spp.</i>) invasions of freshwater wetlands in Great Lakes National Parks	<p>This project is assessing the role of hybridization in the spread of cattails in three Great Lakes national parks using modern molecular techniques to investigate the recent ancestry of invasive cattails and to correlate their hybrid status with their physical characteristics and overall aggressiveness. In 2004, leaf material was collected from nearly 800 plants from wetlands at Indiana Dunes NL, Voyageurs NP, and St. Croix NSR. Genetic analyses conducted during 2005 showed that most of the cattails in the three national parks are spontaneous fertile hybrids between an exotic cattail from Europe, <i>T. angustifolia</i>, and our native broadleaf cattail, <i>T. latifolia</i>, or their offspring, and the highly variable physical characteristics of the corresponding flowering spikes supported this observation. While there are still a few exotic narrowleaf cattails present in the parks, the overall situation has apparently progressed to the level of a hybrid swarm throughout much of the Great Lakes region. At least at Voyageurs, which is both the most northerly and the most westerly of the parks studied, the majority of the cattails bear a greater genetic resemblance to their native ancestor than to their exotic ancestor. In addition, the higher incidence of first generation hybrids at Voyageurs indicates that hybridization is a slightly more recent phenomenon there than at the other two parks. Additional ecological testing was carried out during 2005, with the ultimate goal of providing resource managers with a clearer understanding of management steps needed to preserve the genetic integrity of the pure native cattail in those relict populations where it still exists, and to control any unwanted spread of hybrid and exotic cattails to maintain and enhance wetland biodiversity.</p>

Title of Project	FY 2005 Report
Importance of small wetlands to the diversity of amphibian assemblages in the Delaware Water Gap Recreation Area	This study used a combination of visual encounter surveys, larval dipnet surveys, and adult anuran call surveys in spring and summer of 2005 to assess use of lentic water bodies by pond-breeding amphibians throughout the New Jersey portion of the Delaware Water Gap NRA. The study surveyed 44 wetlands that were stratified among small (< 0.1 ha), medium (0.15 – 0.66 ha), and large (> 1.0 ha) size classes, and found that 14 different species of amphibian deposited eggs in these wetlands. The study will evaluate the importance of small wetlands to the overall maintenance of amphibian biodiversity throughout the study area and will develop predictive models of amphibian species presence as a function of wetland size, hydro-period, and isolation. The study will also produce GIS data layers that will help park natural resource managers identify potential amphibian breeding wetlands, document species occurrence patterns within a portion of these wetlands, and provide gross information on the hydrologic regimes of these habitats. In 2006, the study will assess temporal variability in species presence (i.e. species turnover) by surveying a random selection of 10 wetlands that were previously sampled during the 2005 season.
Producing wolf-elk population model for Yellowstone National Park	Analysis was completed of survival rate and causes of death for a sample of 85 adult female elk in Yellowstone NP over a 3-year period. Annual survival rate was 0.80 (95% CI = 0.73–0.86). Equal amounts of human harvest and wolf predation formed the primary causes of death. Survival analyses of 151 park neonate elk are currently being conducted. Preliminary causes of death were bears (55–60% of total mortality), and coyotes and wolves (10–15% each). When analyses are complete the data from both studies will be used in a wolf-elk population model.
The development of a quantitative decision model for evaluating the effects of river regulation and water use on native fishes in the Chattahoochee River National Recreation Area	Using two study reaches along the Chattahoochee River based on the relative influence of water regulation on the thermal and hydrologic regime, this study during 2005 estimated habitat availability by mapping stream habitats at two flows, representing low and moderate discharge conditions, using GPS and electronic depth recorder. The study also sampled fishes in individual habitat types (e.g., pool, shoal, run) at each study reach to assess effects of thermal and habitat characteristics on fish distribution and community structure and compiled existing data on native fish communities. During FY 2006, the study will complete fish and habitat sampling and begin data analyses and initial model building. The models will allow Chattahoochee River NRA managers to evaluate the influence of various water management scenarios on the abundance and distribution native biota in the river.
Development of methods to improve trapping of free-roaming cats in national parks	Although delayed due to health reasons of the researcher, this project conducted some preliminary site selection during spring 2005 and obtained equipment and field supplies. The study will be conducted in 2006.
Fishes and riverine habitat of Badlands National Park, with emphasis on the sturgeon chub and other imperiled species	Recent surveys of the White River in Badlands National Park have revealed the presence of the sturgeon chub (<i>Macrhybopsis gelida</i>), which had declined in the Missouri River and is a species of concern in South Dakota. This study in Badlands National Park was approved on September 21, 2005, so no substantial work could be done this fiscal year. The possibility of a SCEP (Student Career Employment Program) was explored without success. An MS student will begin sampling in the spring of 2006 and conduct duplicate field studies during the summer of 2007.



