



Funding the Natural Resource Challenge

Report to Congress, Fiscal Year 2003



Mission Statement

The National Park Service preserves unimpaired the natural and cultural resources and intrinsic values of the National Park System for the enjoyment, education, and inspiration of this and future generations. The National Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation, and outdoor recreation throughout this country and the world.

Inside Front Cover: The NPS Biological Resources Management Division is developing biome-based resource protection for Great Smokies National Park, where nonnative forest pests such as hemlock wooly adelgid must be treated to avoid potential forest devastation.

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Cover: An island fox on San Miguel Island at Channel Islands National Park must elude predators such as golden eagles to survive. Concern that predation, parasites, and disease could lead to extinction of the island fox population prompted establishment of a captive breeding program as one effort of the Island Fox Recovery Team.

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Natural Resource Stewardship and Science
Washington, DC

Produced by Harpers Ferry Center
Harpers Ferry, West Virginia

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



Hydrologic data collected by NPS studies for 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.

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English ivy and other highly invasive, shade-tolerant exotic plants were hand-cleared from 101 acres of old-growth redwood forest at Redwood National Park by the California Conservation Corps (CCC) and the California Department of Corrections. English ivy had formed thick mats on the forest floor, altering wildlife habitat, suppressing native plants, and growing up into the trees, threatening to topple them if left unchecked.

PHOTO © FINLEY-HOLIDAY FILMS

Executive Summary

The Natural Resource Challenge has instituted new and efficient approaches to managing natural resources.

The Natural Resource Challenge is establishing a foundation for science-based management in parks for the first time. Significantly, the Challenge Program also provides a means to measure agency performance in resource preservation. Park managers need to know what natural resources they manage and the condition of those resources. They require the capability to act once they have resource information. The Natural Resource Challenge has made a strong start in meeting these needs using innovative approaches and expanded expertise and partnerships.

This fourth Report to Congress on the Natural Resource Challenge describes the expenditures and related accomplishments for FY 2003, reflecting funding that began in FY 2000. Documentation includes funding and activities associated with 11 Servicewide natural resource programs and 36 parks.

ACHIEVEMENTS TO DATE

With the FY 2003 increases provided, \$67.432 million total had been added to natural resource programs by the Natural Resource Challenge since FY 2000. As of FY 2003 this additional funding enabled the National Park Service to achieve the following:

- 1,500 park natural resource data sets, including essentially complete inventories for all parks in seven of 12 basic inventory categories, making the National Park Service on track to meet its future inventory targets.
- Air quality monitoring in 63 parks, including new or expanded monitoring at 21 parks.
- Water quality monitoring capability in 17 networks encompassing 153 parks, and with passage of the proposed FY 2005 budget, capability in all 32 networks serving 270 parks.

- A web-based National Park Service Research Permit and Reporting System that facilitates the processing and tracking of more than 7,500 electronic records annually, including applications, permits, and accomplishment reports.
- 16 Exotic Plant Management Teams serving more than 219 parks.
- 36 national parks with new or expanded natural resource programs and strengthened ability to preserve native species.
- 12 Natural Resource Challenge-funded Research Learning Centers to host researchers and disseminate research information.
- Expanded funding for critical natural resource projects, including more than doubling the Natural Resource Preservation Program (NRPP) by adding more than \$7 million, resulting in funding of 281 high-priority natural resource projects in FY 2003.
- Additional field-based and Natural Resource Program Center expertise, including 15 field-based aquatic resource specialists, nine field-based air quality specialists, and expertise in key geologic and biologic disciplines (such as coastal geology, paleontology, animal disease, threatened and endangered species, exotic species, and restoration).

The following additional accomplishments have been made, although park vital signs monitoring is not complete:

- By the end of FY 2003, there were 17 networks, encompassing 153 parks funded for park vital signs monitoring; in FY 2003 12 of these networks completed identification of their vital signs and began final protocol and other design work.



One of nine NPS units in the Great Lakes Vital Signs Monitoring Network, Isle Royale National Park has received funding to implement a wilderness management plan, to develop a strategy for addressing zebra mussel infestations, and to resurvey rare plant plots. NPS PHOTO

- With passage of the proposed FY 2005 budget, 28 of 32 networks—encompassing about 87 percent of parks with natural resources—will be fully funded to implement park vital signs monitoring.

PERFORMANCE ASSESSMENT

Natural Resource Challenge programs directly contributed to the attainment or exceeding of seven out of 10 strategic plan goals related to Challenge activities with specific FY 2003 targets. The exotic species containment goal was surpassed by more than 100 percent. The three goals that were not achieved include those associated with air quality, water quality, and paleontologic resources. However, new and expanded monitoring information will allow park managers to work with state regulators and sources of emissions to seek ways to improve air and water quality in the future.

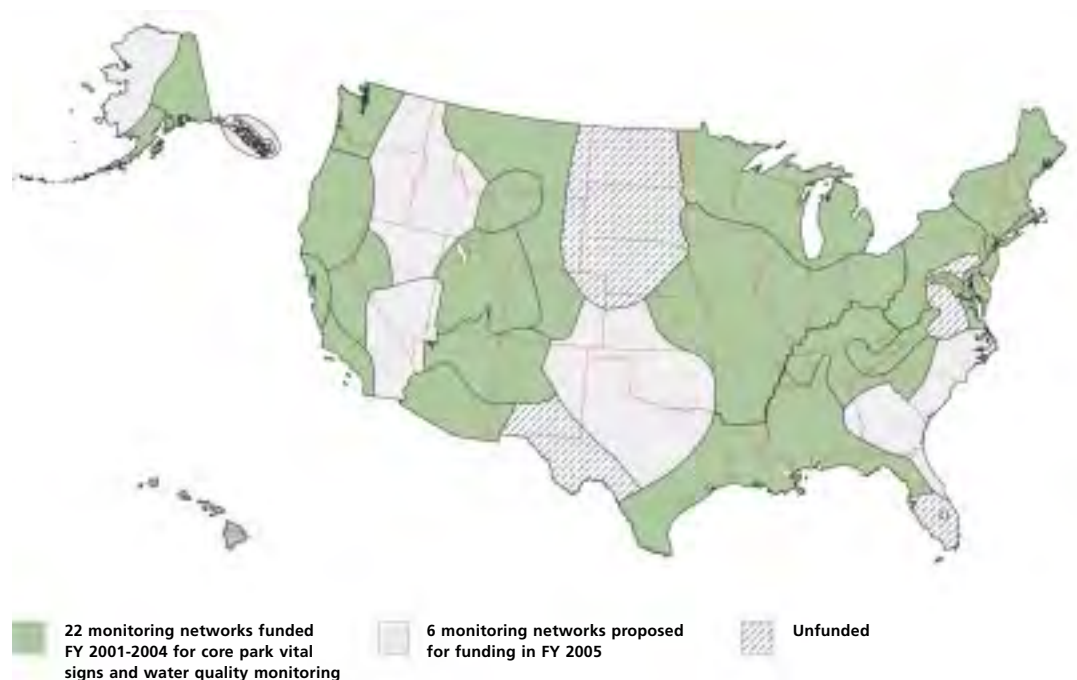
The Natural Resource Challenge has instituted new and efficient approaches to managing natural resources. National parks have been grouped into networks that share similar geographic and natural resource characteristics. Parks within networks share and coordinate fieldwork, staff and equipment, and business practices for monitor-

ing, as well as some inventories. Exotic Plant Management Teams serve multiple parks as mobile strike forces trained in identifying and controlling exotic plants. New partnering arrangements, exemplified by Cooperative Ecosystem Studies Units and Research Learning Centers, have also been established. These new approaches have resulted in significant leveraging of funding.

REAL RESULTS

- More than \$19 million was outsourced to universities, other non-government entities, and non-NPS government agencies for inventory and monitoring products.
- National Park Service Exotic Plant Management Teams leveraged more than \$2.8 million through partnerships to enhance invasive plant control as well as to inventory more than 627,000 acres and treat 10,666 acres of land.
- Use of the Cooperative Ecosystem Studies Units increased from a total of more than 380 projects and \$15 million in FY 2002 to 540 projects and \$19 million in FY 2003.

National Park Service Vital Signs Monitoring Networks Status, FY 2004





Saguaro National Park is one of 11 NPS units in the Sonoran Desert Vital Signs Monitoring Network. In the winter of FY 2003, the Sonoran Desert Network joined with the Sonoran Institute, the U.S. Geological Survey-Sonoran Desert Field Station, and the University of Arizona as the lead partners in a regional monitoring framework for the Sonoran Desert Ecoregion.

PHOTO © RUSS FINLEY/FINLEY-HOLIDAY FILMS

- Through partnerships and consistent communication, the Research Learning Center at Point Reyes National Seashore leveraged \$280,000 to conduct high-priority research in the park and surrounding community areas.
- The Sonoran Desert Network joined with the Sonoran Institute, the U.S. Geological Survey-Sonoran Desert Field Station, and the University of Arizona as the lead partners in a regional monitoring framework for the Sonoran Desert Ecoregion. The framework will embrace monitoring efforts of other federal agencies and Pima County, Arizona.
- The Great Lakes Inventory and Monitoring Network initiated a partnership with Michigan State University to develop an Internet-based gateway that will allow National Park Service staff, partners, and the public to search and download natural resource inventory and monitoring information using spatial and tabular queries.
- Great Smoky Mountains National Park, working with the University of Tennessee, reduced the cost of park stream water quality monitoring by more than 30 percent by applying a state-of-the-art analysis of long-term data sets.
- “Surfrider” volunteers collected marine nearshore water samples to help Olympic National Park determine how to monitor shoreline ocean water quality. Invasive tamarisk and perennial pepperweed were removed from riparian habitat along the Green and Yampa Rivers in Dinosaur National Monument by 524 volunteer “Weed Warriors,” who contributed 2,929 person-hours.
- Post-Hurricane Isabel response decision-making was greatly enhanced by the existence of detailed baseline geologic information provided through the Inventory and Monitoring Program and remote sensing data.

FUNDING SUMMARY

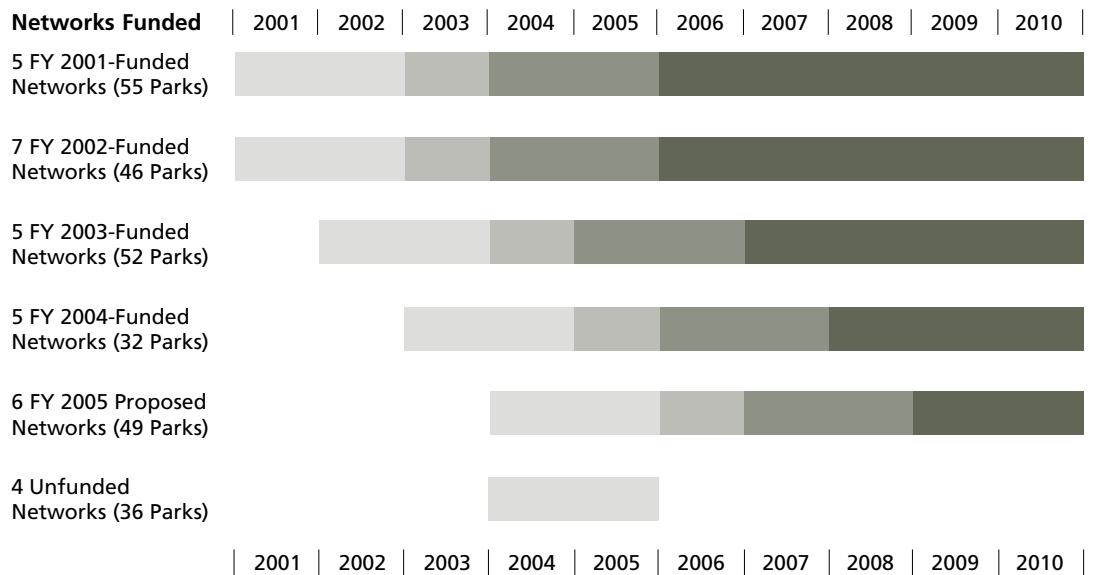
The FY 2004 appropriation and proposed FY 2005 budget for the Natural Resource Challenge contain increases for monitoring activities only. As a result, FY 2003 is the final year of this multi-year effort for increasing funding for non-monitoring elements; these components were significantly funded in FY 2000 through FY 2003.

In FY 2003 there were nine increases totaling \$17.884 million to five programs:

- I. \$2.235 million to accelerate vegetation mapping and \$1.987 million to accelerate other basic inventories, as well as \$6.855 million for park vital signs monitoring in five networks, encompassing 52 parks.
2. \$2.136 million for seven additional Exotic Plant Management Teams.
3. \$397,000 to participate in two additional Cooperative Ecosystem Studies Units.
4. \$497,000 for natural resource projects in Alaska.
5. \$200,000 for three field-based aquatic resource specialists and \$3.08 million for watershed assessments, as well as \$497,000 for water quality monitoring in five networks.

This report provides details on how the National Park Service has used funding and the results that have been achieved.

National Park Service Vital Signs Monitoring Networks Funding and Accomplishments



Accomplishments Each Fiscal Year





Work at Glacier National Park is
underway to evaluate the ecological
integrity of park watersheds.

PHOTO © RUSS FINLEY/FINLEY-HOLIDAY FILMS

Chapter One: Funding

The Challenge includes new funding requests, designed by field superintendents and subject matter experts, necessary to meet future natural resource management needs.

This fourth Report to Congress documents the fourth year of the Natural Resources Challenge Program. Congress endorsed and took the first steps to fund the Challenge, beginning in Fiscal Year 2000. This report describes the expenditures and related accomplishments for FY 2003, as directed in the House Report 106-22 for the FY 2000 appropriations for the NPS and other Department of Interior and related agencies. The intent of the report is to demonstrate agency accountability for stewardship responsibilities and financial obligations, as well as to communicate that implementation of the Challenge Program has been extremely successful to date.

The Challenge Program includes new funding requests, designed by field superintendents and subject matter experts,

necessary to meet future natural resource management needs. Natural Resource Challenge funding has been requested as a series of discrete requests for a specific set of actions included in the Natural Resource Challenge action plan, which features many expansions of preexisting programs. As a result, only some of the Challenge budget increases are easily identifiable programs. In many cases, Challenge funds are mixed with previous program bases. In addition to the Servicewide programs, 36 parks have received funding as a result of the Natural Resource Challenge. The accompanying table shows Natural Resource Stewardship programs appearing in the ONPS: Summaries portion of the National Park Service Budget Justification, with the Natural Resource Challenge components that comprise all or part of the programs.

Natural Resource Challenge Components of Natural Resource Stewardship Programs

PROGRAM	COMPONENT
Air Quality Program	■ Park air emissions inventory ■ Expand air quality monitoring and related activities
Biological Resources Management Program	■ Native/nonnative species management and Exotic Plant Management Teams
Cooperative Ecosystem Studies Units	■ Establish Cooperative Ecosystem Studies Units
Geologic Resources Program	■ Protect geologic resources
Inventory and Monitoring Program	■ Basic inventories (except vegetation mapping) ■ Vegetation mapping (with USGS) ■ Monitor vital signs in park networks
Natural Resource Data and Information Program	■ Make natural resources data useable
Natural Resource Preservation Program	■ Natural Resource Preservation Program project funding
Research Learning Centers	■ Establish Learning Centers
Resource Damage Assessment & Recovery Program (including Oil Spill Pollution Act)	■ Implement Resource Protection Act/restore resources
Resource Protection Fund	■ Establish resource protection fund
Water Resources Program	■ Monitor water quality in park networks ■ Water resource protection and restoration project funds ■ Water resource protection and restoration/field specialists
National Park System Units, Other Field Units, and Central Office Natural Resource Stewardship Programs	■ Park invasive species control/T&E species recovery

The accompanying table shows the history of the funding of Servicewide Natural Resource Stewardship programs, distinguishing those affected by Natural Resource Challenge funding and those that have not been affected. This history since FY 1999—the year before the first Challenge increases—demonstrates how the Natural Resource Challenge has affected these programs.

NPS Natural Resource Stewardship Programs Funding (dollars in thousands)					
PROGRAM COMPONENT	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
SERVICEWIDE NATURAL RESOURCE PROGRAMS					
<i>Programs Affected by Natural Resource Challenge</i>					
Air Quality Program	\$ 6,285	\$ 6,226	\$ 6,443	\$ 9,065	\$ 8,998
Biological Resources Management Program	-	3,449	3,441	5,846	7,930
Cooperative Ecosystem Studies Units ¹	-	-	1,596	46	443
Geologic Resources Program	1,918	1,989	2,676	2,700	2,670
Inventory and Monitoring Program ¹	5,787	12,799	18,565	21,757	32,385
Natural Resource Data and Information Program	-	456	1,542	1,553	1,542
Natural Resource Preservation Program	5,432	8,307	8,289	12,289	12,693
Research Learning Centers ¹	-	-	898	1,800	-
Resource Damage Assessment and Recovery Program (including Oil Spill Pollution Act)	873	879	886	1,394	1,276
Resource Protection Fund	-	-	-	300	298
Water Resources Program	4,754	4,735	6,869	7,905	11,614
<i>Programs Not Affected by Natural Resource Challenge</i>					
Cave and Karst Research Institute	-	-	-	350	348
Everglades–Comprehensive Restoration Plan (CERP)	-	-	2,497	5,544	5,513
Everglades–Critical Ecosystem Studies Initiative	1,200	7,908	6,194	4,000	3,974
Everglades–Task Force Support	800	800	1,316	1,325	1,329
Geographic Information System (GIS) Program	1,336	1,337	1,315	1,316	1,307
Glen Canyon Adaptive Management Program	-	-	-	-	99
Natural Sounds Program (formerly Overflight Program)	200	1,000	1,003	949	931
SUBTOTAL	\$ 28,385	\$ 48,885	\$ 62,527	\$ 77,190	\$ 92,320
NATIONAL PARK SYSTEM UNITS, OTHER FIELD UNITS, AND CENTRAL OFFICE NATURAL RESOURCE STEWARDSHIP PROGRAMS	\$ 65,832	\$ 74,137	\$ 84,530	\$ 94,653	\$ 97,644
TOTAL ²	\$ 94,417	\$ 124,022	\$ 148,060	\$ 172,792	\$ 190,994

¹ Some funds transferred to park or regional bases and not reflected in the programs subsequent to transfer.

² Total of Natural Resources Research Support, Natural Resources Management and Everglades Restoration and Research components of Resource Stewardship Subactivity, Park Management Activity, Operation of the National Park System Appropriation.

This table shows FY 2002 funding and changes resulting from FY 2003 increases and other actions for all of the programs affected by the Natural Resource Challenge. The following three chapters focus on describing the accomplishments achieved in

FY 2003 through the natural resource programs 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.

**FY 2003 Changes to NPS Natural Resource Stewardship Programs Funding
With Natural Resource Challenge Contributions Highlighted (dollars in thousands)**

PROGRAM COMPONENT	FY 2002	FY 2003 PROGRAM INCREASES	FY 2003 ³
SERVICEWIDE NATURAL RESOURCE PROGRAMS			
Air Quality Program	\$ 9,065	\$ -	\$ 8,998
<i>Challenge Contribution</i>	2,800	-	2,800
Biological Resources Management Program	5,846	2,136	7,930
<i>Challenge Contribution</i>	5,849	-	7,985
Cooperative Ecosystem Studies Units ¹	46	397	443
<i>Challenge Contribution</i>	1,596	-	1,993
Geologic Resources Program	2,700	-	2,670
<i>Challenge Contribution</i>	696	-	696
Inventory and Monitoring Program ¹	21,757	11,077	32,385
<i>Challenge Contribution</i>	17,446	-	28,523
Natural Resource Data and Information Program	1,553	-	1,542
<i>Challenge Contribution</i>	1,098	-	1,098
Natural Resource Preservation Program	12,289	497	12,693
<i>Challenge Contribution</i>	6,875	-	7,372
Research Learning Centers ¹	1,800	-	-
<i>Challenge Contribution</i>	2,698	-	2,698
Resource Damage Assessment and Recovery Program (including Oil Spill Pollution Act)	1,394	-	1,276
<i>Challenge Contribution</i>	500	-	500
Resource Protection Fund	300	-	298
<i>Challenge Contribution</i>	300	-	300
Water Resources Program	7,905	3,777	11,614
<i>Challenge Contribution</i>	3,095	-	6,872
Cave and Karst Research Institute, Everglades Research and Restoration, Glen Canyon Adaptive Management Program, and Natural Sounds Program	13,484	-	13,501
<i>Challenge Contribution</i>	-	-	-
NATIONAL PARK SYSTEM UNITS, OTHER FIELD UNITS, AND CENTRAL OFFICE NATURAL RESOURCE STEWARDSHIP PROGRAMS	\$ 94,653	-	\$ 97,644
<i>Challenge Contribution</i>	\$ 6,595	-	\$ 6,595
TOTAL NATURAL RESOURCE STEWARDSHIP PROGRAMS	\$ 172,792	\$ 17,884	\$ 190,994
<i>Challenge Contribution</i>	\$ 49,548	\$ 17,884 ²	\$ 67,432

¹ Some funds transferred to park or regional bases and not reflected in the programs subsequent to transfer.

² All Natural Resource Stewardship increases in FY 2003 associated with Natural Resource Challenge.

³ Net program totals shown; differences between years reflect across-the-board reductions, salary increases, etc., in addition to program increases shown.



Vegetation data collection at
Curecanti National Recreation Area
contributes to inventory and
monitoring efforts within the
Northern Colorado Plateau Network.
NPS PHOTO

Chapter Two: Measuring Progress

Activities associated with the Natural Resource Challenge have contributed to achievement of nearly all the Servicewide long-term goals directly linked to natural resource preservation.

The National Park Service, like most governmental organizations, has an increasing responsibility to report its performance in a measurable way. The Government Performance and Results Act (GPRA)¹ 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.”