Appendix D: Summary of Fully-funded Water Resources Program Competitive Projects

Title of Project	FY 2005 Report
<p>Karst Ground Water Delineation at Russell Cave National Monument and Chickamauga and Chattanooga National Military Park (PMIS #91492)</p>	<p>The purpose of this project was to define the ground-watersheds of Russel Cave National Monument and Chickamauga and Chattanooga National Military Park through fluorescent dye-tracing methods. Such traces demonstrate the connection between recharge points (sinking streams and sinkholes) and springs and also permit inference of the cave stream pathway. The study, being conducted by the Center for Cave and Karst Studies, has conducted a total of 12 groundwater dye traces. On the west side, dyes were injected in Craven's House Spring, Rock Spring, Dogwood Spring, Jackson Spring, Gum Spring, Pond Spring, Warren Point Falls, and Chambliss Cave. With the exception of Chambliss Cave, all tracer tests showed ground water flowing north parallel to the strike. Chambliss Cave, Warren Point Falls, and Jackson Falls all traced to Skyuka Spring. Dogwood and Rock Spring first traced to Ruby Falls and then on to Anderson Spring under the riprap of the highway and into the Tennessee River. All other tracer tests showed groundwater flowing to Mystery Falls Cave and then to Anderson Spring. Although the results are not yet fully analyzed, four dyes have been injected on the East side of the mountain at the Craven's Terrace Swallet, 1st Blue Line Past Rock City Proper Stream, Lenora Spring, and Rock City Swallet. These traces will be traveling to Mystery Falls Cave or Blowing Spring. The last test results are currently being analyzed and a decision will be made if further tracer tests are relevant on Lookout Mountain. Total project costs was \$10,300.</p>
<p>Evaluate Hydrology in Wetlands to Develop Vital Signs—Cuyahoga Valley National Park (PMIS #92088)</p>	<p>The purpose of the project was to extend hydrology monitoring in park wetlands to expand an existing Inventory & Monitoring Program dataset that is being used to develop wetland "Vital Signs." Vital Signs are a set of ecological indicators that can be used as a gauge of wetland stability or condition. Specifically, water level and conductivity were measured approximately biweekly in sixteen selected wetlands (a subset of 48 wetlands from an earlier study) within Cuyahoga Valley National Park for two field seasons over the span of a year. Preliminary results suggest that there are significant differences in hydrology between wetland type, wetland size, and distance to disturbance. A full report will be submitted by December 31, 2005, detailing a final analysis of valuable hydrological indicators in park wetland systems. The total project cost was \$25,080.</p>
<p>Evaluate East Alsek River Sockeye Salmon Habitat—Glacier Bay National Park/Preserve (PMIS #80188)</p>	<p>This project seeks to evaluate existing and historical information to better understand ecological change effects on East Alsek River sockeye salmon. The Park Service and a University of Alaska (Fairbanks) cooperator began collecting and analyzing data to evaluate aspects of natural vs. human change effects on aquatic ecosystems in the Dry Bay area during 2005. Completed geo-referencing and vegetation delineation of four aerial photography series (1948, 1966, 1978–81, and 1996) and summarized vegetation community and wetted-channel change. East Alsek River wetted-channel area has declined more than 40% since 1948. Results of this study will inform Alaska Department of Fish and Game's Biological Escapement Goal of 13,000–26,000 fish per year. Project completion is anticipated in 2007. The project cost was \$46,600.</p>

Endangered duskytail darter (*Etheostoma percnurum*) captured during 2005 fish inventories at Big South Fork National River & Recreation Area.

Title of Project	FY 2005 Report
<p>Prepare a Water Resources Management Plan—Denali National Park (PMIS #55427)</p>	<p>The purpose of the study/project was to develop a water resources management plan using a two-stage process. The plan will summarize the known conditions at the park, including legislation, completed studies and reports, establish “desired conditions,” identify water-related issues, and establish strategic directions for managing water resources. The first phase produced the Water Resources Information and Issues Overview Report during FY 2005. The second phase will use the background information and scoping to inform a formal planning process that will result in a Water Resources Management Plan. This will include conducting public scoping sessions, development of desired conditions for critical water resources, identifying issues, and developing strategies that move Denali National Park closer toward the desired conditions. The total project cost was \$50,000.</p>
<p>Aquatic Resources Synoptic Study along State-Proposed Road Corridor through Denali National Park (PMIS #71667)</p>	<p>The purpose of the study was to gather critical water resources information along a proposed 90-mile new road corridor. Accomplishments include a hydrologic inventory, flood-flow statistics, water quality analysis, air photo interpretation of flood-prone areas, channel geometry analysis of major rivers, aerial survey for springs, and water chemistry of springs. This information was analyzed and the results were presented in a formal report, Water Resources Assessment of the Toklat Basin in the Vicinity of the Stampede Trail Alignment. The total project cost was \$25,000, funded by the Water Resources Program.</p>
<p>Technical Evaluation of Water Quality Monitoring Program—New River Gorge National River, Bluestone National Scenic River, and Gauley River National Recreation Area (PMIS #91435)</p>	<p>The purpose of this project was to evaluate the technical and practical aspects of the water quality monitoring program for New River Gorge NR, Bluestone NSR, and Gauley River NRA (collectively referred to as NERI). A workshop of water quality experts and interested stakeholders was held in Oak Hill, West Virginia, on September 12–14, 2005. All aspects of the NERI water quality monitoring program were discussed at the workshop. Recommendations made at the workshop that are under review include that NERI explore ways to make water quality monitoring data available to the public on the park web site and to consider reducing the amount of interpretation in hard-copy reports to make them available more quickly. A draft report is nearing completion by the workshop facilitator. Suggestions from the workshop and report will be incorporated into the recently initiated NERI General Management Plan for final action. An article for submission to Park Science is expected to come from this project. Total project costs were \$25,500.</p>
<p>Develop Ground Water Flow Model to Determine Wetland Susceptibility to Stressors—Acadia National Park (PMIS #86352)</p>	<p>The purpose of this study is to aid managers at Acadia National Park in selecting wetlands for inclusion in a monitoring program by classifying wetlands according to their hydrologic function and degree of susceptibility to threats posed by degradation (current and potential) of groundwater aquifers on Mt. Desert Island, Maine. Field work has been completed and investigators are finalizing their written reports and GIS data layers. A hydrogeomorphic classification system for wetlands was developed which assigns wetlands to classes using topographic, soils, and surficial geologic data. A table of expected hydrodynamic behavior for each hydrogeomorphic class has been developed. Final reports for the project are expected to be completed early in 2006.</p>