Development of the initial National Park Service Strategic Plan (1997) and emergence of the Natural Resource Challenge were closely linked. At that time, most meaningful indicators of resource condition were beyond the National Park Service’s ability to measure. A few national parks undertook some monitoring; yet, they monitored different parameters. The natural resource goals described in the plan continue to exist as a collection of factors the National Park Service *could* measure, rather than a comprehensive approach to measure the

condition of park resources definitively. The third NPS strategic plan, beginning in FY 2004, features condition goals that are more comprehensive. The National Park Service could adopt these improved goals for measuring progress in natural resources preservation because of Natural Resource Challenge funding.

Resource information is critical input for measuring and improving resource conditions and for measuring performance in caring for resources. Many factors affect the condition of natural resources, including some elements that are not under the control of NPS managers. Furthermore, there are many aspects to resource condition. Distilling and agreeing on the appropriate indicators to measure ecologically diverse national park resources is not simple, especially when funding constraints exist. However, the Natural Resource Challenge is establishing a foundation for developing the kind of cohesive, comprehensive, and

Relation of National Park Service Mission Goals to U.S. Department of the Interior Strategic Plan

NPS Mission Goal	Relevance to U.S. Department of the Interior Strategic Plan	
	DOI Strategic Mission Goal	DOI Outcome Goal
1. Preserve Park Resources	1. Resource Protection	■ Improve Health of Watersheds and Landscapes ■ Sustain Biological Communities ■ Protect Cultural and Heritage Resources
2. Provide for Public Enjoyment and Visitor Experience of Parks	2. Recreation	■ Improve Access to Recreation ■ Ensure Quality of Recreation ■ Receive and Provide Fair Value in Recreation
	3. Serving Communities	■ Protect Lives, Resources, and Property
3. Strengthen and Preserve Natural and Cultural Resources, and Enhance Recreational Opportunities Managed By Partners	2. Recreation	■ Improve Access to Recreation ■ Ensure Quality of Recreation ■ Receive and Provide Fair Value in Recreation
	3. Serving Communities	■ Protect Lives, Resources, and Property

¹ GPRA was passed in 1993 to improve operational efficiency and effectiveness by requiring agencies to define their mission goals and identify long- and short-term program goals through strategic planning, and to measure and evaluate program accomplishments through annual performance reports to the American people.



Souvenir hunters and grazing by livestock once reduced the number of silversword plants, or *'Ahinahina*, at Haleakala National Park to fewer than 1,000 individuals. Park resource managers successfully implemented a fencing program, which along with federal protection regulations, allowed silversword numbers to increase to a present population of 50,000 plants. A project has now been developed through the Endangered Species Program to restore populations of the endangered silversword to Hawaii Volcanoes National Park using funding from the Natural Resource Preservation and Resource Protection Programs.

NPS PHOTO

credible measurement of NPS resource conditions that should be in place for such important public assets.

Development and implementation of strategic monitoring programs, started in FY 2001, will build on a foundation of information that began with inventories. These strategic monitoring programs will allow the NPS to possess definitive information on resources managed by the agency, and to measure management performance. When fully funded and implemented, a means to measure resource condition will be established.

Through FY 2003, 17 networks (of a total of 32) involving 153 of approximately 270 parks managing natural resources will have been funded for condition monitoring. 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.

Activities associated with the Natural Resource Challenge have contributed to achievement of nearly all the Servicewide long-term goals directly linked to natural resource preservation. Of the 10 goals related to Challenge activities that had specific FY 2003 targets, seven were attained or exceeded. The exotic species containment goal was exceeded by more than 100 percent. The three goals that were not achieved were those associated with air quality, water quality, and paleontologic resources. New and expanded monitoring information will allow park managers to work with state regulators and sources of emissions to seek ways to improve air and water quality in the future.

The accompanying table shows the relationship of Natural Resource Challenge activities and natural resource programs to the NPS Strategic Plan goals. The goals are from the plan in effect through FY 2003; the current plan in effect beginning in FY 2004 features several new and more comprehensive goals for natural resources.

Natural Resource Challenge Activities Supporting Natural Resource-Related Programs Relationships to Strategic Plan Goals and Results

Servicewide Natural Resource Program	Natural Resource Challenge Activity	Strategic Plan Mission Goal Ia: Protect Park Resources FY 2003 Goals and Results
Parks	Park invasive species control/threatened and endangered species recovery	■ Ia1B. Exotic Plant Species: Exotic vegetation on 4.6% of targeted acres of park lands (122,600 of 2,656,700) is contained. (exceeded) ■ Ia2. Threatened and Endangered Species: 14.5% of the 1999 identified park populations (64 of 442) of federally listed threatened and endangered species have improved status, and an additional 22.3% (99 of 442) have stable populations. (exceeded)
Air Quality	Inventory air emissions/Expand air quality monitoring and related activities	■ Ia3. Air quality in 61% of reporting parks is improving or remains stable. (not met)
Biological Resources Management	Create native/nonnative species program/field teams for nonnative species management (entire program is Natural Resource Challenge-funded)	■ Ia1B. Exotic Plant Species: 4.6% of targeted acres of park lands (122,600 of 2,656,700) with exotic vegetation are restored. (exceeded) ■ Ia2. Threatened and Endangered Species: 14.5% of the 1999 identified park populations (64 of 442) of federally listed threatened and endangered species have improved status, and an additional 22.3% (99 of 442) have stable populations. (exceeded)
Geologic Resources	Protect geologic and paleontological resources	■ Ia1A. 6.1% of targeted park lands disturbed by development or agriculture as of 1999 (122,000 of 222,300) are restored. (exceeded) ■ Ia9A. 30% of known paleontological localities in parks are in good condition. (not met) ■ Ia9B. 95,820 sq. ft. of cave floors are restored. (exceeded)
Natural Resource Preservation Program	Expand NRPP project fund, specialized inventories, training, etc.	■ Ia. Natural and cultural resources and associated values are protected, restored, and maintained in good condition and managed within their broader ecosystem context.
Resource Damage Assessment and Recovery (including oil spills)	Implement Resource Protection Act to restore resources	■ Ia. Natural and cultural resources and associated values are protected, restored, and maintained in good condition and managed within their broader ecosystem context.
Resource Protection	Establish resource protection fund	
Water Resources	Monitor park water quality/ Expand water resource protection and restoration	■ Ia4. 65% of 288 park units have unimpaired water quality. (not met)
Servicewide Natural Resource Program	Natural Resource Challenge Activity	Strategic Plan Mission Goal Ib: Gain Knowledge About Park Resources FY 2003 Goals and Results
CESUs	Establish Cooperative Ecosystem Studies Units	■ Ib. The NPS contributes to knowledge about natural and cultural resources and their associated values. NPS management decisions about resources and visitors are based on adequate scholarly and scientific information.
Inventory and Monitoring	Complete basic inventories, except vegetation mapping	■ Ib1. Natural Resource Inventories: Acquire or develop 59% (1,498) of the 2,527 outstanding data sets identified in 1999 of basic natural resource inventories for all parks. (exceeded) ■ Ib3. Vital Signs: 40% of 270 parks with significant natural resources have identified their vital signs for natural resource monitoring. (exceeded)
	USGS vegetation mapping cost-share	
	Monitor vital signs in networks of parks	
Natural Resource Data and Information	Make natural resource data useable for management decisions and the public	■ Ib. The NPS contributes to knowledge about natural and cultural resources and their associated values. NPS management decisions about resources and visitors are based on adequate scholarly and scientific information.
Research Learning Centers	Establish Learning Centers	
Water Resources	Monitor water quality in parks and assess watershed condition	■ Ib5. Initiate 30 watershed assessment projects in cooperation with USGS. (exceeded)



Student Conservation Association volunteers assist with Monitoring and Avian Productivity and Survivorship (MAPS) work such as mist-netting and banding of small land birds. NPS PHOTO

Chapter Three: Progress in Protecting National Park System Natural Resources

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 resources program.

This chapter focuses on programs whose accomplishments primarily relate to the National Park Service Strategic Plan goal (Ia) that:

Natural . . . resources and associated values are protected, restored, and maintained in good condition and managed within their broader . . . context.

Described are accomplishments of the natural resource programs that received Natural Resource Challenge funding in Fiscal Year 2003:

- Parks Receiving Natural Resource Challenge Base Increases
- Air Resources Program
- Biologic Resources Management Program
- Geologic Resources Program
- Natural Resource Preservation Program (NRPP)
- Resource Damage Assessment and Recovery Program
- Resource Protection Program
- Water Resources Program

Detailed financial information about these programs is located in Chapter Five.

PARKS RECEIVING NATURAL RESOURCE CHALLENGE BASE INCREASES

Challenge Activity:

- *Park invasive species control/threatened and endangered species recovery*

Cumulative Challenge Increases:

- *\$6,595,000 (in FY 2001 and FY 2002)*

Thirty-six national parks have received Natural Resource Challenge-funded base increases for natural resource management. Because the funds are transferred to parks and become indistinguishable from other base funds, no specific FY 2003 allocation is shown. However, Chapter Five contains information about the funding provided to

individual parks, as well as each park's FY 2002 and FY 2003 funding level for its natural resource program.

While no new national parks were funded in FY 2003, the Natural Resource Challenge base funding had a significant impact on the ability of the natural resource management program at each Challenge-funded unit to manage and protect natural resources. In most cases, the Natural Resource Challenge increases greatly strengthened the ability of an individual park to address its most critical problems in managing exotics and improving habitat for threatened and endangered species. 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 resources program. The effect was great because the Natural Resource Challenge funding contributed a total of 40 percent of the base funding for natural resources in the selected parks.

An evaluation of the accomplishments made by the individual parks toward the management of exotic plants, animal invaders, threatened and endangered species, and other native species proves that the Natural Resource Challenge funding was critical for maintaining and improving management efforts. Before receiving Challenge funding, most parks lacked sufficient human resources to plan, direct, and accomplish reductions in exotic invaders; improve habitats for threatened and endangered species; plan and track changes on Geographic Information System equipment; and cooperate with local entities on common concerns related to individual parks. This funding directly contributed to the National Park Service exceeding its goals for containing exotic vegetation and for achieving stable or improved populations of threatened and endangered species.

Following are some specific accomplishments of individual parks:

- **Dinosaur National Monument** was able to seek and supervise nearly 3,000 person-hours of help in exotic species management. By hiring two seasonal park rangers to provide education and project supervision, 524 volunteer “Weed Warriors” contributed 2,929 person-hours in FY 2003, removing invasive tamarisk and perennial pepperweed from riparian habitat along the Green and Yampa Rivers. The Weed Warrior Program has reached 400 to 800 people each year and involved difficult work in remote back-country settings where access is available only to whitewater boats. The Challenge increase represented the first opportunity to make this popular education and service-oriented program a permanent part of the outreach and partnership development repertoire of the park.
- **Pictured Rocks National Lakeshore** mechanically removed more than 150,000 spotted knapweed plants from the Grand Sable Dunes Natural Research Area, the only perched dune system on Lake Superior, to protect the federally-threatened pitcher’s thistle and to aid in restoration of the vegetation community of the dune system. Spotted knapweed is an invasive exotic plant that competes with and ultimately replaces native dune vegetation, including pitcher’s thistle.
- **Zion National Park**, in cooperation with the U.S. Geological Survey Biological Resources Division, completed an intensive line-distance sampling study for the threatened desert tortoise. The survey found an average of 14 tortoises in park habitat, with a 95 percent confidence interval between 12 and 26. Juvenile tortoises were documented for the first time, indicating that the park has a breeding population.
- **Great Smoky Mountains National Park** initiated action on hemlock woolly adelgid (HWA), which has become much more obvious since its discovery in 2002. Nearly 70 known sites have been recorded in a GIS database. Treatments for this potentially devastating nonnative forest pest include insecticidal soap spray (where accessible), soil injection of the

systemic insecticide Imidacloprid, and release of a nonnative predator beetle (*Pseudoscymnus tsugae*). Seven additional *P. tsugae* releases were made in 2003 for a total of 15 sites to date. Forty-eight sites were treated with soap, using more than 16,000 liters of spray. American holly and Rhododendron dieback were monitored in 2003.

- **Gates of the Arctic National Park and Preserve** personnel continued monitoring musk ox populations, trends, and movement patterns in conjunction with the U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game (ADF&G). Musk ox is a subsistence species. ADF&G issued two emergency orders for take of musk ox that required National Park Service involvement. In addition, a Kobuk River moose survey was completed during spring 2003. Further analysis of data is required. Low numbers (total moose less than 0.2 moose per square mile) conflict with subsistence and sport hunters. Insufficient data on moose numbers have required this survey and may necessitate further survey work.

Because Natural Resource Challenge funding for these national parks has become part of their total operating budgets, parks are requested to report on their total natural resource programs, since it is not possible in most cases to distinguish Challenge funds from other base funds. Based on information provided by parks, it appears that many parks—nearly a third—experience a difficult time retaining funding for their natural resource programs because of incremental changes. Across-the-board reductions in appropriations, travel cuts, and salary increases that are not offset by appropriations can reduce total park funding or affect its distribution. For example, funds from other park programs might need to be allocated to cover increased salary costs for law enforcement personnel. While some park natural resource programs were affected by these budget changes, other parks, through a combination of differing circumstances and priorities, were able to maintain more fully the gains brought about by the Natural Resource Challenge. In all cases, however, it is clear that the Challenge has produced positive change, clearly demonstrated by the accomplishments reported.

AIR QUALITY PROGRAM

Challenge Activities:

- *Air emissions inventory*
- *Expand air quality monitoring and related activities*
- *FY 2003 Allocation: \$9,888,000*

This Natural Resource Challenge-funded expansion reflects the tie between the Challenge funding and the National Park Service strategic plan. The National Park Service goal for FY 2003 was that 61 percent of reporting parks would have stable or improved air quality. The National Park Service can influence, but not directly control, achievement of this goal, which is dependent upon climatic factors and the actions of permit holders and regulators. In FY 2003 only 54 percent of reporting parks had stable or improved air quality; expanded monitoring and ability to provide information to state regulators and those requesting emissions-related permits can help improve air quality in these parks.

Air Emissions Inventory

The Air Resources Division continued its effort to address in-park air pollution sources. The National Park Service initiated audits of air pollution sources in more than

55 parks. Nine of these were completed in FY 2003. These audits are used to calculate emissions, identify strategies to reduce or prevent pollution from park operations, and determine compliance with state and federal air pollution regulations.

Park operations are found to be substantially in compliance with air pollution control, permitting, and emission fee requirements. In addition, many parks are currently implementing green strategies that reduce air pollution emissions, such as alternative transportation measures, use of alternative fuels and vehicles, and fire management practices aimed at preventing the accumulation of woody fuels.

Natural Resource Challenge funds made it possible for the Air Resources Division to provide more specialized and intensive service to parks engaged in environmental planning for activities that result in air pollution, such as use of recreational vehicles and prescribed burning.

Air Quality Monitoring, Analysis, and Technical Assistance

The NPS network, now with some type of air quality monitoring in 63 parks, consists

National Park Service Air Quality Monitoring Sites



**National Park Service Air Quality Monitoring Sites
Funded by Natural Resource Challenge (NRC) or Funded by Other Sources**

PARK CODE	PARK	NON-NRC FUNDING	NRC FUNDING
ACAD	Acadia National Park	1	
ASIS	Assateague Island National Seashore	1	
BADL	Badlands National Park		1
BAND	Bandelier National Monument	1	
BIBE	Big Bend National Park	1	
BISO	Big South Fork National Recreation Area		1
BLCA	Black Canyon of the Gunnison National Park		1
BRCA	Bryce Canyon National Park	1	
BUFF	Buffalo National River	1	
CACO	Cape Cod National Seashore	1	
CANY	Canyonlands National Park	1	
CARE	Capitol Reef National Park	1	
CATO	Catoctin Mountain Park		1
CAVO	Capulin Volcano National Monument	1	
CHAM	Chamizal National Memorial	1	
CHIR	Chiricahua National Monument	1	
CHIS	Channel Islands National Park	1	
COSW	Congaree Swamp National Monument	1	
COWP	Cowpens National Battlefield	1	
CRLA	Crater Lake National Park	1	
CRMO	Craters of the Moon National Monument	1	
DENA	Denali National Park		1
DEVA	Death Valley National Park	1	
EVER	Everglades National Park	1	
GLAC	Glacier National Park		1
GRBA	Great Basin National Park	1	
GRCA	Grand Canyon National Park		1
GRSA	Great Sand Dunes National Preserve	1	
GRSM	Great Smoky Mountains National Park		1
GUMO	Guadalupe Mountains National Park	1	
HALE	Haleakala National Park	1	
HAVO	Hawaii Volcanoes National Park	1	
INDU	Indiana Dunes National Lakeshore	1	
ISRO	Isle Royale National Park		1
JOTR	Joshua Tree National Park	1	
KOVA	Western Arctic-Alaska		1
LABE	Lava Beds National Monument	1	
LAME	Lake Mead National Recreation Area		1
LAVO	Lassen Volcanic National Park	1	
MACA	Mammoth Cave National Park		1
MEVE	Mesa Verde National Park		1
MORA	Mount Rainier National Park	1	
NACA	National Capital		1
NOCA	North Cascades National Park	1	
OLYM	Olympic National Park	1	
ORPI	Organ Pipe Cactus National Monument	1	
PAIS	Padre Island National Seashore	1	
PEFO	Petrified Forest National Park		1
PINN	Pinnacles National Monument	1	
PORE	Point Reyes National Seashore	1	
REDW	Redwood National Park	1	
ROMO	Rocky Mountain National Park	1	
SAGU	Saguaro National Park	1	
SEKI	Sequoia and Kings Canyon National Parks		1
SHEN	Shenandoah National Park		1
THRO	Theodore Roosevelt National Park	1	
TONT	Tonto National Monument	1	
VIIS	Virgin Islands National Park	1	
VOYA	Voyageurs National Park	1	
WICA	Wind Cave National Park		1
YELL	Yellowstone National Park		1
YOSE	Yosemite National Park		1
ZION	Zion National Park		1
TOTAL		42	21

of ozone monitors, fine particle samplers, acid deposition monitors, optical monitors, and, in partnership with the Environmental Protection Agency (EPA), a network of ultraviolet-B monitors.

The National Park Service air quality monitoring network is being expanded as a result of the Natural Resource Challenge to provide improved geographical representation, with emphasis on parks most threatened by air pollution or most vulnerable to degradation caused by air pollution. The network expansion is guided by information developed for air resource inventories and conducted under the Inventory and Monitoring Program. In FY 2003 the NPS continued with the phased deployment of air quality monitoring sites begun in FY 2002. Consequently, 21 of the 63 parks with air quality monitoring as of FY 2003 received new or expanded monitoring because of Natural Resource Challenge funding. Additionally in FY 2003, the National Park Service completed the staffing of Challenge air resources field specialists, continued four ecological effects projects initiated in FY 2002, and initiated two new projects. Complementary activities related to data management, reporting, and interpretation are also being augmented, as are funds provided to parks to support monitoring efforts.

**BIOLOGICAL RESOURCES
MANAGEMENT PROGRAM**

Challenge Activity:

- *Create native/nonnative species management program/field teams for nonnative species management*
- *FY 2003 Allocation: \$7,930,000*

To assist parks in addressing current natural resource management issues, the Biological Resources Management Division (BRMD) provided professional, science-based support for invasive species management, terrestrial ecosystem restoration, threatened and endangered species protection, integrated pest management, and wildlife management. This Natural Resource Challenge-funded program contributed directly to the National Park Service exceeding its FY 2003 goal that 22.3 percent of park populations of threatened and endangered species remain stable and 14.5 percent improve. Parks reported that 23.3 percent of their threatened or endangered species

were stable, and 29.9 percent were improving. This program also directly contributed to the National Park Service exceeding its FY 2003 goal to contain exotic vegetation on a cumulative 122,600 acres; exotic vegetation was contained on a total of 267,480 acres.

Exotic Plant Management Teams (EPMTs)

National parks are home to complex native communities of plants and animals that are threatened by the invasion of exotic plants and animals, as well as by human-caused disturbances that foster the establishment of exotic species. Exotic plants infest approximately 2.6 million acres in the national parks, making control of exotic species one of the most significant land management issues facing national parks. To address invasive nonnative plant issues, Exotic Plant Management Teams have been established to focus on invasive species management. These teams were funded specifically to help address an important National Park Service Strategic Plan goal and significantly helped the National Park Service to exceed its FY 2003 goal to contain exotic vegetation. The fact that the NPS exceeded its goal of containing exotic vegetation by more than 100,000 acres can be attributed in part to the deployment of seven additional Exotic Plant Management Teams, as well as the continued priority focus of parks on harmful invasive species.

Exotic Plant Management Teams (EPMTs), modeled after the coordinated rapid-response approach used in wildland fire fighting, assist parks in combating and controlling exotic plants by providing a highly trained mobile strike force of plant management specialists. In FY 2003 seven new EPMTs were established, adding to the nine teams established over the previous three years.

Summary EPMT Accomplishments

Inventoried acres	627,112
Treated acres	10,666
Monitored acres	340
Re-treated acres	1,039
Restored acres	191
Hours lost due to injury	16
Total Person-hours	88,829

- In FY 2003 these 16 EPMTs, which serve more than 219 parks, inventoried more than 627,000 acres of land and found gross infestation of weeds on 520,516 acres.
- Since initial inception of teams in 2000, at least 12 exotic plant species that were previously identified have been controlled to a maintenance level in park units.
- In FY 2003 National Park Service EPMTs leveraged more than \$2.8 million through partnerships to enhance invasive plant control. For example, collaboration with the Student Conservation Association has led to the formation of student corps to assist EPMTs in controlling invasive plants. Partnership goals are to build Native Plant Corps that will increase park capacity to control invasive plants, restore native plants, and to provide invasive plant management training to young professionals.

Two teams at opposite ends of the country provide examples of how these teams operate, take advantage of partnership opportunities, and successfully address exotic vegetation.

Many invasive exotics take advantage of the no-freeze zone and limited environmental constraints in Florida and the Caribbean. Species such as melaleuca and Brazilian pepper shut out all native species and outcompete them entirely. Areas of coastal mangrove habitat, cypress domes, and marl prairies are threatened by these exotics. Unique island species are threatened in the Caribbean. The Florida/Caribbean Partnership EPMT (FLC-EPMT) addresses these issues. This EPMT was established in partnership with the Florida Department of Environmental Protection (DEP) Upland Invasive Plant Management Program, which was established in 1997, and partners with 400 public land managers who work to control exotic plants. The National Park Service selects and submits projects to DEP under this partnership. The control costs for the projects are divided, and control is accomplished using private contractors. In FY 2003 the Florida EPMT expanded to include the U.S. Virgin Islands. This expansion was the result of a cooperative agreement with the University of Florida under a

grant from the U.S. Department of Agriculture Subtropical Agricultural Research Program Grant.

- In FY 2003 the FLC-EPMT entered a cooperative agreement with the South Florida Water Management District for mapping exotic plants on eight million acres of natural areas in south Florida. FLC-EPMT received \$542,704 in Cooperative Conservation Initiative funding; \$423,000 from Florida DEP; and \$411,112 from EPMT funding.
- Overall, the FLC-EPMT has increased productivity and expanded geographically. However, the invasive species list continues to grow. Fighting invasives in this region requires constant monitoring and continued treatment. A rapidly spreading species, the old world climbing fern, poses a serious threat to tree islands in parts of **Everglades National Park** and surrounding areas.

The California Exotic Plant Management Team experienced a successful FY 2003 season serving 12 partner parks and one additional park. During this second year of operation, the EPMT focused on refining and expanding its ability to serve park needs. Carefully allocating personnel and equipment costs, as well partnering with the Student Conservation Association, the team was able to increase in size by the equivalent of 2.5 team members. Because of its efforts, the NPS now has a presence on the California Invasive Plant Council board of directors and the California Interagency Noxious Weed Coordinating Council. The team philosophy has been to concentrate on smaller, outlying infestations—selecting projects that tend to protect relatively rare or pristine areas. To accomplish this, they developed a project request protocol that facilitates strategic prioritization and enhanced partner park commitments.

- One of the more rewarding projects this year was treatment of a pampas grass invasion on the 600-foot rocky cliffs overhanging the Pacific Ocean at **Point Reyes National Seashore**. Exotic Plant Management Team members were lowered on rappel lines onto Wildcat Cliffs to remove this last untreated pampas grass site within Point Reyes National Seashore. The heat from the



cliffs and the instability of the crumbling sandstone presented challenges; yet, the team managed to manually remove a total of 1,391 plants from these nearly vertical slopes. The work culminated a four-year effort by the park to remove pampas grass from the ecosystem and has made the team a model on how to join forces with a park to remove an “A-rated” invasive on a coastal-scrub site that is extremely difficult to access.

Ecological Restoration

In this component of its program, the Biological Resources Management Division continued to provide assistance in the development of the Fire Ecology Program Strategic Plan and worked with the NPS Fire Management Program to develop a white paper on NPS Fuels Management Strategies in response to the President’s Healthy Forest Initiative. Technical assistance continued on the “Natural Resource Damage Assessment” for Morristown National Historic Park and on contaminated sites for Appalachian National Scenic Trail and Cape Krusenstern National Monument. The Division was also part of an interdisciplinary team to assess numerous disturbed sites at Golden Gate National Recreation Area. In addition, initial assessments of degraded sites were made at Colorado National Monument and Mesa Verde National Park, and a second assessment was made of restoration issues

associated with work done by Exotic Plant Management Teams. Project issues generally addressed included native plant establishment, restoration monitoring, environmental and ecological planning in the face of degrading systems due to invasive species, and soil quality. The BRMD sponsored and developed the March 2003 Arid Land Restoration Workshop that provided a forum to collect and assess restoration needs from the NPS and southwest arid land parks restoration and revegetation specialists. The Division also worked with the Great Plains Cooperative Education Studies Unit (CESU) to organize a symposium on restoration research in prairie parks for the November 2003 Society for Ecological Restoration Meeting.

Integrated Pest Management (IPM) Program

The IPM Program provided training and responded to more than 100 technical assistance requests submitted by parks and regions through consultations, distributed material, remote consultations on problems, and identification of other experts. The Integrated Pest Management Program coordinated and provided instruction for a 36-hour course at the National Conservation Training Center in West Virginia, which was the first joint course on IPM principals by both the National Park Service and the U.S. Fish and Wildlife Service. To enhance technical assistance response,

an IPM expert contracted from Pennsylvania State University has contributed much through the Concessions Environmental Audit Program to install IPM practices into concessions operations and also to conduct a review of the IPM training program to ensure it was professional and current.

Integrated Pest Management Program staff continued to coordinate actions, guidance, and policy response on the West Nile Virus (WNV). Staff members served as lead for the WNV Zoonotic Environmental Disease (ZED) Task Force, coordinated preparation of guidance/policy for parks with other members of WNV ZED task force, and contributed to congressional briefings on WNV. Staff also participated in Centers for Disease Control WNV state agency weekly conference calls, keeping the program updated on virus activity and management efforts to promote cooperation between states and parks in managing WNV. Integrated Pest Management Program staff also participated in a number of federal working groups, including the Invasive Terrestrial Animals and Pathogens (ITAP) Group that provides a forum for coordinating support among member agencies on problems associated with invasive terrestrial animals and pathogens. The National Park Service also

cooperates in the U.S. Forest Service (USFS) Forest Health Management System. The nationwide drought of recent years has placed stress on forests, and in some cases, increased insect survival. These two trends combine to threaten the health of trees. A major development has been the surge of hemlock woolly adelgids into the southern Appalachians. Park managers responded by submitting 50 percent more proposals for USFS forest health funding in FY 2003 than in FY 2002. The Biological Resources Management Division coordinates park requests; the U.S. Forest Service funded all 17 NPS requests, providing a total budget of \$537,700.

Endangered Species Program

The National Park Service presently protects 349 species that are threatened, endangered, proposed, experimental, managed via conservation agreement, or candidates for listing. These organisms are represented in 889 populations in 169 NPS units. Another 246 populations have historically existed in parks, and in many cases could be restored. While mammals and birds represent only 25 percent of the listed species in parks, they draw a disproportionate amount of the funding, as do threatened or endangered species popula-

Number of Endangered, Threatened, Proposed, and Candidate Species Found in National Park Units (as of September 30, 2003)

CATEGORY	NUMBER
Endangered Species	200
Threatened Species	84
Experimental Species	3
Proposed Species	4
Candidate Species	51
Managed via Conservation Agreement	7
TOTAL	<u>349</u>

Number of Endangered, Threatened, Proposed, and Candidate Species Found in National Park Units by Taxonomic Group (as of September 30, 2003)

GROUP	SPECIES
Plants	152
Invertebrates	47
Fish	37
Amphibians	6
Reptiles	18
Birds	50
Mammals	39
TOTAL	<u>349</u>

tions that parks have reported as stable, increasing, or not-at-risk. A new database developed by the Biological Resources Management Division is providing direction to change this trend by furnishing information that suggests species for new recovery projects.

The Endangered Species Program continues to assist in restoring and stabilizing federally listed species, as well as those that are proposed for listing and those that are candidate species. The FY 2003 program has focused on helping to make endangered species consultation for park actions a routine practice and on providing the opportunity for park staff to learn the modern skills of endangered species management.

Through the Endangered Species Program, BRMD reviews the implementation plans and annual accomplishment reports for projects funded through the NRPP Threatened and Endangered source and the new Resource Protection project funding. Projects developed in the past year include restoration of condors at Pinnacles National Monument and silversword at Hawaii Volcanoes National Park; developing biome-based resource protection from Shenandoah National Park to Great Smoky Mountains National Park; and introducing a new resource protection curriculum for personnel across the NPS.

The Endangered Species Program continued to play a role in negotiating MOUs with other federal agencies, as well as in drafting internal NPS guidance.

Wildlife Program

In FY 2003 the Biological Resources Management Division assisted several parks in evaluating and developing wildlife management actions for critical wildlife issues. This included assisting Channel Islands National Park in developing and implementing aerial capture operations for the removal of golden eagles; Big Bend National Park in developing management alternatives for the removal of feral hogs and trespass livestock; and Fossil Butte National Monument in developing management strategies for coyotes and possible transient wolves. The BRMD conducted six training classes in Aerial Capture, Eradication, and Tagging of Animals (ACETA).

The Biological Resources Management Division's Wildlife Health Program provided 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, fertility control, and the identification of wildlife health research needs. Veterinary diagnostic services were provided to NPS units in partnership with the U.S. Geological Survey (USGS), National Wildlife Health Center (NWHC), and the Colorado State University Veterinary Diagnostic Laboratory (CSUVDL). More than 120 diagnostic submissions were processed by CSUVDL. Chronic wasting disease (CWD) continued as a priority wildlife health issue this fiscal year. A chronic wasting disease coordinator was hired, and technical assistance provided to parks, particularly Rocky Mountain and Wind Cave National Parks. Training and consultation were also provided to staff from 10 other NPS units, and scientific information on wildlife disease was presented in several publications and forums with large NPS audiences. The BRMD continued interagency interactions via the CWD Implementation Team, state wildlife agencies, USGS, Food and Drug Administration, and Environmental Protection Agency. The BRMD collaborated with the Colorado Division of Wildlife on fertility control work in captive cervids and in elk at Rocky Mountain National Park. The Biological Resources Management Division also continued assistance with safety evaluation of brucellosis vaccine RB51 in pronghorn and continued collaboration with CSU scientists on CWD studies.

The Park Flight Migratory Bird Program (Park Flight) works to protect shared migratory bird species and their habitats in both U.S. and Latin American national parks and protected areas. In FY 2003 Park Flight, in cooperation with the National Park Foundation, supported seven bird conservation and education projects in 13 U.S. national parks and in protected areas in Guatemala, El Salvador, Nicaragua, Honduras, Panama, and Mexico. The program was also expanded to include a new project in Alaska and in South America (Argentina). As part of the FY 2003 Park Flight technical exchange effort, four international interns from Mexico and Panama assisted with monitoring and educational efforts at

North Cascades National Park, Point Reyes National Seashore, Golden Gate National Recreation Area, and Cuyahoga Valley National Park. These technical exchanges were coordinated through the NPS Office of International Affairs International Volunteers in Parks Program. The Park Flight Program held its second grantee workshop in FY 2003 in Pico Bonito National Park in Honduras. The goal of the workshop was to help integrate monitoring and education efforts and to improve knowledge and coordination of migratory bird monitoring programs in U.S. national parks and counterpart protected areas of the Mesoamerican region.

Biological Resource Projects

National Level Support Biological Resources Management Division competitive funds benefit multiple partners and are used for biological resource projects that address issues facing various park units. These projects address a myriad of resource management needs for aquatic or terrestrial plants and animals throughout the National Park Service. Thirty-nine projects were funded in FY 2003 at 35 parks (see Appendix A). Following are highlights for some of the fully funded projects:

- **Big Bend National Park** implemented a conservation agreement for two candidate plant species. In cooperation with the U.S. Fish and Wildlife Service, the Texas Department of Parks and Wildlife, and Texas State University, predictive habitat models were developed to help design conservation management plans to protect two candidate plant species. Accomplishments also included establishing permanent monitoring plots, analyzing 11 years of recruitment and mortality data, and preparing site protection and habitat improvement plans for Guadalupe fescue, one of the candidate species. A major finding of this project was that Guadalupe fescue seed banks are very short lived and soil surface treatments may be necessary to ensure recruitment. Persistence of this species in the last decade has depended on the survival of existing plants, which may be nearing the end of their life cycle. Therefore, planned habitat improvements are important to ensure the persistence of both rare species.
- **Saguaro National Park** developed information needed to design strategies for the management and recovery of lowland leopard frogs in the Rincon Mountain District of the park. The species currently persists in several small, isolated populations in the park, but basic information necessary for their successful conservation and management was lacking. The University of Arizona, through a cooperative agreement with the Sonoran Desert Cooperative Ecosystem Studies Unit, is conducting a parkwide survey, identifying specific threats and movement corridors, and developing a habitat model. Major findings thus far include discovery of this species in several previously undocumented locations and insight into habitat needs that will help guide management decisions.
- A digital database for tracking high-risk plant species was developed for a “Sensitive Plants and Orchid Recovery Plan” at **Indiana Dunes National Lakeshore**. In a part of the project that examined 21 state-listed and park-sensitive species in one unit of the park, 10 species populations were found to be stable, nine species populations have declined, and two species could not be located. However, four other species not reported in 1990 were present in FY 2003. In addition, habitat favorable for orchids was searched in the database. Seeds were collected from identified localities for propagation, but only one of four orchid species collected, *Cypripedium acule*, successfully germinated. Out-planting of *C. acule* plantlets is scheduled for the following spring. Successful hand-pollination of rare orchids at the park, combined with orchid pollinator investigations, suggest that the lack of a natural fruit set of these orchids may be related to the absence of pollinators.
- **Lake Mead National Recreation Area** developed a “Comprehensive Invasive Plant Management Plan,” which is undergoing its final compliance review. The plan provides the framework for a working philosophy that emphasizes prevention and early treatment of invasive plants. Sources of invasives are discussed in the plan, which outlines actions and methods to prevent invasive plant introductions and spread, as well as

Studies on rare orchids and their pollinators at Indiana Dunes National Lakeshore revealed a possible absence of pollinators in the park ecosystem. NPS PHOTO



to treat existing invasive plants. A large portion of the shoreline, developed areas, and primary vector areas of Lake Mead have been surveyed and mapped, and incipient populations of invasive plants have been treated. An aquatic plant survey has been started and will be ongoing. This plan guides the park for many years in the chronic battle against invasive plants.

GEOLOGIC RESOURCES PROGRAM

Challenge Activity:

- ***Protect geologic resources***
- ***FY 2003 Allocation: \$2,670,000***

The Natural Resource Challenge provided the first funding for geologic resource management activities other than mining and minerals-related activities in the Geologic Resources Division (GRD). Challenge funding supports six geoscience specialists in geologic program areas that provide expertise at the national level in cave resources and karst processes, coastal resources and processes, disturbed lands restoration, geologic hazards management, and paleontology. This specialized expertise is being used to support parks, regions, vital signs networks, and the Inventory and Monitoring Program.

This program contributed to the National Park Service far exceeding its FY 2003 goal to restore 95,820 square feet of cave floor, achieving 161,765 square feet of restoration in FY 2003. However, the National Park Service did not attain its goal of having 30 percent of known paleontological localities in good condition. This is because of an improved inventory of paleontological resources, which increased the total number of known localities (2,097 newly identified localities, resulting in a total of 5,149). Limited funding to assess fully the condition of these newly discovered localities resulted in a lower percentage (22 percent) of the total sites known to be in good condition.

The following are some FY 2003 program accomplishments:

- Partnering activities in the cave and karst program included coauthorship of a new book entitled "Recommendations and Guidelines for Managing Caves on Protected Lands" with the Karst Waters Institute, Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, and the National Cave and Karst Research Institute (NCKRI). This book may be translated into French for use in Europe.

- Advances in cooperative planning and environmental compliance were made on several coastal engineering projects proposed by the U.S. Army Corps of Engineers in and near parks. Examples include a major restoration effort at **Assateague Island National Seashore** to mitigate adverse impacts of the Ocean City jetties, and collaboration on the coastal shoreline protection project at **Fire Island National Seashore**.
- In the aftermath of Hurricane Isabel, GRD staff provided on-the-ground technical assistance and coordinated with other agencies and university geologists to provide coastal process scientific expertise to park managers facing difficult natural resource management decisions on an urgent daily basis. Post-hurricane response decision-making was greatly aided by the existence of detailed baseline geologic information provided through the Inventory and Monitoring Program and remote sensing data.
- Disturbed land restoration program and geo-hazard program staff provided oversight for 12 Natural Resource Preservation Program restoration projects in 11 parks. These projects restored nearly 150 acres of severely disturbed lands.
- Support was provided for fossil resource surveys at four parks. Some assistance involved partnering with university faculty and graduate students. Other support resulted in the significant discovery of an extinct rhinoceros fossil.

NATURAL RESOURCE PRESERVATION PROGRAM (NRPP)

Challenge Activity:

- *Expand NRPP project fund, specialized inventories, training, etc.*
- *FY 2003 Allocation: \$12,693,000*

Most ongoing resource management activities are undertaken and funded at the park level. National parks usually have little or no flexible, dedicated funding for cyclical and one-time project needs. Thus, to undertake larger projects, most parks require special funding. The major source of such funds is the Natural Resource Preservation Program (NRPP). This program provides the only reliable and dedicated source of

National Park Service funding for natural resource management projects costing more than \$50,000. Natural Resource Preservation Program funds are distributed among seven subcategories: larger natural resource management projects; special categories dedicated to threatened and endangered species and disturbed lands restoration; and regionally managed funding, including one specific to small parks. In addition, some funding is provided for U.S. Geological Survey biological technical assistance. A breakdown of funding by category is included in Chapter Five. Highlights of FY 2003 accomplishments in each of these categories follow. See Appendix B for a complete listing of projects funded under the Natural Resource Preservation Program.

In addition to contributing to the National Park Service's general resource protection goal, many of these projects directly contributed to the National Park Service exceeding its goals for containing exotic vegetation, restoring disturbed land, and achieving stable or improving populations of threatened and endangered species.

Natural Resource Management Projects

The largest segment of the Natural Resource Preservation Program funds a broad range of competitively selected, multi-year natural resource management projects that may cost as much as \$900,000 each. The total number of natural resource management projects funded through this program has significantly increased since FY 2000, with funding provided by the Natural Resource Challenge, from 49 projects in FY 2000 to 75 projects in FY 2003. The majority of projects funded fall within these categories: restoration, exotic species control, resource assessment and mapping, and natural resource management plan development. Nineteen projects received their last year of funding in FY 2003. Some highlights follow.

- A internal review draft feral hog management plan and associated draft environmental assessment were developed for **Congaree Swamp National Monument** by the South Carolina USGS/BRD/Cooperative Research Center Unit and Clemson University after they completed bimonthly monitoring of feral hog disturbance activity over three years at 12 monitoring plots. Data show

feral hog disturbance was relatively frequent and widespread for wetland habitats on the floodplain, and occasional in upland habitats adjacent to the floodplain. Disturbance was also relatively persistent in certain habitat types, such as seepage areas. The plan considered the information gathered during the monitoring study, the available literature, and discussions with several resource management experts.

- The biological and sociological effects were studied of the Teton Wolf Pack, a group of approximately 20 wolves utilizing **Grand Teton National Park**, and several educational efforts were undertaken to provide the public with information about the return of wolves to the Jackson Hole, Wyoming, area. Weekly monitoring efforts via aerial telemetry and ground surveys documented the pack's movements, including dispersal, reproduction status, number of pups, and wolf-livestock conflicts. A survey to evaluate public attitudes towards wolves and their management was produced and distributed to park visitors and local residents; analysis of the survey will be completed during winter 2003/2004.
- A coastal dune area was restored at Abbott's Lagoon at **Point Reyes National Seashore** by removing nonnative iceplant and European beachgrass from 30 acres of coastal dune habitat. This resulted in a 33 percent increase in native plant species, including two endangered plants, beach layia and Tidestrom's lupine, and improved habitat for the endangered myrtle silverspot butterfly. The restoration also resulted in the establishment of four nesting sites for western snowy plovers within the project area. The project provided the park with valuable information on removal methods of nonnative plants, improved conditions for four federally listed species, and helped to prioritize sites for future treatment.
- English ivy and other highly invasive, shade-tolerant exotic plants were hand-cleared from 101 acres of old-growth redwood forest at **Redwood National Park** by the California Conservation Corps (CCC) and the California

Department of Corrections. English ivy had formed thick mats on the forest floor, altering wildlife habitat and suppressing native plants. Ivy vines were growing up into the ancient trees, threatening to topple them if left unchecked. As the ivy grows into the sun, it is able to flower and produce seeds, which are then eaten by birds and distributed into uninvaded groves, enabling exponential reproduction. Additional support for this project came from California Department of Parks and Recreation and park operating funds.

Threatened and Endangered Species Projects

The long-term goal of this group of projects is to reverse the decline of listed species and to reestablish species that have been extirpated from parks. Despite the obvious importance of implementing identified recovery plan actions, limited funding has precluded many parks from implementing many needed actions. Therefore, this NRPP project funding emphasizes on-the-ground conservation actions. Larger threatened and endangered species projects are also funded within the Natural Resource Management portion of NRPP and are eligible for regionally administered NRPP funding. This allocation was established to assure that a minimum amount of funding would address this NPS goal. This funding directly contributed to the National Park Service exceeding its FY 2003 goal for 22.3 percent of park populations to remain stable and for 14.5 percent to be improving; parks reported that 23.3 percent of their threatened or endangered species were stable, and 29.9 percent were improving.

Fourteen projects were funded in FY 2003, including five that were fully funded, receiving their last year of funding, including the following:

- **Cape Hatteras, Cape Lookout, and Assateague Island National Seashores** assessed habitat to determine potential restoration sites for the federally threatened seabeach amaranth using Geographic Information System (GIS) and Light Detection and Ranging (LIDAR). In the past, some of the more substantial naturally occurring populations of seabeach amaranth, an East Coast native, were found in North Caro-

lina. The numbers have dropped dramatically in North Carolina and throughout much of the range of this species. Lab-reared juveniles and lab-germinated seedlings at Cape Hatteras were transplanted in three elevation ranges—below, within, and above the elevation range considered appropriate. Surveys after transplantation showed percentages of plants reaching seed-set in the three elevations were 0 percent, 67 percent, and 97 percent, respectively; this information will help resource managers to select sites for future plantings.

Disturbed Lands Restoration Projects

A portion of the NRPP was established in FY 2000 for projects related to disturbed land restoration, a reflection of the tie between the Natural Resource Challenge funding and the National Park Service Strategic Plan. Disturbed lands are those park lands where the natural conditions and processes have been impacted or altered by development (such as facilities, roads, mines, and dams) or by agricultural practices (such as cropping, grazing, and timber harvest). Restoration is the process of assisting the recovery of disturbed areas and reintegrating the site into the surrounding natural system using direct manipulations. This funding directly contributed to the National Park Service exceeding its goal to restore a cumulative 13,500 acres of disturbed land by the end of FY 2003 by 272 acres.