Title of Project	FY 2005 Report
<p>Develop Standards and Indicators for Aquatic Invertebrates for VERP Planning—Zion National Park (PMIS# 43731)</p>	<p>The purpose of this project is to determine if populations of aquatic invertebrates are an effective tool documenting impacts of in-stream hiking in the Zion Narrows. The project was initiated in 2004 through and Interagency Agreement with the U.S. Geological Survey, though field work was delayed until the summer of 2005 by competing work commitments and exceptionally high runoff in the winter and spring of 2005. In 2005, field work was initiated following a field reconnaissance and revision of the study plan, and the interagency agreement with USGS was amended to obligate the FY 2006 (year 2) funding for this 2-year project. Sample sites were identified and samples collected at several sites in the Zion Narrows and two other streams were sampled as potential control sites. In 2006, field sampling will continue, visitor use levels will be measured and additional streams will be evaluated as control sites. Total funds obligated for the project were \$26,500.</p>
<p>Final Water Quality Monitoring to Rescind Cleanup or Abatement Order on Santa Rosa Island—Channel Islands National Park (PMIS# 97342)</p>	<p>The purpose of this project is to develop a stream water quality monitoring plan so that a 1995 Cleanup or Abatement Order issued by the Central Coast Water Quality Board for activities associated with grazing and road management practices on Santa Rosa Island may be rescinded. The plan being developed by the University of California at Santa Barbara will continue the assessment of water quality completed in 1998 and 2002 and develop a plan for future stream monitoring on Santa Rosa Island. Final year project funding will be used to carry out water quality sampling on Santa Rosa Island and develop a monitoring protocol. The final report is expected in 2006. The park is working with the Central Coast Water Quality Control Board (Board). The Board is expected to consider data submitted from the park during the next several months and it is hoped that a decision is made in 2006 to rescind the Cleanup or Abatement Order. Total funding for this project was \$30,000.</p>
<p>Assess Nutrient Sources, Fluxes, and Water Quality of the Aimakapa and Kaloko Hawaiian Fishponds—Kaloko-Honokohau National Historical Park (PMIS #86564)</p>	<p>The goal of the project is 1) to develop a water quality baseline to which future water quality can be compared, 2) develop an understanding of the physical and biological factors that influence the transformation of dissolved nutrients into microbial biomass in the pools and ponds, and 3) determine the natural variability of water quality within the park's resources as a result of seasonality, tidal cycles, and stochastic processes (real variability). A future monitoring schedule to be carried out by park staff will be devised based on these data. Water quality data consists of ammonium, nitrate + nitrite, phosphate, silicate, total dissolved nitrogen, total dissolved phosphate, and chlorophyll a. The first full year of sampling was completed in January 2006. Monthly sampling of anchialine pools, fishponds, and groundwater wells (3 park wells, 2 upslope drinking water wells). A 2-week bioassay of nutrient uptake for Kaloko pond and Aimakapa pond was completed in August 2005. Nutrient analyses and data analyses are on-going. Expendable sampling equipment and data sondes are provided by park base funds to support the project. Park staff has been trained in all field work, sample processing and QA/QC procedures so that future monitoring can be carried out by park staff. All field work and processing is now handled by the staff. Total funding for this project was \$30,800.</p>

Title of Project	FY 2005 Report
Repair Endangered Big Bend Mosquitofish Pond—Big Bend National Park (PMIS #94785)	The purpose of the project was to rehabilitate a failing man-made pond that serves as habitat for an endangered species, the Big Bend mosquitofish. The initial 2004 objectives were: 1) plan pond changes, 2) contract design specifications, 3) obtain necessary permits, 4) design and purchase inflow and outflow structures. The initial objectives were modified somewhat due to recommendations developed during interagency planning meetings where it was strongly suggested to building a new pond rather than reconstructing the existing one as planned. This resulted in the need for an environmental assessment rather than a categorical exclusion for the project. Additionally, the Natural Resources Conservation Service (NRCS) agreed to perform engineering and design for the project at no charge to the National Park Service. Thus, FY 2004 funds originally planned for design activities were used (with Water Resource Program approval) to contract development of an environmental assessment. The total project cost is \$101,900. During FY 2004, \$30,000 in funds was provided by WRP, \$5000 by NRCS, \$1000 by U.S. Fish and Wildlife Service, and \$8000 by Big Bend NP. In FY 2005, \$38,900 was allocated by WRP to complete construction of the pond and accessory structures.
Effects of Dam Removal on Marine-derived Nutrients within the Elwha River Ecosystem—Olympic National Park (PMIS #91682)	The purpose of this project was to establish baseline values for marine derived 15N and 13C isotopes from various trophic levels of the Elwha River ecosystem for comparison with future values after anadromous salmonids return following removal of two dams on the Elwha River. This project was fully accomplished, with macroinvertebrate, fish tissue, periphyton, and macroalgae samples collected during the summer of 2005 for this purpose. Final analysis of the samples is expected to be completed by June 2006, with results to be provided in the Final Completion Report, due September 30, 2006. The total project cost was \$39,000.
Characterize Water Quality, Hydrology, and Aquatic Biology in the Kijik River Basin—Lake Clark National Park/Preserve (PMIS #46782)	The water quality of the Kijik River Basin was studied due to concern over the recent decline in sockeye salmon abundance and potential development on private in-holdings within the drainage. Water quality and biological data were collected from four stream and two lake sites during the summer runoff months (June through October) in 2004 and the winter (March) in 2005. Preliminary results indicate water type throughout the Kijik River Basin is calcium bicarbonate with low concentrations of nutrients, major ions, and dissolved organic carbon. Funds totaling \$40,000 were obligated in FY 2005, and a final report will be completed by December 31, 2005.
Develop a Water Resources Management Plan—Death Valley National Park (PMIS # 98058)	This Water Resources Program-funded project will develop the initial phase of Death Valley National Park's Water Resources Stewardship Plan, focusing on park water resources and applicable laws and regulations. On completion, this phase will be followed by a plan that addresses management actions for DEVA water resources. Major tasks that will be completed in FY 2006 include: (1) evaluation of regulatory relationships that may affect management of Death Valley's water resources, (2) summary of the hydrologic environment of Death Valley and the surrounding region, and (3) detailed identification of water resources and associated resources such as soils, aquatic flora and fauna, and water quality. Phase 1 is expected to be completed in FY 2006 with delivery of a Phase 1 report. The total project cost is \$40,399, which was provided by WRP in FY 2005.