Twelve projects were funded in FY 2003, featuring four that received final funding, including the following:

- The Wondering Woods area at **Mammoth Cave National Park**, a 50-acre abandoned theme park, was restored. Site restoration initially entailed the demolition, removal, and disposal of dilapidated structures and remnants from previously dismantled buildings, gravel parking areas, fences, and trash dumps. Resulting surface cavities were filled with soil and contoured to conform to the surrounding landscape and drainage patterns. Exotic plants, such as Japanese honeysuckle and mimosa trees, were eradicated, and bare soils were covered with a biodegradable ground cover to stabilize the site and prevent erosion. Forty acres of the site were then seeded

with a native grass/forbs seed mix to restore the prairie/barren plant community. These efforts also improved the water quality of runoff from the site, which flows into a karst aquifer. This aquifer supports the endangered Kentucky cave shrimp and freshwater mussel habitat, and in turn supports seven species of endangered mussels.

Small Parks Projects

NRPP funds are provided to regions to allocate to small national 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. Funds are allocated according to the natural resource management workload of these parks. Funded projects included a wide variety of management actions such as natural resource management and monitoring plans, exotic species control, restoration of native ecosystems, natural resources surveys, inventories, assessments and analyses, and fence repair for resource protection. Sixty-nine projects in at least 57 parks were funded in FY 2003. The cost of these projects ranged from \$1,700 to \$40,400.

- **National Park of American Samoa** began resuscitating a weed-infested rainforest on Mt. Alava Ridge. Many of the park lands are infested with alien plant species, such as *Paraserianthes falcataria*. A greenhouse was constructed by park staff and village volunteers on elementary school grounds. This greenhouse has already provided approximately 1,400 trees for restoration efforts in the park and more than 800 trees for education purposes and local village plantings. All greenhouse activities were facilitated directly by the small parks NRPP funds in this project, which paid for seasonal employees, volunteers, and materials to construct the greenhouse. Five acres dominated by alien plant species, most of which were cleared prior to the project, were replanted with native trees and maintained during 2001 to 2003. Most of the trees planted in the restoration plots were asi (*Syzygium inophylloides*) and afa (*Neonauclea forsteri*), the predominant trees in local forests. All species were planted adjacent to their collection site.

NPS staff inform a television crew about the creation of a native botanical garden by National Park of American Samoa and Le'atele Elementary School. Restoring weed-infested areas located on village lands at National Park of American Samoa included objectives such as establishing a greenhouse and propagating native tree species, removing nonnative plants, and developing and implementing an educational model. NPS PHOTO



Regional Block Allocation Projects

NRPP funds are provided to regions for national park projects as a part of regional natural resource programs. These funds are evenly distributed among the regions at \$200,000 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 Inventory and Monitoring Program's 12 databases) and mitigation actions (i.e., exotic plant or exotic animal control). Eighty-one projects in 51 parks were funded in FY 2003. The cost of these projects ranged from \$1,500 to \$75,000. Funded projects included a variety of management actions such as ecosystem restoration, exotic species control, seismic hazard inventories, wildlife and vegetation inventories and assessments, soundscape monitoring, public outreach, and employee development.

Alaska Special Projects

This funding category was funded and established in FY 2003 to enable the NPS 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 (ANILCA) and other Alaska-specific re-

quirements, including providing for subsistence harvests. During the first year of funding, some of the projects undertaken include the following:

- Studies with the University of Alaska and the U.S. Geological Survey to collect and evaluate baseline data about arctic animals such as musk ox, lynx, and snowshoe hare.
- Studies on marine birds in **Glacier Bay National Park and Preserve**, Steller sea lions and sockeye salmon in **Wrangell-Saint Elias National Park and Preserve**, and sockeye salmon in **Aniakchak National Monument and Preserve**.
- Social science research at the historic **Klondike Gold Rush National Historic Park** town site of Dyea to assist park managers to develop appropriate visitor and resource management strategies.
- Documentation of subsistence harvest levels and patterns for the Native Village of Buckland, working with the Alaska Department of Fish and Game.

Several of these studies continue, and new cooperative research is planned in FY 2004.

USGS Biological Technical Assistance Agreement–Park-Oriented Biological Support

The U.S. Geological Survey-Biological Resources Division and the National Park Service, through the Natural Resource Preservation Program, jointly support biological projects that provide exploratory research and technical assistance to national parks. Twenty-four separate projects were funded in FY 2003. Information on the project topics, as well as status reports on the projects, is included in Appendix B. Many FY 2003 projects address continuation of endeavors that were initiated in FY 2002 or in various phases of previous years.

Servicewide Projects

In addition to national parks, there are often project needs outside specific Servicewide programs which 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 NRPP or fee monies or other sources. In FY 2003, as in the past, several of these needs exist for database systems and information dissemination efforts not related to inventory and monitoring. Some FY 2003 projects were designed to provide tools or capacity that will benefit many programs and components of the National Park Service, such as the prototype information synthesis project and the Natural Resource Laureate Program. Other projects respond to special issues that are beyond the capacity of the base programs to fund, such as assessing

the vulnerability of coastal parks to climate change.

RESOURCE DAMAGE ASSESSMENT AND RECOVERY PROGRAM

Challenge Activity:

- *Implement Resource Protection Act to restore resources*
- *FY 2003 Allocation: \$1,276,000*

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 NPS units. Funding provided by the Natural Resource Challenge enhanced capabilities of the program. Accomplishments in FY 2003 include: (1) direct technical assistance to parks in conducting damage assessments for incidents injuring park resources and in planning and implementing restoration projects; (2) outreach and training on damage assessment for park staff; and (3) continued development of policies and procedures for the program. Some FY 2003 highlights include the following:

- **Vessel Groundings in Dry Tortugas National Park**—Cases are pending for vessel groundings in 2001 and 2002. The incidents, involving four vessels, are jurisdictionally complex, and resulted in injury to and loss of some of the most significant coral reef and submerged cultural resources in the National Park System.

Resource Damage Assessment and Recovery Program FY 2003 Program Activity by Region and Legislative Authority

AUTHORITY	HQ	ALASKA	INTER- MOUN-	MID- WEST	NAT'L CAPITAL	NORTH- EAST	PACIFIC WEST	SOUTH- EAST	TOTAL
Park System Resource Protection Protection Act	1	3	4	2	4	7	5	27	53
Oil Pollution Act	-	-	-	-	-	-	2	2	4
Comprehensive Environmental Response, Compensation, and Liability Act	1	-	1	3	-	5	2	1	13

- **Obed National Wild and Scenic River**—The U.S. Fish and Wildlife Service, the State of Tennessee, and the NPS have completed response actions to the July 2002 oil spill in the Obed River. Damage assessment and restoration planning are underway.

Program staff worked with 19 different park units in FY 2003 to plan support and implementation of 32 different restoration projects using funds collected and withdrawn from successful resource damage claims. The accompanying table summarizes by region and legislative authority program activity in FY 2003.

RESOURCE PROTECTION PROGRAM

Challenge Activity:

- *Establish Resource Protection Fund*
- *FY 2003 Allocation: \$298,000*

The Resource Protection Program supported four projects in its second year of funding that call for innovative approaches involving natural resource specialists, protection rangers, and partners from other agencies and universities. The new resource stewardship and protection curriculum, which was proposed by several regions, is now providing training across the National Park Service. A model to focus protection efforts toward those natural resources most at risk is being applied cooperatively by the parks along the Appalachian Mountains, utilizing the expertise of economists as well as botanists. Special Agent Ken Johnson of Shenandoah received a national award for pioneering this enforcement approach at the biome level. New surveillance techniques are being tested in Capitol Reef to protect endangered cacti that are advertised on Internet sites. Another example follows:

- **Illegal mushroom harvest at Mount Rainier National Park** was evaluated. Mushroom harvest is a popular activity in and around Mount Rainier National Park. Although personal harvest of mushrooms is allowed in the park, it is limited to one quart of fruiting bodies per person each day. Illegal commercial harvest has long been suspected. Consequently, the park developed potential habitat maps using GIS data based on the autecology and habitat requirements of desired species. During 2002 and 2003 the park surveyed potential mushroom

habitat near existing roads, documented potential illegal harvest and impacts from that harvest, conducted law enforcement patrols, and developed training materials. Local markets, including Pike Place Market in Seattle, were visited to determine desired species and sources. Permits from the U.S. Forest Service were reviewed, and interviews with local buyers were conducted. Citations or warnings were written in six cases for mushroom harvest greater than the one-quart limit. One citation was issued for collection of approximately 15 pounds of fruiting bodies. The species of mushrooms confiscated implied that this was likely a commercial collection.

While initially funds were sought by several parks to address pressing needs for routine patrols, proposals increasingly show the innovation and collaboration between divisions that this funding source requires. See Appendix C for a complete listing of projects funded under the Resource Protection Program.

WATER RESOURCES PROGRAM

Challenge Activities:

- *Monitor water quality in parks and assess watershed conditions*
- *Expand water resource protection and restoration*
- *FY 2003 Allocation: \$11,614,000*

The National Park Service Water Resources Division worked with national parks, regions, and Washington office personnel to continue implementation of the water resources component of the Natural Resource Challenge. A funding increase was received in FY 2003 to support three new aquatic resource professionals in the field. Funding was also received to support watershed condition assessments in parks and water quality monitoring in five additional Park Vital Signs Networks.

This was the fourth year of funding for a program that reflects a direct connection between the Natural Resource Challenge and the National Park Service Strategic Plan. The Natural Resource Challenge-related components of the Water Resources Program include both new capability to track the attainment of water quality standards in units of the National Park System and expanded efforts to improve aquatic

resources through projects and field-based aquatic resource specialists who can work with other water resource managers in watersheds requiring attention. The National Park Service goal for FY 2003 was that waters in 65 percent of parks were unimpaired, that is, not included on state lists of quality-impaired waters or otherwise documented by the park as having water quality problems or standards violations. The National Park Service did not attain this goal in FY 2003, as only 62 percent (178 of 288 applicable parks) had unimpaired waters. This represented a slight decrease over 2002 of parks with unimpaired waters, primarily because many parks have recently completed water quality inventories that have discovered quality-impaired water bodies that were not previously reported. For example, Badlands National Park recently discovered that a spring was contaminated with the pesticide atrazine. The information being provided by Natural Resource Challenge-funded efforts, combined with increased capacity to address aquatic resource issues, will enhance National Park Service ability to improve water resource conditions in parks in the future.

Water Resource Projects

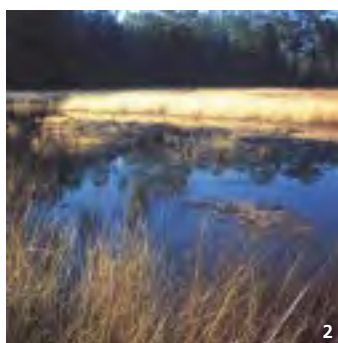
Funding for this activity supports projects in three areas: Water Resource Protection Projects, Competitive Projects, and Other Projects, which are non-competitive. Projects in these areas include general water resources, water quality, wetlands protection, and water rights. Highlights of FY 2003 accomplishments in each of these project categories are included. For a complete listing of projects funded in FY 2003 under Water Resource Protection, see Appendix D of this report.

Water resource protection projects help to fund data collection and analyses that target development of scientific information that will benefit decision-makers, including federal managers, court judges, and state administrators. Results are often intended to support settlement negotiations conducted to avoid contested case hearings or contested land use decisions, or to support the implementation of settlements. Often hydrologic characterization is a need common to all water resources protection issues addressed by this budget. The majority of these FY 2003 project funds were used to

support ongoing studies designed to characterize surface or groundwater flow systems. In the western United States, ongoing projects are developing modeling information that will benefit the capabilities of decision-makers such as federal managers, judges, and administrators to predict effects of large-scale development in regional groundwater flow systems. In the eastern United States, 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 are often required to implement settlement agreements.

To increase the effectiveness of its water resource protection project funding, the National Park Service partners with other nonfederal entities. Some studies occur as a result of collaboration with state or private entities with common science objectives. For example, hydrologic data collected by NPS studies for Lake Mead National Recreation Area and Death Valley National Park are shared with the Nevada State Engineer, southern Nevada water purveyors, and private developers, thereby contributing to the larger-scale investigation of water availability in southern Nevada. In another example, data and other science information collected at Chickasaw National Recreation Area contribute to an ongoing state-federal study of the Arbuckle-Simpson Aquifer in southeastern Oklahoma.

Water Resources Division competitive projects support a wide range of park-based activities. Such efforts include riparian/stream, wetland and watershed restoration, and regulatory assessments. Projects also support design and implementation of best management practices required to improve water quality to meet state-mandated polluted runoff or non-point source pollution control, one-time assessments or inventories of water quality baseline conditions or contaminants, wetland inventories, groundwater assessment and monitoring, well and spring inventories, channel and bank stability investigations, floodplain assessments, water resources management planning, and other water resources-related activities.



Natural Resource Challenge funding enabled restoration of native vegetation to a savanna wetland at Moores Creek National Battlefield. By 1940 a drainage ditch installed in the early 1900s (top) had altered the hydrology and plant community of the historic pine-savanna wetland system(1). Pre-drainage water levels were restored when the drainage ditch in the savanna was plugged in 1998, but native bunchgrasses had failed to recolonize the site (2). A prescribed burn in fall of 2003 (3) set the stage for reintroducing native bunchgrasses using nursery-grown plugs (4). NPS PHOTOS

Two examples of the projects funded in FY 2003 follow:

- Native vegetation was restored to the savanna wetland at **Moores Creek National Battlefield**, restoring the terrace east of the bridge to the ecosystem in existence at the time of the Battle of Moores Creek Bridge in 1776. Ditching, mowing, seeding, fertilizing, and other activities during the 20th century had converted the site to a drained, weed-dominated meadow. In the late 1990s, the NPS began restoring the historic landscape by blocking the drainage works and recreating the original wetland hydrology, but wire grass (*Aristida stricta*) and other native bunchgrass species showed no sign of recolonizing the site. These grasses are critical to pine savannas, providing fuel for the fires that maintain these ecosystems and creating conditions that support rare plants such as the Venus flytrap. Using bunchgrass seeds from savannas on nearby Nature Conservancy lands, a nursery was contracted to grow, deliver, and supervise

the planting of 25,000 plants over a two-year period. A prescribed burn was completed as well. With favorable weather conditions, the plants introduced to the savanna in December 2003 should grow large enough during 2004 for a fall burn, to be followed by planting of the remaining plants by December 2004.

- The U.S. Geological Survey-Pennsylvania District developed a groundwater monitoring plan for **Delaware Water Gap National Recreation Area** that assesses current water quality conditions and establishes a baseline for comparing future changes within the area. A full report submitted to the park includes a description of the Delaware Water Gap NRA region and identifies possible threats to groundwater quality. The report also describes the geohydrologic framework of the region, thereby enabling park managers to make decisions regarding a groundwater monitoring network; provides a searchable database of existing research completed within and around

the region; compiles a monitoring-well inventory that verifies the suitability for inclusion in the network; and contains a proposal for objectives, approach, and estimated budget for future completion and implementation of a groundwater monitoring network within the recreation area.

Because of the limited professional fishery expertise within the National Park Service, a small amount of funding is directed at developing and increasing cooperative relationships between the academic community and the NPS fisheries program. Funds are set aside to help foster graduate student research at National Park System units and to help cooperatively fund fishery students engaged in NPS park projects. Potential high-priority projects suitable for graduate student research are identified through the NPS project need data system and matched to student availability through discussions with fishery professors. The program helps introduce top caliber fishery students to National Park Service programs and expands the level of expertise made available to parks. In FY 2003 a two-year project was completed in Rocky Mountain National Park on the evaluation of barriers to the upstream movement of nonnative brook char.

Water Quality Monitoring

Full program funding was allocated to 17 Park Vital Signs Networks in FY 2003, including five new networks (allocations are included in Chapter Five). The five newly funded networks include Southwest Alaska, Northeast Temperate, Southern Colorado Plateau, Pacific Island, and Great Lakes. Network planning approaches included personnel hiring, in-house allocation of staff, university cooperative agreements, and USGS Interagency Agreements. In addition, some equipment acquisitions were made. All networks accomplished the following activities: (1) network water quality planning workshops; (2) historic data compilations and analyses; (3) information input on state-listed impaired waters and park “outstanding” waters; (4) documentation of significant water quality stressors/threats; (5) synoptic inventory studies in support of detailed statistical design; and (6) database management and GIS support programs. See Appendix C for the allocation of

funding under Water Quality Park Vital Signs Monitoring.

Work proceeded during FY 2003 on development of program technical guidance, technical protocols, detailed study plan and Quality Control/Quality Assurance Plan guidance, and database management. Database templates are being developed for networks so that data can be managed consistently with the requirements of STORET, and also as part of Network Vital Signs Monitoring databases. The Servicewide NPS water quality database being constructed by the program has more than 2.5 million water quality observations. This database has served as the starting point for most network water quality data compilation and analysis efforts.

Water Resource Protection—Aquatic Resource Professionals

In FY 2003 the Natural Resource Challenge funded three additional aquatic resource specialists: a groundwater hydrologist at Chickasaw National Recreation Area, a marine ecologist at Fire Island National Seashore, and a groundwater hydrologist at Lake Mead National Recreation Area. This brings the number of new aquatic resource specialists funded by the Natural Resource Challenge to a total of 15 field positions (*see Appendix D*).

Before funding provided by the Natural Resource Challenge, only 20 parks had aquatic resource professionals on staff. The new field-based staff work on aquatic resource issues in a number of parks to provide technical assistance, 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. While these 15 Challenge-created positions work on a wide range of water resource-related issues facing the parks, some particularly significant issues addressed in FY 2003 include the following:

- The aquatic ecologist for the Central and Northwest Alaska Network conducted a wetland plant inventory at Wrangell-St.

Elias National Park and Preserve; developed a water resources monitoring plan for **Yukon-Charley Rivers and Gates of the Arctic National Park**; conducted a pilot study to test the field sampling protocols for aquatic monitoring in the Central Alaska Network; and monitored a large NPS-USGS project to monitor groundwater quality at **Anaktuvuk Pass in Gates of the Arctic National Park and Preserve**.

- The groundwater hydrologist at the Sonoran Desert Network worked with USGS and park staff to conduct water quality sampling at **Tumacacori National Monument**; planned monitoring for Apache Spring in **Fort Bowie National Historic Site**; investigated options for potable water supply outside of **Saguaro National Park**; provided field support in the installation of monitoring instrumentation at Rincon Creek in Saguaro National Park; and measured water levels in springboxes and several wells at **Coronado National Memorial**.
- The aquatic ecologist at the Center for Urban Ecology in the National Capital Region provided comprehensive review of water quality monitoring efforts in **Morristown National Historic Park**, **Wolf Trap National Park for the Performing Arts**, **Catoctin Mountain Park**, and **Prince William Forest Park** that involved technical evaluations of the design of park-based water quality monitoring programs and statistical analysis and interpretation of long-term data sets.
- A cooperative interdisciplinary project with the Cooperative Ecosystem Studies Units (CESU) system initiated in 2003 to conduct a review, evaluation, and classification of condition assessment methods, and to develop a compendium of methods applicable to NPS needs, as well as guidance in methods selection. The field of watershed condition assessment is new, and there are no standard or widely accepted methods or approaches to conducting structured, replicable assessments of watershed resources.
- Six multi-year partnership projects at **Lake Roosevelt National Recreation Area**, **Rock Creek Park**, **Niobrara National Scenic Riverway**, **Mammoth Cave National Park**, **Yosemite National Park**, and **Canyonlands National Park** as part of the NPS-USGS Water Quality Assessment and Monitoring Partnership Program.
- A hydrologic assessment at **Congaree Swamp National Monument** conducted in response to an emergency draining and repair of an upstream dam.

Water Resource Technical Assistance

This was the fundamental component of the Water Resources Program before the Natural Resource Challenge, and it 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 accomplishments include the following:

Watershed Condition Assessment Program

Funding provided for this effort was used for initial design work on a long-term program of systematic park-based assessments of watershed conditions, for shorter-term condition assessments, and to support the backlog of watershed and water quality assessment needs currently identified in the project needs system. As a result of the latter, a larger number of competitive projects were funded, discussed in the previous section and listed in Appendix D.

Examples of other work supported in short-term condition assessments and planning for longer-term assessments include the following:

- Completed Water Resources Management Plans for **Sleeping Bear Dunes National Lakeshore**, **Richmond National Battlefield Park**, **Hagerman Fossil Beds National Monument**, and **New River Gorge National River/Gauley River National Recreation Area/Bluestone National Scenic River**.
- Developed technical portions of Fisheries Management Plans for **Amistad National Recreation Area**, **Biscayne National Park**, and **North Cascades National Park**.



A Student Conservation Association volunteer uses a kicknet to collect stream organisms at George Washington Memorial Parkway. In addition to providing baseline water quality data, the surface water quality monitoring program provides valuable resource management experience for SCA conservation interns. NSP PHOTO

- Evaluated alternative discharge locations for the Las Vegas sewage treatment plant at Lake Mead.
- Provided technical guidance to Yosemite Valley planning and Merced River restoration.
- Provided technical support to development of a sediment management program for Elwha River dam removal.
- Evaluated alternatives for management of a uranium tailings pile at Moab, Utah.
- Evaluated flood mitigation alternatives at Manzanar National Historic Site.
- Assisted in the development of a flood warning system at Haleakala National Park.
- Participated in the development of the Colorado River Annual Operating Plan.
- Assisted the Department of the Interior in securing a settlement agreement that sets a course to secure water rights for the **Black Canyon of the Gunnison National Park** in Colorado.
- Secured final Snake River basin adjudication decree for water rights at **City of Rocks National Preserve** in Idaho.
- Collaborated with other Interior and nonfederal interests to advance the level of scientific information available to decision-makers for groundwater systems in southern Nevada to protect resources at **Lake Mead National Recreation Area** and **Death Valley National Park**.
- Assisted **Saguaro National Park** to initiate efforts to secure protection for instream flows in Rincon Creek under Arizona law.



Tree characteristics are measured and GPS location data are gathered by an NPS seasonal ranger and high school summer interns from the Casey Tree Foundation in Washington, D.C. Such work on the National Mall is part of a program conducted by the National Capital Parks Urban Ecology Research Learning Alliance. NPS PHOTO

Chapter Four: Progress in Learning About National Park System Natural Resources

In the new strategic plan, the NPS 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.

This chapter focuses on programs whose accomplishments primarily relate to the National Park Service goal (Ib) that:

The National Park Service contributes to knowledge about natural . . . resources and associated values; management decisions about resources and visitors are based on adequate . . . scientific information.

Descriptions of the accomplishments of the four natural resource programs that received Natural Resource Challenge funding in FY 2003 and contributed to the knowledge goal (Ib) follow:

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

Additional detailed financial information about these programs is located in Chapter Five.

COOPERATIVE ECOSYSTEM STUDIES UNITS (CESUs)

Challenge Activity:

- *Establish Cooperative Ecosystem Studies Units*

Cumulative Challenge Increases:

- *\$1,993,000 (FY 2001 and FY 2003)*

Cooperative Ecosystem Studies Units (CESUs) are multi-agency partnerships with the nation's universities and other institutions, organized around biogeographic areas. Their broad scope includes the biological, physical, social, and cultural sciences needed to address natural and cultural resource and visitor management issues at multiple scales, and in an ecosystem context. A total of 120 universities, including 22 minority institutions, and 24 state, tribal, and non-governmental partners participate in the CESU Network. In FY 2003 four new CESUs were established,

bringing the total number of CESUs to 16. The seventeenth (and final) CESU is on schedule to be established in FY 2004.

Active National Park Service participation in the CESU Network is an essential component of the Challenge. Twelve CESUs now have an NPS Research Coordinator duty stationed at the respective host universities. Funding in FY 2003 resulted in NPS participation in two of the twelve CESUs—the Great Lakes-Northern Forest and Gulf Coast CESUs. National Park Service coordinators are “brokers,” working 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. In addition, through their direct connection with parks to facilitate projects, they have become instrumental in fostering cohesion and enhancing communication among park clusters and among diverse program offices.

While biological and physical science projects continue to dominate, National Park Service coordinators are working to facilitate more projects that meet cultural resources and social science needs. This is particularly significant in the Intermountain Region, where the regional office is supporting Cultural Resource Specialist positions at three CESUs. Several NPS coordinators in border areas are exploring innovative approaches to address management challenges that cross international boundaries. Others are focusing efforts on encouraging and facilitating greater multi-agency activities within the CESU Network.

CESUs play a significant role in conducting and completing the extensive NPS Inventory and Monitoring efforts underway through the Natural Resource Challenge. Connections between NPS participation in

CESUs, the NPS Inventory and Monitoring Program, and Research Learning Centers continue to create highly productive synergy among multiple components of the Challenge. Cooperative Ecosystem Studies Units contribute to the professional development of the NPS workforce through key topical workshops, the development of curricula being used in Servicewide training, and through the contributions of NPS coordinators to training courses. Opportunities for minority students and faculty at participating CESU institutions to become involved in NPS CESU projects continue to be developed, a potential step toward diversifying the NPS.

Use of the CESUs increased from a total of over 380 projects and \$15 million in FY 2002 to 540 projects and \$19 million in FY 2003. In addition to providing academic expertise for collaborative projects, CESUs provide training opportunities and serve as a valuable means to coordinate activities among agencies and academia. Appendix E provides a list of projects carried out through CESUs using Natural Resource Challenge CESU funding. Following are some examples of FY 2003 accomplishments:

- The National Park Service, U.S. Geological Survey, U.S. Fish and Wildlife Service, Army Corps of Engineers, and Pennsylvania State University are collaborating to evaluate the impacts on Potomac River ecology of sediment discharge from the Washington Aqueduct water treatment plant. One study was conducted in response to concern that flocculated aluminum might become toxic to benthic invertebrates living downstream of the discharge point, especially under conditions of anoxia within fine sediments. Researchers from the University of the District of Columbia, through the **Chesapeake Watershed CESU**, are using the Asiatic clam, *Corbicula fluminea*, as a model to study whether aluminum accumulation in estuarine biota is relative to the water treatment discharge point. Results will be used to develop management plans for facility operation to ensure safe drinking water for Washington citizens and protection of natural resources in the river.
- A report produced through the **Colorado Plateau CESU** updated outdoor recreation use values. This report presents updated values per visitor day of outdoor recreation opportunities commonly found at National Park System units, state parks, and national forests. In the report, the term “value” indicates net willingness to pay. Development of credible measures of benefits for outdoor recreation is useful in damage assessment as well as in analysis of current management and policy actions. The investigators updated previous literature reviews on outdoor recreation use valuation, and included recent analyses and estimates. They added 479 new estimates to a previous database, bringing the total to 1,239 benefits estimates obtained from 539 studies. The study provides values for 30 separate outdoor recreation activities, including additions for such values as snorkeling, scuba diving, and bird watching, among others. The average value per day for NPS recreation varies by U.S. Census region; for example, \$22.61 in the Southwestern National Park units and \$89.21 per day for the Pacific Coast states. The overall NPS average was \$43.26 per day.
- During the summer of 2003, a paleontology team excavated several marine vertebrates from the Upper Cretaceous Tropic Shale northeast of Big Water, Utah, at **Glen Canyon National Recreation Area**. The largest and most impressive fossil collected was the partial skeleton of a very large plesiosaur, a marine predator of the Cretaceous Interior Seaway that was the dominant carnivore in the shallow sea covering the North American continent 90 million years ago. This individual is considerably larger than previously collected skeletons of plesiosaurs in the area. During the excavation, Glen Canyon NRA sponsored a one-week open house where the public was invited to observe firsthand the scientific process underway. This was a **Colorado Plateau CESU** project.
- In cooperation with the U.S. Geological Survey Colorado Plateau Field Station and Northern Arizona University, the **Colorado Plateau CESU** developed a website to provide information and tools for invasive plant management in the Southwest (<http://usgs.nau.edu/SWEPIC>).

A high school volunteer eradicates Scotch thistle at Zion National Park. The park has expanded its exotic plant management efforts using volunteers funded by the Natural Resource Challenge. NPS PHOTO



This project was partially funded by Recreational Fee Demonstration funds. The site joins the Southwest Exotic Mapping Program and the Alien Plant Ranking System (APRS) with numerous other direct links to information on invasive plants. Alien Plant Ranking System scores for more than 300 exotic plants in the Southwest are now available. It is hoped that the site will be an essential tool for land managers in Southwest parks and serve as a prototype for regional websites across the country.

- The **Rocky Mountains CESU** joined the Rocky Mountain “wolverine parks” managers with researchers from the U.S. Forest Service and Wildlife Conservation Society to discuss strategies for a landscape-level analysis of wolverine populations in the northern Rockies. Many NPS partners, including the NPS Fire Ecology Program in Boise, Idaho, used the University of Wyoming biostatistician resources for training and education.
- The **Colorado Plateau CESU** developed a prototype course in Integrated Fire and Resource Management Planning in cooperation with NPS Biological Resource Management, Cultural Resources, Training and Development, National Interagency Fire Center, and Northern Arizona University. The course brings to-

gether natural and cultural resource managers from national parks, or groups of parks, with fire managers to encourage integrated fire management planning. The course is designed to contain core sections that do not change with each course offering. As the course is taught throughout the country, the fire ecology and management sections are tailored to the geographic area in which they are offered, using local scientific experts as instructors. The one-week prototype course was presented at the Horace M. Albright Training Center April 28 to May 2. The National Park Service National Fire Program Center will be offering the newly developed course on four to five occasions throughout the country in 2004.

- A project was implemented marking selected ginseng plants at **Shenandoah National Park, Blue Ridge Parkway, and Great Smoky Mountains National Park** with different dyes to determine the uptake and retention of the dye markers in the plants. The intent was to find a dye that persists in suitable amounts in the plants so that identification of poached specimens can be definitive and defensible. Wild ginseng plants are being illegally removed from NPS units in the Appalachian chain to be sold in national and international markets. Identifying poached ginseng once it is removed from

park boundaries is almost impossible and can easily be legally challenged. This project was conducted through the **Southern Appalachian Mountains** CESU and demonstrated the role of CESUs in assisting law enforcement in the NPS.

INVENTORY AND MONITORING PROGRAM

Challenge Activities:

- *Complete basic inventories, except vegetation mapping*
- *Vegetation mapping cost-share with USGS*
- *Monitor vital signs in networks of parks*
- *FY 2003 Allocation: \$32,385,000*

The Natural Resource Challenge assesses ecosystem health through inventorying and monitoring park vital signs with the help of cutting-edge science. Establishing baseline inventories provides park managers with critical and necessary information that they use when making decisions about the management of their park resources. To coordinate these activities, the National Park Service has organized 270 natural resource parks (*see Appendix F*) into a system of 32 networks. Parks within the networks are expected to coordinate fieldwork, share staff and equipment, implement smart business practices jointly, and develop resource trend data indicative of the network at large. By doing this, duplication of effort and costs should be reduced, and the integrity of science programs should improve.

Each of the parks involved is to obtain 12 basic inventory products. The 32 networks are charged with developing individually tailored monitoring programs for their parks. These programs are complex and address wildlife, plant life, water and air quality, and landscape ecosystem components. The Park Vital Signs Monitoring component of the Inventory and Monitoring Program is being approached incrementally. Emphasis has been placed on building on the experience gained from early efforts to improve subsequent activities.

This program was designed as a foundational component of the Natural Resource Challenge and reflects the goals of the National Park Service Strategic Plan. The National Park Service target for its inventory goal in FY 2003 was completion of 1,498 (54 percent) of the 2,767 outstanding data sets. The National Park Service met and slightly exceeded this goal by completing an additional 152 data sets in FY 2003, bringing the total to 1,507 (54 percent) of the outstanding data sets. The National Park Service goal for park vital signs was that, by September 30, 2003, 40 percent (108) of 270 parks with significant natural resources would have identified their vital signs for natural resource monitoring. As a direct result of the strategy of organizing parks into 32 vital signs monitoring networks, the goal was exceeded. By the end of FY 2003, 118 parks (43 percent) had identified their vital signs, compared to the annual goal of 108 parks. In the new strategic plan, the NPS will focus

Twelve Basic Natural Resource Inventories

BASIC DATA SETS	UNDERWAY	COMPLETED THROUGH FY 2003
1. Natural Resource Bibliography	0	270
2. Species List	0	270
3. Vegetation Map	45	36
4. Base Cartography Data	1	269
5. Species Occurrence and Distribution	270	0
6. Soils Map	31	58
7. Geology Map	227	17
8. Baseline Water Quality Data	0	270
9. Water Body Location and Classification	0	270
10. Air Quality Data	20	250
11. Air Quality Related Values	270	0
12. Meteorological Data	0	270
TOTALS	864	1980

Note: All numbers represent status as of the end of FY 2003. See Appendix A for a complete list of the status of all basic inventories for the 270 natural resource parks. The National Park Service is working toward implementation of monitoring programs in those 270 natural resource parks.

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.

Financial details about the program are included in Chapter Five.

Inventories

Beginning in FY 2000, the Natural Resource Challenge provided substantial increases for inventories, allowing the National Park Service to significantly accelerate providing a core set of 12 basic inventories to all parks with natural resources. As of FY 2003 seven data sets are essentially completed, and the balance are underway. The status of these inventories is shown in the accompanying table.

All networks received significant funding in FY 2003 for completing species occurrence and distribution inventories, or biotic inventories. This funding has allowed parks to obtain the most basic biotic inventory information, primarily for vascular plants and vertebrate animals. Many of the most exciting inventory results are from these efforts and are highlighted in this section.

Vegetation information is a high-priority inventory need for most parks and is arguably the most important piece of information needed for park resource management and protection. Such information is important

for (1) the management and protection of wildlife habitat; (2) modeling vegetation flammability and fuel implications for fire management; (3) analyses for site development suitability; and (4) evaluation of resources at risk. By combining FY 2003 Natural Resource Challenge funding with other funding provided by the U.S. Geological Survey and National Park Service Fire Program, the NPS was able to complete 12 additional vegetation mapping projects (30 total complete), continue 53 ongoing projects, and initiate 26 new park mapping projects. Some vegetation mapping highlights are included in this section.

The Alaska Landcover Mapping Program is separate from the vegetation mapping effort for other parks; the scale of parks there dictates different mapping approaches. The National Park Service has also partnered with a variety of entities to conduct cooperative projects in Alaska, including the U.S. Geological Survey-EROS Field Office, Ducks Unlimited, National Wetlands Inventory, and the University of Alaska. By the end of FY 2003, land cover maps had been completed for six Alaskan park units; field data viewers had been completed for seven park units; and user's guides were completed for six park units. Each of these products is also under development in a number of other Alaska park units. Mapping efforts are expected either to be completed or initiated in all of the Alaskan

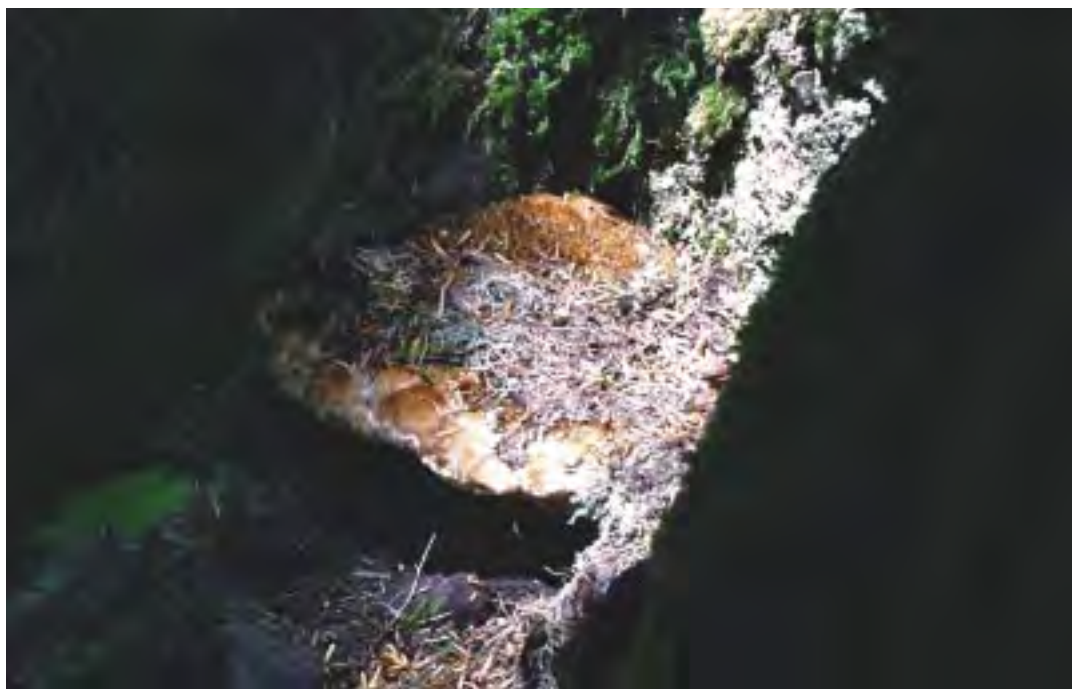
Inventory Status and Projected Completion Schedule

	END OF FY 2003		END OF FY 2004	END OF FY 2005	FY 2006-10*
BASIC DATA SETS	UNDERWAY	COMPLETED	COMPLETED	COMPLETED	TO BE COMPLETED
1. Natural Resource Bibliography	0	270	270	270	0
2. Species List	0	270	270	270	0
3. Vegetation Map	45	36	52	70	200
4. Base Cartography Data	1	269	270	270	0
5. Species Occurrence and Distribution	270	0	230	270	0
6. Soils Map	31	58	70	95	175
7. Geology Map	227	17	38	70	200
8. Baseline Water Quality Data	0	270	270	270	0
9. Water Body Location and Classification	0	270	270	270	0
10. Air Quality Data	20	250	270	270	0
11. Air Quality Related Values	270	0	50	100	170
12. Meteorological Data	0	270	270	270	0

* 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. The TO BE COMPLETED column reflects the number of parks Servicewide with outstanding needs.

Natural Resource Challenge funding supported a survey in Mount Rainier National Park that revealed the presence of a second park population of the extremely rare fungus, *Bridgeoporus nobilissimus*.

NPS PHOTO



parks by FY 2004. Other inventories that received substantial efforts in FY 2003 included soils mapping that is ongoing in 11 parks and groups of parks, mostly in cooperation with the Natural Resource Conservation Service, and geologic inventories, which are being undertaken in 33 parks.

Highlights of inventory results in FY 2003 include the following:

- An agreement in 2003 with the Seattle City Light Wildlife group added \$19,500 to the **North Cascades National Park Forest Carnivore Inventory**, greatly supplementing the NPS Inventory funding for this project. Biologists conducted the first year of a two-year forest carnivore inventory, documenting carnivores in photographs by placing cameras (38 stations). Fifteen species were documented in 974 animal photographs; the most common of which were marten and spotted skunk. Other species documented included black bear, cougar, coyote, bobcat, and short-tailed weasel. Though not targeted in this effort, northern flying squirrel was one of the more notable species “captured” on film in this productive, but non-invasive inventory project.
- Rare plant surveys at **Mount Rainier National Park** led to the serendipitous discovery of a second park population of extremely rare fungus, *Bridgeoporus nobilissimus*. The worldwide distribution of this very large mushroom, which grows on old-growth fir trees, is limited to 10 known locations in the Pacific Northwest. The new population is located in designated wilderness and appears to be stable, which is important because the other park population is located on a steep slope below a roadway that continues to slough. The newly discovered site is located in a more secure, stable environment. This is an outstanding example of unexpected benefits from NPS inventories; this discovery of an extremely rare fungus was made during surveys looking for an entirely different biological kingdom.
- The presence of a “mesic bur oak forest” was documented at **Homestead National Monument in Nebraska**. According to local experts, it is one of relatively few mesic bur oak forests in good condition in the entire state. This plant community has been identified as critically imperiled in Nebraska and is on The Nature Conservancy’s watch list.
- The Ozark hellbender was documented at six new locations within the **Ozark National Scenic Riverway** during a recent survey. The Ozark hellbender (*Cryptobranchus alleganiensis bishopi*), an

exclusively aquatic giant salamander, was recently listed as a new federal candidate endangered species under the Endangered Species Act.

- The vegetation/fuels mapping effort at **Santa Monica Mountains National Recreation Area** will provide information for park fire management while following NPS national standards and guidelines. Work began in early FY 2002, and the final digital map should be completed by the end of FY 2004. The project is a cooperative effort between the NPS, the California Department of Fish and Game, and several private contractors. Aerial Information Systems (AIS) is completing aerial photo interpretation and map automation. Detailed field-based data are being collected by park staff for the vegetation classification and accuracy assessment. A preliminary classification map was developed during FY 2003. Work will conclude in FY 2004 with a formal accuracy assessment and development of final products.
- At **Bandelier National Monument**, biologists found evidence for the occurrence of up to 37 new small mammal species for which previous documentation was poor or lacking. Because of their precarious isolation from other populations and their limited habitat in the higher elevations of Bandelier National Monument, populations at the park may serve as important indicators of the health of these montane ecosystems in the future. Many of the new species documented represent important records for mammals in New Mexico, including the rock pocket mouse, American pika, mountain cottontail, yellow-bellied marmot, bushy-tailed woodrat, and southern red-backed vole.
- The **Great Lakes Inventory and Monitoring Network** initiated a partnership with Michigan State University to build a “Natural Resources Information Gateway.” The Gateway will be an Internet-based system that will allow National Park Service staff, partners, and the public to search and download natural resource inventory and monitoring information using spatial and tabular queries. The site will contain data on climate, air and water quality, land use change, and human population growth in and around the parks. These regionally important data will be “harvested” from various state and federal agencies. The objective is to bring important data together in a one-stop website for managers of national parks and their partner agencies and researchers. The site will include a public interface that will allow access to nonsensitive natural resource information.
- Observers conducting bird inventories noted a spectacular richness and abundance of bird species in the riparian forest of **Knife River Indian Villages National Historic Site**. They commented that the rich diversity of birds was due to a thick forest with an abundant vertical structure and dead woody debris—habitat features that would be affected by forest thinning. While documenting the presence, abundance, and/or distribution of species occurring in the parks, information on habitat use such as this is also sometimes collected and forwarded to park management. The researchers also observed bird species that likely existed in park units because of fire, such as mountain and eastern bluebirds at **Jewel Cave National Monument**. In burn areas in Jewel Cave National Monument, the black-backed woodpecker counts were twice as high as in any other transect in a burn area outside the park (i.e., on national forest lands). This is probably because of the mature forest that existed in the park before the fire and the absence of salvage logging after the fire.
- Avian and mammalian inventories at two small cultural parks, **Fort Necessity National Battlefield** and **Friendship Hill National Historic Site** in western Pennsylvania, illustrate the importance of protected areas for species of concern. Dr. Rich Yahner, Brad Ross, and other Penn State investigators surveyed bird populations, documenting 127 and 138 bird species at Fort Necessity NB and Friendship Hill NHS, respectively. A total of 27 bird species were of special concern, including five state vulnerable species, two state threatened species, and one federally threatened species.