Title of Project	FY 2005 Report
Restore Habitat for the Endangered Southern California Steelhead Trout: Solstice Creek Dam Removal—Santa Monica Mountains National Recreation Area (PMIS #94171)	<p>The purpose of this WRP-funded project is to restore access to spawning endangered southern steelhead trout. The objectives are to remove in-stream barriers (low-water crossings and dams) that may impede the migration of adult and juvenile trout. The objectives have been accomplished in part through cooperative effort from the California Conservation Corps and Heal the Bay, who removed three of the low-water crossings and other concrete debris from a previous dam. WRP funds and funding from the California Conservation Corps and Wildlife Resources Board have been obligated and a contract has been awarded to an 8(a) contractor. The contractor will be removing the remaining three dams and a low-water crossing and replacing the crossing with a residential bridge. Work is scheduled to begin in November (FY 2006) and should be complete by the end of December.</p> <p>The estimated total project cost is \$537,000. During FY 2005, \$100,000 was provided by WRP and was obligated for project implementation. Additional contributions were from California Coastal Conservancy—\$200,000, Wildlife Conservation Board—\$200,000, and NOAA-American Fisheries—\$37,000.</p>

Title of Project	FY 2005 Report
Survey Mercury Levels in Fish in the St. Croix River—St. Croix National Scenic Riverway (PMIS #73209)	The purpose of the project was to compliment and expand heavy metal monitoring that was done as part of the U.S. Geological Survey National Water-Quality Assessment (NAWQA) program to determine the extent and distribution of heavy metals; to continue the study of trace elements in sediment which began in FY 2000; and to study of the relation between tributary basin land use/land cover and methylmercury levels in streams. The study will also provide a mercury tissue index and build upon existing data to provide a more detailed assessment of mercury and methylmercury sources to the St. Croix Riverway. Total WRP project funds expended for FY 2005: \$40,500.
Evaluate Relationships between Water Quality, Seagrass Habitat and Fish Populations—Assateague Island National Seashore (PMIS #96052)	The purpose of the project is to evaluate relationships between estuarine fin fish, invertebrates, water quality, and sea grass coverage. The study will make use of a unique group of datasets collected in the waters surrounding Assateague Island National Seashore that chronicle change in environmental attributes over the past 15 to 30 years during a period when sea grass coverage was expanding. Sophisticated statistical analyses will take advantage of the spatial and temporal range of these data to test for significant correlations between fisheries, habitat and environmental conditions. Accomplishments to date include the acquisition and organization of GIS coverages, preparation of water quality datasets and review of sampling procedures, and the aggregation of fisheries data into ecological categories. The total project cost was \$50,000.00 with final products due in the spring or summer of 2006.
Flood Pulse Systems: Analyzing Potential Changes in Corridor Dynamics due to Changes in Stream Flow—Big Thicket National Preserve (PMIS #88121)	This WRP-funded project seeks to establish models that characterize the hydraulic regimes of the Neches River and the relationship of these regimes to the ecological and conservation requirements of its floodplain in the Big Thicket National Preserve. The \$50,000 project included a topographic survey of the project area, equipment for stream monitoring, and compilation and analyses of existing geographic and vegetation data. The final report detailing the modeling results and the conclusions regarding flood-dependent floral communities will be completed in FY 2006.
Developing Numeric Non-degradation Water Quality Standards for Biscayne National Park (PMIS #94291)	The purpose of this project is to develop a process and statistical methods to define numeric nutrient criteria for Biscayne Bay waters using existing water quality data. FY 2005 funding of tasks completed thus far include: (1) the collection and compilation of the existing nutrient datasets to produce an inventory or database to provide a statistical foundation for the project; (2) documentation of analytical protocols, and; (3) mapping of monitoring stations in the Bay. The final product, expected late in 2006, will be a report containing calculations of the proposed numeric criteria for the nutrients and documentation of the statistical procedures used to derive the criteria.
Develop Water and Aquatic Resources Management Plan—Point Reyes National Seashore (PMIS #3343)	This Water Resources Program-funded project will develop the Point Reyes National Seashore Water Resources Stewardship Plan (WRSP), focusing on park water resources and applicable laws and regulations. Upon completion the WRSP will include: (1) a summary of the hydrologic environment of Point Reyes National Seashore, (2) evaluation of regulatory relationships that may affect management of Point Reyes National Seashore's water resources, and (3) detailed identification of water resources management goals and objectives, and strategies for achieving desired conditions. The total project cost is \$40,399, with completion scheduled by September, 2006.

Title of Project	FY 2005 Report
Assessing the Occurrence, Dissipation & Potential Risks of Glyphosate to Coastal Areas of Biscayne National Park (PMIS #94264)	The purpose of this project is to assess the occurrence, dissipation and potential risks of the herbicide glyphosphate, a pesticide used to control unwanted vegetation along canals and structures in areas of Biscayne NP adjacent to the water control structures. The project is continuing to conduct a detailed survey of canals and coastal environments focusing on the following objectives: a) occurrence of the parent herbicide and metabolites, b) spatial and temporal distributions, c) occurrence of other compounds of concern such as Atrazine, and d) potential accumulation into marine and limnetic sediments. The preliminary results indicate that Atrazine is present in the all the water samples at concentrations ranging from 4.00 to 17.2 ng/L, as expected from surface waters near urban and agricultural lands. Of all chlorinated compounds analyzed only Endosulfan II was detected in the C-102 canal sample above the chemical method detection limit. At 24.4 ng/L, the concentration of this pesticide is well within the levels expected for an area where agrochemicals are still actively used in particular around South Miami-Dade County. All these samples have been extracted for glyphosate and AMPA are waiting for data reduction and reporting. The team has detected other contaminants in the canals in addition to glyphosate, and this finding was considered significant. The information will be to make recommendations on the use of Glyphosphate to local entities and to the NPS Water Resources Program. Total funds obligated for the project were \$66,800.
Retrofit Maintenance Yard Drainage Using Best Management Practices to Prevent Stream Pollution—Rock Creek Park (PMIS # 44717)	The purpose of this project was to retrofit Rock Creek Park’s maintenance yard storm drains to abate any polluted discharges and control excessive stormwater flows from eroding open channels into nearby park streams. Total project funds of \$92,000 was used to install three Filterra stormwater structures, an AquaShield filter, a new manhole, culvert, and discharge dissipation structure in the storm drainage system. The projected improvement to the stream’s water quality will allow for the affected stream to recover and be productive for aquatic organisms.
Assess Hydrological Dynamics of a Pacific Island Wetland—The National Park of American Samoa (PMIS #4145)	The purpose of this WRP funded project is to begin the hydrologic characterization of a palustrine wetland that is unique in Micronesia. At this time, no hydrologic data exist for this 33-acre wetland which serves as the primary natural resource in American Memorial Park and supports at least two federally endangered species, the Nightingale Reed-warbler (<i>Acrocephalus luscini</i>) and the Mariana Moorhen (<i>Gallinula chloropus</i>). Rapid and unregulated urbanization in adjacent lands as well a proposed U.S. Army Corps of Engineers flood control project that will drain into the wetland serves as unquantified threats to the resource integrity. A basic characterization of the wetlands hydrology will provide park staff with the necessary information to evaluate external threats. A contract was awarded at the beginning of FY 2005 and monitoring wells were installed in the summer of 2005. Data collection will continue into 2006, with expected completion and report at end of FY 2006.