- Inventories at **Padre Island National Seashore** documented 22 reptile and amphibian species. The survey also identified a frog possibly new to science, according to the investigator, Dr. Mike Duran. The detection of a previously unrecorded species of toad (Woodhouse's toad, *Bufo woodhousii*) in the park is notable. The barrier and consequent genetic isolation imposed by Laguna Madre may have resulted in the toad's distinctive characteristics. Another discovery at Padre Island National Seashore was the Texas scarlet snake (*Cemophora coccinea lineri*), a state endangered species; there are only four specimens of this species in existence.
- The Soil Resource Inventory for **Grand Canyon National Park** was completed in FY 2003. Products included a detailed soil survey report, a set of digital map finished soil survey quad sheets, as well as a soils geospatial database and metadata file which meet National Cooperative Soil Survey Standards. A meeting was conducted with park staff where researchers explained how the soil resource inventory was performed, its limitations for use, and how the geospatial data can be used in a Geographic Information System (GIS). Participants indicated that the park hopes to use the Soil Resources Inventory as a tool to help stratify the park into various ecological zones to address several current and future resource management issues. One result would be a better understanding of the distribution of several threatened and endangered plant species, and the relationship of endemic plant species to various soil and site properties.
- A Coastal Mapping Protocols Workshop at **Canaveral National Seashore** addressed coastal park mapping needs and coastal management issues related to low relief and barrier island coastal systems. Workshop participants identified coastal landform and bathymetric features that should be incorporated into coastal geology mapping products.
- With the increased funding available in 2003, coastal park mapping projects were initiated or continued for seven parks. Leveraging funds with the U.S. Geologi-

cal Survey Western Division of Coastal and Marine Geology has made possible the mapping of submerged resources of the three west coast parks on Hawaii and the integration of these maps with on-shore mapping awaiting digitization.

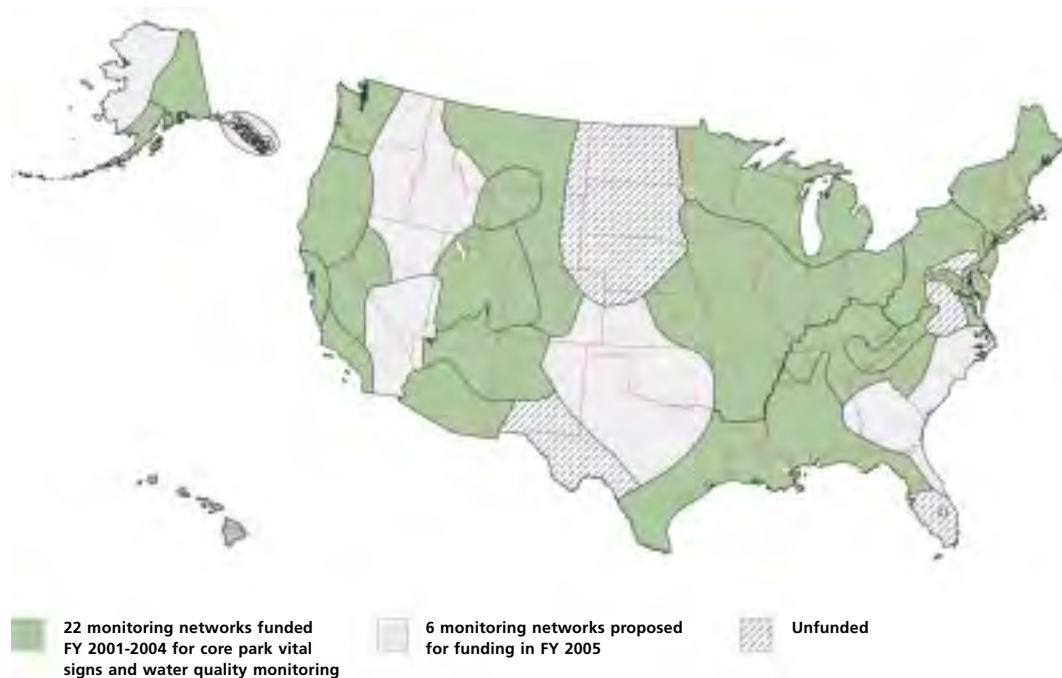
Monitoring

Five additional networks were funded for park vital signs monitoring in FY 2003, bringing the total funded to 17 networks encompassing 153 parks. The 17 networks are involved in a three-phase planning process that is designed to build upon existing information about park ecosystems and maximize the use and relevance of monitoring results for management decision-making, research, and education. Each phase of the design work undergoes peer review and refinement before approval is granted for implementation.

The first twelve networks funded for vital signs monitoring completed Phase Two of their planning and design. This was preceded by the Phase One tasks of compiling and synthesizing existing information, developing conceptual models of ecosystem functioning, and evaluating whether current monitoring efforts that may be ongoing in some parks in each network should be continued and/or expanded as part of the network monitoring program. The networks also identified partnership opportunities with other agencies and academia, and other means of leveraging the monitoring funding. Drawing on this information and understanding, and bringing in experts through scoping meetings and other processes, each network then used a well-documented decision-making process to identify and prioritize park vital signs for monitoring.

Because of funding restrictions, only the highest priority vital signs can be monitored with Natural Resource Challenge funding. However, parks have augmented Challenge funds with personnel and funding from other sources and have established partnerships with numerous agencies and universities. It is often possible to monitor several vital signs and parameters together. For example, a field crew may visit a stream segment and make numerous measurements on the physical and chemical parameters of the water (e.g., channel width, flow rate, pH, dissolved oxygen), as well as measures

National Park Service Vital Signs Monitoring Networks Status, FY 2004



ORDER FUNDED	NETWORK	CODE	NUMBER OF PARKS	REGION
1	North Coast and Cascades Network	NCCN	7	Pacific West
2	Northeast Coastal and Barrier Network	NCBN	8	Northeast
3	Heartland Network	HTLN	15	Midwest
4	Sonoran Desert Network	SODN	11	Intermountain
5	Cumberland/Piedmont Network	CUPN	14	Southeast
6	Central Alaska Network	CAKN	3	Alaska
7	National Capital Region Network	NCRN	11	National Capital
8	Northern Colorado Plateau Network	NCPN	16	Intermountain
9	San Francisco Bay Area Network	SFAN	6	Pacific West
10	Greater Yellowstone Network	GRYN	3	Intermountain
11	Appalachian Highlands Network	APHN	4	Southeast
12	Mediterranean Coast Network	MEDN	3	Pacific West
13	Southwest Alaska Network	SWAN	5	Alaska
14	Northeast Temperate Network	NETN	10	Northeast
15	Southern Colorado Plateau Network	SCPN	19	Intermountain
16	Pacific Island Network	PACN	9	Pacific West
17	Great Lakes Network	GLKN	9	Midwest
18	Gulf Coast Network	GULN	8	Southeast
19	Rocky Mountain Network	ROMN	6	Intermountain
20	Sierra Nevada Network	SIEN	3	Pacific West
21	Eastern Rivers and Mountains Network	ERMN	9	Northeast
22	Klamath Network	KLMN	6	Pacific West
23	Arctic Network	ARCN	5	Alaska
24	Southeast Coast Network	SECN	17	Southeast
25	Upper Columbia Basin Network	UCBN	8	Pacific West
26	Southern Plains Network	SOPN	10	Intermountain
27	Mojave Desert Network	MOJN	6	Pacific West
28	Southeast Alaska Network	SEAN	3	Alaska
29	South Florida/Caribbean Network	SFCN	6	Southeast
30	Mid-Atlantic Network	MIDN	11	Northeast
31	Chihuahuan Desert Network	CHDN	6	Intermountain
32	Northern Great Plains Network	NGPN	13	Midwest

of aquatic macroinvertebrate and fish communities (e.g., species occurrence, relative abundance), using funding from both the core vital signs and water quality monitoring components of the Natural Resource Challenge.

The list of vital signs that will be implemented with Natural Resource Challenge funding by the first 12 networks will not be finalized until completion in 2004 of the protocol design phase and negotiations with partners on options for implementation. To understand the vital signs most likely to be monitored, each of the 12 networks was asked to provide a preliminary list of their parks' three or four highest-priority vital signs. Listed in the accompanying table are some of the most common park vital signs and the number of parks in the first 12 networks that identified them as a top priority.

The following provides the rationale for some specific network selections of vital signs, including those in the accompanying table, and gives an example of a network that listed each vital sign as a top priority.

- **Exotic/Invasive Plant Species Occurrence** – Invasive plant species easily take

over sections of ecosystems, choking out native species and consuming valuable resources. Exotic species can greatly alter ecological processes such as energy flow, nutrient cycling, and succession (e.g., tree mortality because of introduced forest pests). A significant amount of money is spent each year to combat exotics and restore affected habitat. Monitoring exotic species occurrence in a scientifically robust manner could greatly improve efficiency of removal and restoration efforts. (*Greater Yellowstone Network*)

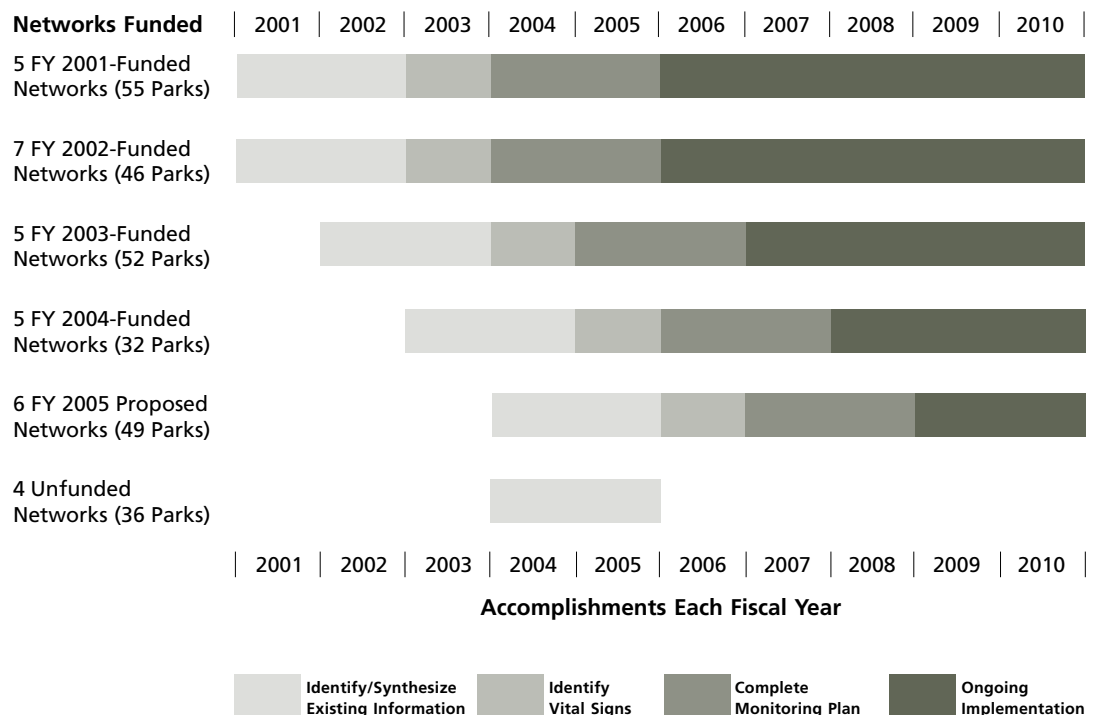
- **Changes in Adjacent Land Use/Land Cover** – Changes in adjacent land cover/land use directly influence park ecosystems in many important areas such as habitat loss, fragmentation, altered nutrient cycles, pollution, invasive species, and hydrologic impacts. Several parks are surrounded completely by urban development, while others exist in rural settings that are rapidly changing. Combining the monitoring of this attribute with key attributes for air quality, water quality, and vegetational changes will provide park managers with early warning for future impacts on park ecosystems. (*Cumberland Piedmont Network*)

Preliminary List of Priority Vital Signs to be Monitored

VITAL SIGN	EXAMPLE MEASURES (VARIES BY NETWORK)	NUMBER OF PARKS
Exotic/Invasive Plants	Distribution, occurrence (presence/absence), area covered by specific species of exotic/invasive plants	79
Land Use/Land Cover Change	Area covered by each land use type; patch size; distance between patches (largely derived from aerial and satellite imagery)	67
Vegetation Community Structure/Composition	Species richness and abundance; percent cover by species; age and size distributions; recruitment (focus on key species and communities)	59
Aquatic Macroinvertebrate Composition Abundance	Species and family richness; abundance of macroinvertebrate indicator species; ratios of observed:expected species	35
Soil Structure and Stability	Presence/absence of erosional features (rills, pedestaled plants, gullies); cover and development of biological soil crust; area of uplands with various soil cover types; patterns of channel aggradation/degradation; channel volume, bedload	20
Fish Community Dynamics	Distribution and abundance of native and exotic species; sex and age structure	15
Land Bird Distribution and Abundance	Distribution and abundance of native and exotic species; age structure	15

- **Vegetation Community Structure/Composition** – The herbaceous forest understory provides information regarding important issues of interest to managers (changes in canopy density, deer browse) in addition to reflecting the underlying ecological processes of competition, emigration and immigration, and nutrient cycling. Changes in the tree community may reflect successional trends resulting from management practices or the disruption of historic ecological regimes. (*Heartland Network*)
- **Aquatic Macroinvertebrate Composition and Abundance** – Macroinvertebrates are sensitive to changes in the chemical and physical properties of their environment, and certain species require very particular habitat conditions to survive. Data for macroinvertebrates have been used to assess water quality impairment for decades, and are now being used by almost every state agency and numerous county programs across the country for monitoring the biological integrity of our nation's waters. (*Central Alaska Network*)
- **Soil Structure and Stability** – Soil structure and stability (particularly in arid parks) provides a measure of the resilience of a system to recover from disturbance and its resistance to being substantially affected by disturbances. Accelerated soil erosion in uplands is a predictable response to stressors and disturbances such as altered fire regimes, overgrazing by livestock on adjacent lands, and the creation of unauthorized social trails. Soil loss in upland portions of watersheds can result in extreme sedimentation and scour events along streams and other critical surface water sources, and diminished soil productivity can directly impact vegetation and indirectly affect wildlife. (*Northern Colorado Plateau Network*)
- **Fish Community Dynamics** – Lake ecosystem processes are greatly affected by the presence and composition of fish communities. In the North Coast and Cascades Network, the status of rare and endemic species are of high concern, as is the effect of exotic species introduction on native fish communities and lake food web structure. In many lakes, native species are subject to recreational harvest. Overharvest can have profound effects on lake food web structure. (*North Coast and Cascades Network*)

National Park Service Vital Signs Monitoring Networks Funding and Accomplishments



- **Land Bird Distribution and Abundance** – The Sonoran Desert lies along a major flyway for migratory birds in North America, and many Sonoran Desert parks contain rare and regionally diminishing habitat (e.g., lowland riparian vegetation) for both migrant and resident land birds. Compared with many other vertebrate taxa, the science of land bird monitoring is well developed, and the community dynamics of land birds provides a useful indicator of overall ecosystem patterns and processes. Simultaneous monitoring of land bird communities and vegetation communities will provide complementary perspectives on ecosystem condition and management effectiveness. (*Sonoran Desert Network*)
- **Glaciers** – In addition to their importance to hydrology, aquatic ecosystems, and vegetation, glaciers are valuable indicators of climatic variability. Annual variations in temperature and precipitation make identification of meaningful changes in climate difficult—glaciers integrate these variations, while they respond continually to temperature and precipitation changes. The climatic change of the late 1940s, which subsequently was found to have caused the advance of glaciers in many parts of the world, was apparently first detected in 1946 and 1947 in the Nisqually Glacier on Mount Rainier. Thus, glacier monitoring is important globally, as well as locally. (*North Coast and Cascades Network*)
- **Shoreline Change** – Monitoring natural shoreline dynamics and retreat of the land in the face of rising sea level is basic to understanding the driving forces behind many Northeast Coastal and Barrier Network park ecosystems. The loss of valuable cultural/historic sites and natural resources (e.g., endangered plover and tern breeding habitat) is of paramount concern to park managers. Understanding shoreline dynamics will assist with these management decisions in the future. For ocean parks such as Cape Cod National Seashore and Assateague Island National Seashore, horizontal position of the shoreline is one of the simplest and most effective means of monitoring shoreline change. (*Northeast Coastal and Barrier Network*)

Highlights of results of ongoing monitoring and planning for monitoring in the first twelve networks include the following:

- A climate/weather workshop was held at the **National Oceanic and Atmospheric Administration (NOAA)** Sandpoint facility in Seattle to (1) integrate and cost-share NPS monitoring with other programs; (2) devise means to economically monitor weather and track climate change for understanding linkages to terrestrial and aquatic systems; and (3) recommend monitoring locations, types of equipment, and appropriate models for extrapolating monitored data. Scientists from NOAA, state and local air regulatory agencies, the National Park Service, regional energy agencies, Natural Resources Conservation Service (NRCS), Washington Department of Transportation, and local universities attended.
- Connections with communities were strengthened at **Olympic National Park** as the park developed its water quality monitoring design. The marine water quality samples required to develop a marine water quality monitoring protocol must be collected in the nearshore environment. “Surfrider” volunteers, members of a nonprofit organization dedicated to protecting oceans, waves, and beaches, collected these water samples in 2003. Their work will continue next year, and the results will help determine how Olympic National Park will monitor ocean water quality on its shores.
- Protocol development for monitoring seagrasses in the **Northeast Coastal and Barrier Network** provided an opportunity for multi-party collaboration. Lead scientists from the U.S. Geological Survey Patuxent Wildlife Research Center invited scientists from Cape Cod National Seashore, NOAA Waquoit Bay National Estuarine Research Reserve, and Massachusetts Department of Environmental Protection to participate in training using **SeagrassNet** protocols. SeagrassNet is a global monitoring project with stations throughout the world oceans. Cofounder Dr. Frederick Short, from the University of New Hampshire, provided on-site training in

SeagrassNet methods. Also assisting with the work was a group of regional high school students participating in a summer science enrichment program under the supervision of a **Cape Cod National Seashore** Student Conservation Association intern.

- In the winter of FY 2003, the **Sonoran Desert Network** joined with the Sonoran Institute, the U.S. Geological Survey-Sonoran Desert Field Station, and the University of Arizona as the lead partners in a regional monitoring framework for the Sonoran Desert Ecoregion. Such cooperation has begun just as Pima County, Arizona (which contains **Organ Pipe Cactus National Monument** and **Saguaro National Park**, the largest parks in the network), is developing an ecological monitoring plan, and the Bureau of Land Management, the U.S. Forest Service, and Mexican agencies are increasingly mandated to conduct sustained, consistent ecological monitoring. These and other entities in the Sonoran region have been very responsive to the network monitoring approach. As network parks comprise less than one percent of the Sonoran Desert, and many of the network resource management issues and threats come from outside park boundaries, a cooperative, regional monitoring approach can provide obvious benefits to network parks. As such, the potential regional and collaborative approaches to monitoring have been considered explicitly during monitoring plan development.
- Results of analyzing five years of bird monitoring data from **Tumacacori National Historical Park**, **Coronado National Memorial**, **Chiricahua National Monument**, **Organ Pipe Cactus National Monument**, **Fort Bowie National Historic Site**, and two nearby preserves in Mexico provided important lessons for future monitoring in the **Sonoran Desert Network**. The data were collected as a part of the national Monitoring Avian Productivity and Survivorship (MAPS) program, but had not been analyzed. Results of the analysis indicated that sample size limitations prevented meaningful trend information for these parks. Another type of monitoring that could be obtained more easily and more economically appears more reliable—relative abundance estimates developed using distance sampling. Results were distributed to network parks and presented at a network meeting. This inexpensive project demonstrated the value and importance of periodic data analysis and careful examination of natural and sampling variance for designing ecological monitoring.
- One of the most feasible and practical ways to monitor long-term changes in permafrost has been identified by the **Central Alaska Network**—the interpretation of aerial photography or other imagery. To explore this option further, a request for proposals has been announced that will evaluate the effectiveness of this method in other settings and delineate limitations and important components of using this technique. One site in each of the network parks will be interpreted as an example of this technique.
- The Kennecott and Nebesna Glaciers in **Wrangell-St. Elias National Park and Preserve** have been identified as suitable for employing the index method of glacier monitoring that was developed by the Denali prototype monitoring program. Site visits were conducted, and descriptions of identified sites will be presented during 2004 to a group of experts. This will establish the groundwork for continued scoping of glacier monitoring ideas during FY 2004.
- Although the 2002-2003 winter was the lowest snowfall winter on record, the overwinter mortality of caribou cows in the **Denali** herd was the highest recorded (19 percent) during this 17-year study. When added to observed summer mortality, an estimated 23 percent of the cows were lost in the last year. The high losses could be attributed to the age structure in the herd, which was biased strongly to older females. A population of approximately 1,130 cows is estimated for September 2003 (15 percent less than September 2002, corroborating the estimate of 16 percent from above). Further estimation of bulls and calves indicates a total herd size of approximately 1,600 caribou. In addition, the fall density of wolves and their mean litter size indicate

some of the lowest measurements ever made for this population. Data indicate a food-stressed wolf population in general; low overall population size, low mean pack size, low pup survival, wolves killing each other, and low capture weights in March. Additionally, two of eight wolves captured in March were in poor physical condition.

Reports identifying the most important vital signs for monitoring are being reviewed for approval. After approval, the vital signs for all 12 networks will be compiled and summarized.

NATURAL RESOURCE DATA AND INFORMATION PROGRAM

Challenge Activity:

- *Make natural resource data useable for management decisions and the public*
- *FY 2003 Allocation: \$1,542*

The Natural Resource Challenge has provided two-thirds of the funding support (above support from the Inventory and Monitoring Program) for the Natural Resource Information Division. This infusion of funds has provided the means to enhance and accelerate the capabilities of the National Park Service to develop information technology (IT) solutions for sharing data and information with others. The capstone of this effort has been the ability to recruit highly competent information technology staff and cooperators as IT system project leaders and application developers. The Division coordinates and maintains various hardware and database systems for all of the natural resource programs, including its web presence. A significant effort was made in FY 2003 to improve the public website, NatureNet, which was completed and introduced in early FY 2004.

The Division maintained and continued refining the NPS Research Permit and Reporting System through ongoing outsourced software design and system support. In FY 2003 the system was used to process and track more than 7,500 electronic records, including applications, permits, and accomplishment reports. Specific software refinements included preparing version 2.0, including an innovative online tutorial-style interface, and an

assortment of functions improving the system confirmation and other auto-messaging capabilities. These refinements resulted in more efficient communication between the NPS and the community of scientific researchers.