Title of Project	FY 2005 Report
Lake Ozette Basin Sediment Source Analysis, Olympic National Park (PMIS # 91707)	<p>The purpose of this project is to examine structure and composition and determine sedimentation rates into Lake Ozette over the last 500 years. WRP funding supported the work. The project was conducted in collaboration with partners at the University of Washington Earth Sciences Department through a cooperative agreement with the Pacific West Region-CESU. Work during the first year focused on an aerial photo/map analysis to determine a history of watershed disturbance, a GIS data compilation, a literature review and preliminary sediment characterization to prepare for coring activities. Major accomplishments associated with these tasks include: (a) compilation and review of literature associated with sedimentation, sediment characterization, watershed processes, and coring techniques and analysis; (b) acquisition and orthorectification into ARCGIS of a set of 1964 aerial photos covering the Lake Ozette watershed; (c) acquisition of watershed aerial photos from 1935, 1953, 1964, 1971, 1977, 1985, 1994, 2000, and 2003; (d) completion of a preliminary shoreline change analysis, including a high resolution shoreline comparison between the 1953 and 2003 photo sets; (e) collection of approximately 25 linear miles of side-scan sub-bottom acoustic profiles determine sediment characteristics for the identification of coring areas; (f) collection of 27 sediment grab samples from depths ranging between 10–75 meters near potential coring sites to determine actual sediment characteristics; and (g) analysis of lead-210 several grab samples to determine feasibility of lead-210 dating as a method for aging sediment layers. Total project cost was \$100,000.</p>
Define Existing Water Quality for Development of Special Protection Waters Regulations—Delaware Water Gap National Recreation Area (PMIS #97320)	<p>The purpose of the project was to add a third year of monitoring data to an existing NPS/USGS Water Quality Assessment Project: Define Existing Water Quality for Development of Special Protection Waters Regulations for 14 Delaware Water Gap NRA Tributaries. The addition of this third year of data was necessary to improve the dataset developed under a two-year sampling effort conducted under the NPS-USGS Water Quality Assessment Program. The two-year effort was influenced by drought conditions in the first year of sampling, resulting in high variability within the dataset. The additional year of data funded under this project improved the dataset to where it is acceptable for inclusion into the Special Protection Waters Regulations administered by the Delaware River Basin Commission (DRBC). The objectives of the project were accomplished in full through the existing NPS-USGS partnership, utilizing a Student Conservation Association Conservation Associate for field and laboratory assistance. USGS has completed data analysis and has presented the analysis procedure and preliminary results to the DRBC where it was accepted as an appropriate procedure for defining existing conditions for Special Protection Waters. Report deadlines for USGS are as follows: draft report for NPS review October 30, 2005; draft report for external review December 31, 2005; and published report summer 2006.</p>



U.S. Department of the Interior

The mission of the Department of the Interior is to protect and provide access to our nation's natural and cultural heritage and honor our trust responsibilities to tribes. We:

- encourage and provide for the appropriate management, preservation, and operation of the nation's public lands and natural resources for use and enjoyment both now and in the future;
- carry out related scientific research and investigations in support of these objectives;
- develop and use resources in an environmentally sound manner, and provide an equitable return on these resources to the American taxpayer; and
- carry out trust responsibilities of the U.S. Government with respect to American Indians and Alaska Natives.



National Park Service

The National Park Service is a bureau within the Department of the Interior. We preserve unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. We also cooperate with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.



Research Geologist Bruce Molnia stands atop a rock in Holgate Arm in Kenai Fjords National Park where photos of Holgate Glacier were taken in 1909. Molnia's modern day photos document a century of glacier change.



Natural Resource Stewardship and Science
1201 Eye Street NW
Eleventh Floor
Washington, DC 20005