The Natural Resource Information Division continued to provide park staff with a software application to help them organize, access, and synthesize data and information pertaining to resource stewardship. Through ongoing university partnerships, park-based data previously available only in hard-copy media was transferred into electronic (digitized) files. Data within a framework of interactive software supporting the "Views of the National Parks Program" were expanded and refined to provide the public with greater knowledge of coastal geology, glaciers, invasive species, and volcanism.

The program implemented several public information efforts in FY 2003. A cooperative venture with the EarthCare radio series was initiated to provide 90-second radio programs on natural resource topics via National Public Radio stations nationwide in 2004. Also developed was an informal partnership with the National Science Teachers Association (NSTA). The first in a planned sequence of two-day National Park Service "tag-on" training sessions was presented in advance of the association's annual meeting, which focused on communicating natural resource stories and issues. In FY 2003 this training focused on NPS geology. As another part of its public outreach effort, the program developed a Research Learning Center website for presenting information to the public about research activities in parks and to help the Research Learning Centers share information among themselves. Additional efforts were made to increase the use of the Internet and other means to make distribution of natural resource publications more efficient.

Update of the Natural Resource Management Assessment Program (NR-MAP) database was completed in FY 2003. This database captures natural resource and natural resource management workload information about parks and helps compare park needs. The NR-MAP database was effectively converted from DBaseIV to MS-Access. The previous client-based NR-

MAP software was successfully migrated to a web-based solution enabling rapid access to core data attributes, including park-specific attributes and National Park Servicewide compilations.

RESEARCH LEARNING CENTERS

Challenge Activity:

- *Establish Learning Centers*

Cumulative Challenge Increases:

- *\$2,698,000 (FY 2001 and FY 2003)*

Thirteen National Park Service Research Learning Centers (RLC) offer infrastructure and other incentives to researchers such as lab space, low-cost housing, access to computer information systems, extensive natural and cultural resource data sets, suggestions for preferred research topics or subject area emphasis, and in some cases, matching funds. With one exception, these RLCs were funded through the Natural Resource Challenge. In addition, RLC education staff members enhance the making of data more useable by identifying expanded methods to access the data, such as through the Internet, through libraries, scheduled public research seminars, or programs with gateway communities. Furthermore, partners are associated with each center in order to help maximize programmatic and financial resources. This ensures that parks and staff possess the current scientific information required to make sound management decisions and maintain an ability to communicate about science in the parks in a relevant way both to community members and area students. An Internet RLC clearinghouse has been developed to provide best practices and RLC case study examples.

Some highlights from FY 2003 follow.

- Through partnerships and consistent communication, the **Pacific Coast Science and Learning Center (PCSLC)** successfully leveraged \$280,000 to conduct high-priority research in **Point Reyes National Seashore** and surrounding community areas. Research outcomes include discovery of an invasive sea squirt that can harm oyster farming and the ecology of the bay. This early detection may allow more effective removal or mitigation. Secondly, subtidal mapping and marine protected area (MPA) modeling will aid with potential MPA plans for the state of California.
- The **Appalachian Highlands Science Learning Center (AHS LC)**, with the help of the Friends of **Great Smoky Mountains National Park**, received a three-year grant (\$165,100) from the Burroughs Wellcome Fund of Research Triangle Park, North Carolina. This grant has allowed the learning center to expand its staff in the summer months with a biological technician, a college intern biological science aid, and 12 high school intern biological science aids (from four local counties). Student intern work in 2003 resulted in the identification of 18 new park-record beetles, five new park-record moths, and more than one dozen new park gall-making flies.
- The director of the **Ocean Alaska Science and Learning Center (OASLC)** holds a faculty position in marine biology through the School of Fisheries and Ocean Sciences, University of Alaska,

National Park Service Research Learning Centers

1. Appalachian Highlands Science Learning Center, Great Smoky Mountains National Park
 2. Atlantic Learning Center, Cape Cod National Seashore
 3. Continental Divide Research Learning Center, Rocky Mountain National Park
 4. Crown of the Continent Research Learning Center, Glacier National Park
 5. Great Lakes Research and Education Center, Indiana Dunes National Lakeshore
 6. Jamaica Bay Institute, Gateway National Recreation Area
 7. North Coast and Cascades Learning Network, Seattle, Washington
 8. Ocean Alaska Science and Learning Center, Kenai Fjords National Park
 9. Old-Growth Bottomland Forest Research and Education Center, Congaree Swamp Nat'l. Monument
 10. Pacific Coast Science and Learning Center, Point Reyes National Seashore
 11. Schoodic Education and Research Center, Acadia National Park
 12. Southern California Coast Research Learning Center, Santa Monica Mountains Nat'l. Recreation Area
 13. Urban Ecology Research and Learning Alliance, Washington, DC
-



A forestry intern with the Casey Tree Foundation (left) uses a laser range finder to measure the height of the oldest and largest trees at the Reflecting Pool on the National Mall as an intern from the University of Maryland (right) provides GPS information for each tree measured.

NPS PHOTO

Fairbanks. This connection strengthens communication between the NPS and the University, resulting in innovative research and partnerships. Since its inception in 2001, the OASLC has funded (through formal requests for proposals) more than \$850,000.00 in coastal and marine research and public education programs.

- A blue-ribbon panel prepared a report on the loss of salt marsh in **Jamaica Bay Wildlife Refuge** within **Gateway National Recreation Area** in New York. In an attempt to reverse the trend, the Jamaica Bay Institute has increased NPS staff awareness about the issues through brown bag lunches and has effectively communicated to gateway communities and implemented a successful beach clean-up program that targets angler's monofilament.
- **The Urban Ecology Research Learning Alliance (UERLA)** has begun an All Taxa Biodiversity Inventory (ATBI) on arthropod species known to be in or from

Rock Creek Park and is sponsoring a study that is assessing visitor harvesting of wild morel mushrooms in **Chesapeake and Ohio Canal National Historical Park** and **Catoctin Mountain Park**.

- **The Great Lakes Research and Education Center (GLREC)** sponsored a Purple Loosestrife Workshop for resource managers, educators, and non-government organization staff. The workshop provided educational tools to teachers and volunteers about the impacts of purple loosestrife on wetland habitats.
- Research scientists at the **Atlantic Learning Center** located in **Cape Cod National Seashore** are working with local teachers to develop student protocols to monitor changes in the park's coastal ecosystem and gather local salt marsh responses to sea level change. Teachers and students are challenged to design salt spray catchers, sand collectors, and "tatter flags" to evaluate wind impact.



A snowy egret contrasts with the dense foliage characteristic of subtropical wilderness in Everglades National Park.

PHOTO © RUSS FINLEY/FINLEY-HOLIDAY FILMS

Chapter Five: Financial Details

Because many of the Challenge funds are indistinguishable from other program funds, financial information is provided for entire program areas receiving Challenge funding, whether they are Challenge-created programs or have been expanded as a result of the Challenge.

The Natural Resource Challenge funding has been requested as a series of discrete requests for a specific set of actions included in the Natural Resource Challenge action plan. Several of the actions represent new directions and new program areas, but many are expansions of existing programs. As a result, 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.

Because many of the Challenge funds are indistinguishable from other program funds, financial information is provided for entire program areas receiving Challenge funding, whether they are Challenge-created programs or have been expanded as a result of the Challenge. These Servicewide programs are identified separately in the National Park Service budget.

Parks receive a single allocation for their operations funding, and neither Challenge

funding nor natural resource management funding are identified separately. For parks, funding is shown for park natural resource programs as reported by the parks.

Narrative descriptions of accomplishments, found in Chapters Two through Four, focus on those parts of the program that have been most affected by Natural Resource Challenge funding. This chapter provides detailed financial information about the affected programs, showing how the program funding changes between FY 2002 and FY 2003 and how the funds were distributed. The accompanying table shows the Natural Resource Stewardship budget, by programs affected by the Natural Resource Challenge, indicating the extent of Challenge contributions to the overall program.

Following are details of funding changes by program between FY 2002 and FY 2003. In addition, where appropriate, additional detail is provided regarding how funding within these programs has been allocated.

Natural Resource Challenge Funding History (dollars in thousands)

CHALLENGE PROGRAM ELEMENT	INCREASE FY 2000	INCREASE FY 2001	INCREASE FY 2002	INCREASE FY 2003	INCREASE FY 2004	REQUEST FY 2005	TOTAL THROUGH FY 2005
Inventory and Monitor Resources							
Basic Inventories (except vegetation mapping)	\$ 7,309	\$ -	\$ -	\$ 1,987	\$ -	\$ -	\$ 9,296
Vegetation Mapping (With USGS)	-	1,746	-	2,235	-	-	3,981
Park Air Emissions Inventory	-	200	-	-	-	-	200
Monitor Vital Signs in Park Networks	-	4,191	4,200	6,855	4,939	4,111	24,296
Monitor Water Quality in Park Networks	-	1,272	-	497	592	528	2,889
Watershed Assessment	-	-	-	3,080	-	-	3,080
Expand Air Quality Monitoring and Related Activities	-	-	2,600	-	-	-	2,600
Make Natural Resources Data Useable	\$ -	\$ 1,098	\$ -	\$ -	\$ -	\$ -	\$ 1,098

(continued on next page)

Mechanical removal of nonnative plants was one phase of restoring the vegetation community at an abandoned ski area in Lassen Volcanic National Park. NPS PHOTO



Natural Resource Challenge Funding History (dollars in thousands) (continued)

CHALLENGE PROGRAM ELEMENT	INCREASE FY 2000	INCREASE FY 2001	INCREASE FY 2002	INCREASE FY 2003	INCREASE FY 2004	REQUEST FY 2005	TOTAL THROUGH FY 2005
Fix Critical Problems							
Natural Resource Preservation \$	2,875	\$ -	\$ 4,000	\$ -	\$ -	\$ -	\$ 6,875
Program Project Funding							
Alaska Natural Resource	-	-	-	497	-	-	497
Projects							
Establish Resource Protection	-	-	300	-	-	-	300
Fund							
Water Resource Protection and	-	823	-	-	-	-	823
Restoration/Project Funds							
Water Resource Protection and	-	-	1,000	200	-	-	1,200
Restoration/Field Specialists							
Native/Non-Native Species	3,449	-	2,400	2,136	-	-	7,985
Management and Exotic							
Plant Management Teams							
Implement Resource Protection	-	-	500	-	-	-	500
Act/Restore Resources							
Protect Geologic Resources	696	-	-	-	-	-	696
Park Invasive Species	\$ -	\$ 3,395	\$ 3,200	\$ -	\$ -	\$ -	\$ 6,595
Control and Threatened							
and Endangered Species							
Recovery							
Attract Scientists							
Establish Learning Centers	\$ -	\$ 898	\$ 1,800	\$ -	\$ -	\$ -	\$ 2,698
Establish Cooperative	\$ -	\$ 1,596	\$ -	\$ 397	\$ -	\$ -	\$ 1,993
Ecosystem Studies Units							
ANNUAL INCREASE	\$ 14,329	\$ 15,219	\$ 20,000	\$ 17,884	\$ 5,531	\$ 4,639	\$ -
TOTAL ANNUAL FUNDING	\$ 14,329	\$ 29,548	\$ 49,548	\$ 67,432	\$ 72,963	\$ 77,602	\$ 77,602

**Natural Resource Funding of Parks Receiving Natural Resource Challenge (NRC) Program Increases
(dollars in thousands)**

PARK	FY 2001 OR FY 2002 NRC INCREASE	FY 2002 TOTAL NRC FUNDS	FY 2003 NRC TOTAL
Acadia National Park	\$ 345,000	\$ 849,827	\$ 794,395
Antietam National Battlefield	150,000	319,965	316,723
Appalachian National Scenic Trail	142,000	263,638	256,603
Big Cypress National Preserve ¹	399,000	1,033,640	1,010,000
Buck Island Reef National Monument ²	100,000	270,000	216,450
Catoctin Mountain Park*	89,000	254,400	231,900
Channel Islands National Park	498,000	1,406,622	1,406,622
Coronado National Memorial	60,000	94,993	105,231
Curecanti National Recreation Area	141,000	657,500	690,600
Dinosaur National Monument	189,000	501,800	559,375
Gates of the Arctic National Park and Preserve	148,000	362,401	363,039
Great Basin National Park	126,000	331,450	315,756
Great Sand Dunes National Preserve	180,000	291,700	287,500
Great Smoky Mountains National Park	402,000	1,245,100	1,152,700
Haleakala National Park	480,000	1,561,660	1,372,200
Homestead National Monument of America	82,000	104,500	104,500
Hopewell Culture National Historical Park*	105,000	95,000	79,322
Jewel Cave National Monument	50,000	168,500	168,500
John Day Fossil Beds National Monument	95,000	129,000	130,000
Kalaupapa National Historical Park	211,000	549,000	549,000
Lake Clark National Park and Preserve	147,000	321,500	319,810
Little River Canyon National Preserve ³	85,000	182,426	174,027
Mojave National Preserve*	470,000	1,264,000	1,219,073
Monocacy National Battlefield*	118,000	120,000	116,000
Obed Wild and Scenic River	195,000	245,000	193,318
Padre Island National Seashore	95,000	408,000	403,825
Pictured Rocks National Lakeshore	55,000	194,650	207,000
Rock Creek Park*	163,000	436,522	393,168
San Juan Island National Historical Park	95,000	124,600	125,050
Saugus Iron Works National Historic Site	58,000	58,000	58,000
Sequoia and Kings Canyon National Parks* ⁴	112,000	1,446,000	1,424,400
Stones River National Battlefield	132,000	132,000	137,100
Sunset Crater, Walnut Canyon, and Wupatki National Monuments	100,000	166,762	171,227
Theodore Roosevelt National Park	133,000	302,500	292,500
Virgin Islands National Park ⁵	399,000	1,077,234	1,002,726
Zion National Park	246,000	536,300	515,872
TOTAL	\$ 6,595,000	\$ 17,506,190	\$ 16,863,512

* Information provided by parks for FY 2003 report included discrepancies in previously provided information or figures did were not added or subtracted correctly; attempts to resolve were unsuccessful.

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.

³ Figures shown for FY 2001 and FY 2002 reflect a correction to those reported in FY 2002 report.

⁴ Also received a non-Challenge \$367,000 base increase in FY 2001.

⁵ Also received a Coral Reef Initiative base increase of \$300,000 and Prototype Monitoring increase of \$230,000 in FY 2001.

Natural Resource Challenge Funding Changes, FY 2002-2003
Air Resources Program

DESCRIPTION	FUNDING
Funding available in FY 2002	\$ 9,065,000
Across-the-board travel reduction	(26,000)
Pay increase	18,000
Across-the board reduction	(59,000)
TOTAL ALLOCATED IN FY 2003	\$ 8,998,000
Reprogramming of travel reduction to reflect funds that incurred travel, rather than personnel	(1,000)
TOTAL FUNDING AVAILABLE IN FY 2003	\$ 8,997,000
<i>Air Resources Program Funding by Categories</i>	
Air emissions inventory	200,000
Air quality monitoring, analysis, and technical assistance	8,797,000
TOTAL	\$ 8,999,000

Natural Resource Challenge Funding Changes, FY 2002-2003
Biological Resources Management Program

DESCRIPTION	FUNDING
Funding available in FY 2002	\$ 5,846,000
Across-the-board travel reduction	(27,000)
Pay increase	13,000
FY 2003 Natural Resource Challenge increase	2,136,000
Across-the-board reduction	(38,000)
TOTAL ALLOCATED IN FY 2003	\$ 7,930,000
Reprogramming of travel reduction to reflect funds that incurred travel, rather than personnel	(1,000)
TOTAL FUNDING AVAILABLE IN FY 2003	\$ 7,929,000
<i>Biological Resource Management Program Funding by Categories</i>	
Exotic Plant Management Teams	\$ 5,150,000
Ecological Restoration	425,000
Integrated Pest Management Program	515,000
Endangered Species Program	465,000
Wildlife Program	438,800
Biological Resource Projects–National Level Support	935,200
TOTAL	\$ 7,929,000

Natural Resource Challenge Funding Changes, FY 2002-2003
Cooperative Ecosystem Studies Units

DESCRIPTION	FUNDING
Funding available in FY 2002 ¹	\$ 46,000
FY 2003 Natural Resource Challenge Increase ²	397,000
TOTAL FUNDING AVAILABLE IN FY 2003	\$ 443,000
FY 2003 transfer to regions	(310,000)
NET AVAILABLE AFTER TRANSFER	\$ 133,000
<i>Cooperative Park Studies Unit Funding Distribution *</i>	
Alaska Region	\$ -
North and West Alaska CESU—no Challenge funding	
Intermountain Region	\$ 465,000
Colorado Plateau CESU (\$155,000)	
Desert Southwest CESU (\$155,000)	
Rocky Mountains CESU (\$155,000)	
Midwest Region	\$ 310,000
Great Plains CESU (\$155,000)	
Great Lakes-Northern Forest CESU (\$155,000)	
Upper and Middle Mississippi Valley CESU—no Challenge funding	
National Capital Region	\$ 155,000
Chesapeake Watershed CESU	
Northeast Region	\$ 155,000
North Atlantic Coast CESU	
Pacific West Region	\$ 310,000
Great Basin CESU (\$155,000)	
Pacific Northwest CESU (\$155,000)	
Californian CESU—no Challenge funding	
Southeast Region	\$ 465,000
South Florida-Caribbean CESU (\$155,000)	
Southern Appalachian Mountains CESU (\$155,000)	
Gulf Coast CESU (\$155,000)	
Piedmont-South Atlantic Coast CESU —no Challenge funding	
Washington Office	\$ 133,000
TOTAL	\$ 1,993,000

¹ \$1,596,000 received in FY 2001; \$1, 550,000 transferred to regions

² Increase amount reflects across-the-board reduction

* Shows distribution with funds previously transmitted to regions, as well as funds received and transferred in FY 2003. A total of \$310,000 was transferred to the Midwest and Southeast Regions, representing new funding to two CESUs in FY 2003.

Natural Resource Challenge Funding Changes, FY 2002-2003
Geologic Resources Program

DESCRIPTION	FUNDING
Funding available in FY 2002	\$ 2,700,000
Across-the-board travel reduction	(34,000)
Pay increase	21,000
Across-the-board reduction	(17,000)
TOTAL ALLOCATED IN FY 2003	\$ 2,670,000
Reprogramming of travel reduction to reflect funds that incurred travel, rather than personnel	25,000
TOTAL FUNDING AVAILABLE IN FY 2003	\$ 2,695,000

Natural Resource Challenge Funding Changes, FY 2002-2003
Inventory and Monitoring Program

DESCRIPTION	FUNDING
Funding available in FY 2002	\$ 21,757,000
Transfer to prototype park	(189,000)
Across-the-board travel reduction	(126,000)
Pay increase	5,000
Across-the-board reduction	(139,000)
Natural Resource Challenge Increases in FY 2003	
Accelerate basic inventories	1,987,000
Vegetation mapping cost-share with USGS	2,235,000
Park Vital Signs Monitoring	6,855,000
TOTAL FUNDING AVAILABLE IN FY 2003	\$ 32,385,000
<i>Inventory and Monitoring Program Funding by Categories</i>	
Resource Inventory Projects	\$ 13,794,500
Vital Signs Monitoring	13,578,900
Prototype Monitoring	1,231,300
Monitoring Projects	286,365
Database Development	1,404,335
Regional Coordinators	640,000
Program Administration	1,191,600
Reprogrammed	258,000
TOTAL	\$ 32,385,000
<i>Allocation of Funding Among Basic Natural Resource Inventories in FY 2003</i>	
Species Lists	\$ 25,000
Base Cartography Data	35,000
Biological Inventories	5,908,500
Vegetation Mapping	
Alaska	500,000
Outside of Alaska	4,000,000
Water Resource Data	620,000
Soil Surveys	986,000
Geology Inventories	1,395,000
Air Quality Related Values	325,000
TOTAL	\$ 13,794,500
<i>Allocation of Park Vital Signs Monitoring Funding Among Networks in FY 2003</i>	
North Coast and Cascades	\$ 345,100
Northeast Coastal and Barrier	776,500
Heartland	684,400
Sonoran Desert	670,000
Cumberland/Piedmont	476,700
Central Alaska	730,100
National Capital	747,000
Northern Colorado Plateau	535,500
San Francisco Bay Area	742,800
Greater Yellowstone	742,700
Appalachian Highland	416,400
Mediterranean Coast	302,000
Southwest Alaska	974,700
Northeast Temperate	481,200
Southern Colorado Plateau	815,200
Pacific Island	1,095,100
Great Lakes	811,500
Gulf Coast	150,000
Rocky Mountain	150,000
Sierra Nevada	150,000
Eastern Rivers and Mountains	150,000
Klamath	150,000
Arctic	\$ 150,000

(continued on next page)

Natural Resource Challenge Funding Changes, FY 2002-2003
Inventory and Monitoring Program (continued)

DESCRIPTION	FUNDING
<i>Allocation of Funding Among Basic Natural Resource Inventories in FY 2003</i>	
Southeast Coast	\$ 150,000
Northern Semi-Arid	150,000
Southern Plains	150,000
Mojave Desert	150,000
Southeast Alaska	150,000
South Florida/Caribbean	150,000
Mid-Atlantic	150,000
Chihuahuan Desert	150,000
Northern Great Plains	150,000
TOTAL	\$ 13,578,900

Natural Resource Challenge Funding Changes, FY 2002-2003
Inventory and Monitoring Program (continued)

CATEGORY	UNIVERSITIES	OTHER NON-FED	USGS	OTHER FED
<i>Inventory and Monitoring Expenditures by Non-NPS Categories</i>				
Inventories				
Biological Inventories	\$ 2,312,300	\$ 1,411,200	\$ 557,900	\$ 339,500
Vegetation Mapping	812,400	910,600	0	44,800
Water Resources	335,600	0	239,400	0
Air Quality-Related Values	322,000	0	0	0
Soils	0	0	0	940,000
Geology	215,000	0	0	0
Base Cartography	0	0	15,000	0
Miscellaneous	0	0	0	25,000
Monitoring	4,472,400	4,759,000	649,900	608,100
TOTALS	\$ 8,469,700	\$ 7,080,800	\$ 1,462,200	\$ 1,957,400

Natural Resource Challenge Funding Changes, FY 2002-2003
Natural Resource Data and Information Program

DESCRIPTION	FUNDING
Funding available in FY 2002	\$ 1,553,000
Across-the-board travel reduction	(13,000)
Pay increase	12,000
Across-the-board reduction	(10,000)
TOTAL ALLOCATION IN FY 2003	\$ 1,542,000
Reprogramming of travel reduction to reflect funds that incurred travel, rather than personnel	(1,000)
TOTAL FUNDING AVAILABLE IN FY 2003	\$ 1,541,000

Natural Resource Challenge Funding Changes, FY 2002-2003
Natural Resource Preservation Program (NRPP)

DESCRIPTION	FUNDING
Funding available in FY 2002	\$ 12,289,000
Across-the-board travel reduction	13,000
Across-the-board reduction	80,000
Challenge increase	497,000
TOTAL ALLOCATED IN FY 2003	\$ 12,693,000
Reprogramming of travel reduction to reflect funds that incurred travel, rather than personnel	(15,000)
TOTAL FUNDING AVAILABLE IN FY 2003	\$ 12,678,000

Natural Resource Challenge Funding Changes, FY 2002-2003
Natural Resource Preservation Program (NRPP)

CATEGORY	ALLOCATION	NO. PROJECTS
<i>Allocation of NRPP Among Project Categories and Projects Funded</i>		
Natural Resource Management	\$ 6,287,700	70
Threatened & Endangered Species	532,000	14
Disturbed Lands Restoration	850,000	12
Small Park	999,800	69
Regional Block Allocation	1,400,000	81
Alaska Projects	497,000	unknown
USGS/BRD Technical Assistance	255,000	30
Servicewide	934,000	16
Reprogrammed	922,500	
TOTAL	\$ 12,678,000	

Natural Resource Challenge Funding Changes, FY 2002-2003
Research Learning Centers

LOCATION	RESEARCH LEARNING CENTER	FUNDING FY 2001	FIRST REC'D FY 2002
Acadia National Park	Acadia Center for the Environment		X
Cape Cod National Seashore	Atlantic Learning Center	X	
Gateway National Recreation Area	Jamaica Bay Learning Center for Applied Research on Urban Ecology		X
Glacier National Park	Crown of the Continent Learning Center		X
Great Smoky Mountains National Park	Purchase Knob Learning Center	X	
Indiana Dunes National Lakeshore	Great Lakes Research and Education Center		X
National Capital Region	Urban Ecology Learning Alliance		X
North Cascades, Mount Rainier, and Olympic National Parks	North Coast and Cascades Learning Center		X
Point Reyes National Seashore	Pacific Coast Learning Center	X	
Rocky Mountain National Park	Continental Divide Research and Learning Center	X	
Santa Monica Mountains National Recreation Area	Center for Teaching New America		X
Seward, Alaska Sealife Center	Ocean Alaska Science and Learning Center	X*	

Except as noted, each of these Research Learning Centers received \$225,000 in Challenge funding the year that they were funded. 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.

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

Maryland educators working on a project with the National Capital Parks Urban Ecology Research Learning Alliance identify and record plants along transects in Dyke Marsh at George Washington Memorial Parkway. NPS PHOTO



Natural Resource Challenge Funding Changes, FY 2002-2003 Resource Damage Assessment and Recovery Program	
DESCRIPTION	FUNDING
Funding available in FY 2002 ¹	\$ 1,394,000
Transfer of function/position ²	(95,000)
Across-the-board travel reduction	(20,000)
Pay increase	5,000
Across-the-board reduction	(8,000)
TOTAL AVAILABLE IN FY 2003	\$ 1,276,000

¹ Combines two former line items: Oil Pollution Act and Resource Protection Act
² Response position transferred to another program area

Natural Resource Challenge Funding Changes, FY 2002-2003 Resource Protection Fund	
DESCRIPTION	FUNDING
Funding available in FY 2002	\$ 300,000
Across-the-board reduction	(2,000)
TOTAL AVAILABLE IN FY 2003	\$ 298,000

Natural Resource Challenge Funding Changes, FY 2002-2003
Water Resources Program

DESCRIPTION	FUNDING
Funding available in FY 2002	\$ 7,905,000
Across-the-board travel reduction	(41,000)
Pay increase	26,000
Natural Resource Challenge increases in FY 2003	
Monitor water quality	497,000
Watershed assessment	3,080,000
Expand water resource protection and restoration	200,000
Across-the-board reduction	(53,000)
TOTAL ALLOCATED IN THE FY 2003	\$ 11,614,000
Reprogramming of travel reduction to reflect funds that incurred travel, rather than personnel	(1,000)
TOTAL FUNDING AVAILABLE IN FY 2003	\$ 11,613,000
<i>Water Resources Program Funding by Categories</i>	
Water Resources Projects	
Water Resource Protection	\$ 1,329,000
Competitive Projects	380,300
Other Projects	15,000
Water Quality Monitoring	1,775,000
Water Resource Protection–Aquatic Resource Professionals	1,170,100
Watershed Condition Assessment Program	1,263,000
Competitive Projects	1,102,700
Critical Projects	500,000
Water Resource Technical Assistance	3,711,500
Reprogrammed	366,400
TOTAL	\$ 11,613,000
<i>Allocation of Water Quality Monitoring Funding</i>	
Network	
Central Alaska	\$ 98,000
Heartland	82,000
Northeast Coastal and Barrier	90,000
National Capital	71,000
Cumberland/Piedmont	59,000
Appalachian Highlands	70,000
Northern Colorado Plateau	108,000
Greater Yellowstone	71,000
Sonoran Desert	64,000
North Coast and Cascades	82,000
San Francisco Bay	70,000
Mediterranean Coast	76,000
Southwest Alaska	139,000
Northeast Temperate	60,000
Southern Colorado Plateau	124,000
Pacific Island	151,000
Great Lakes	123,000
Servicewide Data Management	237,000
TOTAL	\$ 1,775,000



Extensive prairie grasslands of Badlands National Park support diverse wildlife including bison, bighorn sheep, pronghorn, swift fox, and black-footed ferrets.

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Appendix A: Biological Resources Management Program Projects

Biological Resources Management Program Projects, FY 2003 Funding

REGION	PARK	PROJECT TITLE	FUNDING
AKR	LACL	Improve a Census Technique for a Harvested Population of Moose	\$ 4,200
AKR	LACL	Assess Dynamics of a Harvested, Low Density Population of Dall Sheep	28,000
AKR	WRST	Determine the Status and Distribution of Mountain Goats	19,000
IMR	BAND	Develop Wilderness Stewardship Plan	20,000
IMR	BAND	Monitor Ecosystem Conditions Baseline Wilderness Plan EIS	16,000
IMR	BIBE	Implement Conservation Agreement for Two Candidate Plant Species	21,000
IMR	CANY	Salt Creek Invertebrates	21,000
IMR	CORO	Conservation and Management of Jaguars, Mountain Lions, and Other Felids	50,000
IMR	CURE	Gunnison Sage Grouse-Habitat Inventory of Surrounding Lands	25,000
IMR	DINO	Assess Impact of Non-native Channel Catfish on Endangered and Sensitive Native Fish in the Yampa River	25,000
IMR	GLAC	Manage Invaders Threatening Glacier's Wilderness	23,000
IMR	GRCA	Declining Northern Leopard Frog Population in the GRCA Eco-region: Rims and River Surveys	31,000
IMR	SAGU	Status Assessment and Management of Lowland Leopard Frogs	19,000
IMR	YELL	Baseline Inventory of Thermophile Biodiversity	25,000
MWR	BADL	Document Location and Distribution of Nine Rare Plant Species	38,000
MWR	BUFF	Assess Roost Habitat Conditions for Three Endangered Bat Species	23,000
MWR	INDU	Develop Database for Sensitive Plants and Orchid Recovery Plan	19,500
MWR	ISRO	Develop Fishery Management Plan	15,000
MWR	PIRO	Evaluation of Seasonal Stream Usage and Interstream Migration by Coaster Brook Trout	17,000
MWR	THRO	Evaluate Critical Resource Threats Using High Resolution Satellite Imagery	20,000
NCR	GWMP	Potential Impacts of Mosquito Control Activities	24,000
NCR	NCRO	Compiling and Analyzing Historical Insect Data for Plummers Island, MD	38,000
NER	CACO	Salt Marsh Restoration at Herring River: Dike Design and Construction at Mill Creek	50,000
NER	DEWA	Assess Long-term Viability of Newly Discovered Bog Turtle Population	28,000
NER	NERI	Determine Status and Trends of New River Mussel Community	39,000
NER	SHEN	Gather Essential Operations Data for Invasive Vegetation Control Decision-making	23,000
NER	UPDE	Determine Minimum Water Flows Required to Sustain Federally Endangered Dwarf Wedge Mussels	50,000
PWR	CRMO	Assessment of Habitat for Sagebrush Steppe Dependent Birds	25,000
PWR	GRBA	Status and Distribution of Rare Plants in Sub-alpine and Alpine habitat	19,000
PWR	HALE	New Alaenui Fence Section	8,000
PWR	HAVO	Investigate Ecological Impacts of the Kalij Pheasants	20,000
PWR	LAME	Development of Comprehensive Invasive Plant Management Plan	15,000
PWR	LAVO	Taxonomic Affinity, Spatial Ecology, and Resource Utilization of Red Fox Population	7,500
PWR	PINN	Assessment of Vascular Plant Communities Before and After Feral Pig Removal	24,000
PWR	PORE	Habitat Assessment of the Federally Endangered Myrtle's Silverspot Butterfly	25,000
PWR	WAPA	Assessing Impacts of a Subsistence Fishery on Coral Reef Resources	35,000
SER	MACA	Recovery and Reintroduction of American Chestnut	26,000
SER	VIIS	Propagation and Reintroduction of <i>Solanum conocarpum</i> , a Critically Rare Shrub	15,000
		Editor for SCC Guidance	4,000
TOTAL			<u>\$ 935,200</u>



Historic Piper Lane at Antietam National Battlefield has been greatly altered by grazing and intrusion by exotic plant species. Natural Resource Challenge funding has enabled resource managers to initiate restoration efforts, which include enhancing native plant propagation and minimizing the effects of grazing. NPS PHOTO

Appendix B: Natural Resource Preservation Program (NRPP) Projects

NRPP Natural Resource Management Fully Funded Projects

PARK	PROJECT TITLE	TOTAL FUNDING	FY 2003 FUNDING
Olympic NP	Evaluate Goat Management	\$ 79,000	\$ 26,000
Petrified Forest NP	Preserve Petrified Wood	168,000	56,000
Glacier Bay NP/Pres	Quantifying Commercial and Sportfish Harvest	160,000	47,000
Congaree Swamp NM	Develop Feral Hog Reduction Plan	43,000	39,000
Grand Teton NP	Monitoring of Wolves	396,000	42,000
Sleeping Bear Dunes NL	Restoration of Biodiversity	364,000	123,000
Great Basin NP	Cutthroat Trout	164,000	36,000
Buffalo National River	Assessment of Fish	405,000	58,000
Point Reyes NS	Coastal Dune Restoration	333,000	116,000
Redwood NP	Remove English Ivy	218,000	66,000
Cape Code NS	Effects of Groundwater	195,000	45,000
Mammoth Cave NP	Restore Habitat for Indiana Bat	245,000	180,000
Western Arctic NP Lands	Assessment of Reindeer Impacts to Lichen Ecosystems	108,000	99,000
Redwood NP	Restoring Lost Man Creek Watershed	900,000	134,000
Biscayne NP	Reverse Declining Population by Fisheries Mgmt Plan	233,000	94,000
Glacier Bay NP/Pres	Backcountry Management Data Collection Analysis	244,000	103,000
Buffalo National River	Delineate Karst Groundwater Recharge Zone	100,000	50,000
Padre Island NS	Assess Impacts on Seagrass Meadow	100,000	50,000
Fire Island NS	Relationships Among Barrier Island Processes	188,000	81,000
TOTAL		\$ 4,643,000	\$ 1,445,000

NRPP Natural Resource Management New and Ongoing Projects*

PARK	PROJECT TITLE	TOTAL FUNDING	FY 2003 FUNDING
Cumberland Island NS	Eradicate Feral Hogs	\$ 171,000	\$ 56,000
Badlands NP	Emergency Salvage of Collection of Fossils	341,000	95,000
Jean Lafitte NHP/Pres	Establish a Biocontrol Program for <i>Salvinia</i>	111,000	37,000
Lake Meredith NRA	Protect Native Habitat by Completing North Boundary Fence	153,000	51,000
Indiana Dunes NL	Restore Biological Resources of the Cowles Bog Wetland	101,000	32,000
Pinnacles NM	Reestablish California Condors	572,000	187,000
Olympic NP	Wilderness Recovery at Boulder Hot Springs	54,000	14,000
Intermountain RO	Initiate IMR Noxious Weed Inventory and Mapping Program	632,000	134,500
Great Basin NP	Wild Cave Inventory and Management	216,000	62,000
Point Reyes NS	Remove Iceplant at Point Reyes Lighthouse Headlands	339,000	113,000
Kalaupapa NHP	Exclude Ungulates from Pu'u Ali'i Plateau	663,000	164,000
Pinnacles NM	Restore Climbing Area	94,000	27,000
Lake Clark NP/Pres	Refine Techniques to Survey Harvested Brown Bear Populations	285,000	75,000
Denali NP/Pres	Determine Baseline Information Along Proposed North Access Corridor	355,000	121,000
Voyageurs NP	Document Changes in Reservoir Management on Mercury Accumulation in Fish and Other Aquatic Ecosystem Components	311,000	102,000
Isle Royale NP	Implement Wilderness Management Plan: Carrying Capacity and Long-term Monitoring	270,000	102,000
Pipe Springs NM	Geologic Mapping and Seismic Profile Investigations	308,000	64,000
Fossil Butte NM	Geological Mapping of Primary Formations	209,000	63,000
Rocky Mountain NP	Restore Glacier Creek Livery and Wetland	\$ 103,000	\$ 14,000

(continued on next page)

NRPP Natural Resource Management New and Ongoing Projects* (continued)

PARK	PROJECT TITLE	TOTAL FUNDING	FY 2003 FUNDING
Big Bend NP	Stop Feral Hog Invasion	\$ 130,000	\$ 45,000
National Capital Parks	Dragonflies and Damselflies Likely Affected by WNV Management	63,000	18,000
Wind Cave NP	Monitor for Chronic Wasting Disease	428,000	144,000
Rocky Mountain NP	Implement Interim actions for CWD Management	246,000	160,000
Oregon Caves NM	Complete Cave Restoration	50,000	16,000
Golden Gate NRA	Restore Ft. Baker Mission Blue Butterfly Habitat	632,000	208,000
Capitol Reef NP	Threatened and Endangered Plant Pollinators	151,000	65,000
Glacier NP	Lake McDonald Fishery Management	174,000	52,000
Glacier NP	Assess Wolverine Population	186,000	70,000
Olympic NP	Determine Migratory Pathways, Spawning Areas, and Potential Sources of Threats to Listed Bull Trout	229,000	75,000
Rocky Mountain NP	Implement Invasive Plant Management Plan	150,000	68,000
Mammoth Cave NP	Propagation and Restoration of Endangered Mussels in the Green River	526,000	292,000
Haleakala NP	Prevent <i>Miconia</i> Invasion From Displacing Haleakala Rainforest	878,000	189,000
Channel Islands NP	Reintroduce Island Fox on San Miguel and Santa Rosa Islands	826,000	213,400
George Washington MPkwy	Should We Restore Dike Marsh? A Management Dilemma	159,000	100,000
Lake Meredith NRA	Continue Salt Cedar Control	153,000	51,000
George Washington M Pkwy	Saving the Potomac Gorge Through Partnerships	240,000	80,000
Grand Teton NP	Bison Demographic Monitoring: Disease Surveillance	796,000	280,000
Yellowstone NP	Multi-trophic Level Ecology of Wolves, Elk, and Vegetation	175,000	59,000
Theodore Roosevelt NP	Evaluate Factors Influencing the Distribution and Movement of Elk	162,000	91,000
Biscayne NP	Quantitative Analysis and Scenario Testing of Fisheries Management Alternative	95,000	52,000
Pinnacles NM	Eradicate Feral Pigs	844,000	120,000
New River Gorge NR	Fecal Bacteria Source Tracking	205,000	49,000
Badlands NP	Document Significant Fossil Localities Within the Poleslide Member	290,000	104,000
National Capital Region Parks	Assess Condition and Identify Stressors of Aquatic Resources	248,000	76,000
Assateague Island NS	Evaluate Episodic Water Quality Event in MD/VA Coastal Bay	125,000	68,000
Zion NP	Restore Highly Impacted Backcountry Areas	327,000	106,000
Rocky Mountain NP	Prepare a Situation Assessment for Elk Management Environmental Impact Statement	122,000	68,000
Cuyahoga Valley NP	Control Invasive Plant Species and Sensitive Resource Areas	180,000	83,000
Gateway NRA	Investigation and Restoration of the Jamaica Bay Salt Marsh Ecosystem	524,000	250,000
Pinnacles NM	Protect Dark Night Skies	272,000	54,000
Natural Resource Program Center	Cost-estimate Reviews for NRPP-NRM Projects	N/A	22,800
TOTAL		\$16,015,000	\$ 4,842,700

* A Western Arctic/Noatak lichen inventory, a Western Arctic/Cape Krusenstern heavy metal bioaccumulation assessment, and a Point Reyes National Seashore cape ivy removal project, originally scheduled for FY 2003, were delayed. Funds for the latter two were reprogrammed out of NRPP, and funds for the first were reprogrammed to other NRPP projects.

Research at Rocky Mountain National Park indicates that the relationship between elk and beaver population densities affects the natural condition of the riparian-willow ecosystem.

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NRPP Threatened and Endangered Species Fully Funded Projects

PARK	PROJECT TITLE	TOTAL FUNDING	FY 2003 FUNDING
Saint Croix NSR	Mussel Communities	\$ 60,000	\$ 20,000
Cape Hatteras NS	Seabeach Amaranth: Habitat Assessment	136,400	33,000
Big Thicket NPres	Reintroduce Texas Trailing Phlox	32,000	32,000
Wind Cave NP	Reintroduction of Black-footed Ferrets	100,000	58,000
Santa Monica Mountains NRA	Recovery of Federally Endangered <i>Pentachaeta</i>	54,000	26,000
TOTAL		\$ 382,400	\$ 169,000

NRPP Threatened and Endangered Species New and Ongoing Projects

PARK	PROJECT TITLE	TOTAL FUNDING	FY 2003 FUNDING
Rocky Mountain NP	Reestablish, Stabilize, and Manage 19 Greenback Cutthroat Trout Populations	\$ 66,000	\$ 16,000
Lake Mead NRA	OHV Damage Control in Desert Tortoise Critical Habitat	150,000	51,000
Pinnacles NM	Reestablish California Red-legged frogs in Bear Gulch Reservoir	103,000	32,000
Chesapeake & Ohio Canal NHP	Recovery of Federally Endangered <i>Harperella</i>	151,000	48,000
Hawaii Volcanoes NP	Complete Reintroduction of Silversword	55,000	30,000
Mammoth Cave NP	Restoration of Echo River Passage	93,000	31,000
Sleeping Bear Dunes NL	Wildlife Management: Piping Plover Preservation	46,000	25,000
Olympic NP	Effectiveness Monitoring Northern Spotted Owl Demographic Rates	112,000	55,000
Haleakala NP	Critical Assessment of Habitat for Releasing Endangered Maui Parrotbill	149,000	75,000
TOTAL		\$ 925,000	\$ 363,000

NRPP Disturbed Lands Restoration Fully Funded Projects

PARK	PROJECT TITLE	TOTAL FUNDING	FY 2003 FUNDING
Fire Islands NS	Plug and Abandon Flowing Water Wells	\$ 76,400	\$ 8,800
Palo Alto Battlefield NHS	Restore Resaca Wetlands	116,900	6,900
Buffalo NR	Develop Strategy for Runoff From Park Roads	96,800	40,200
Mammoth Cave NP	Site Restoration of Wondering Wood Area	119,000	119,000
TOTAL		\$ 303,890	\$ 174,900

NRPP Disturbed Lands Restoration New and Ongoing Projects

PARK	PROJECT TITLE	TOTAL FUNDING	FY 2003 FUNDING
Big Bend NP	Phase 2 Nine Point Draw Watershed Restoration	\$ 236,700	\$ 83,500
Denali N Pres.	Reclamation of Placer-Mined Glacier Creek	200,000	51,000
Lake Mead NRA	OHV Restoration: North Shore/Lakeshore Scenic Drive Areas	250,000	86,100
Lassen Volcanic NP	Restoration of an Abandoned Ski Area	205,000	153,000
Pinnacles NP	Old Pinnacles Road Restoration	250,000	119,700
Rocky Mountain NP	Restore Alpine Sewage Lagoons	82,300	70,300
Timpanogos Cave NM	Restore Natural Cave Drainage	115,000	41,000
Yellowstone NP	Reclaim Three Miles of Abandoned Turbid Lake Road and Reconstruct Turbid Lake Trail	211,500	70,500
TOTAL		\$ 1,550,500	\$ 675,100

NRPP Small Park Projects, FY 2003 (\$999,800)

REGION	FUNDING	NUMBER PARKS	NUMBER PROJECTS
Alaska	\$ 20,000	2	2
Intermountain	289,400	20	24
Midwest	174,000	13	14
National Capital	20,000	2	2
Northeast	128,900	5	5
Pacific West	163,200	10	11
Southeast	204,300	5	11
TOTAL	\$ 999,800	57	69

NRPP Regional Block Allocation Projects, FY 2003 (\$1,400,000)

REGION	FUNDING	NUMBER PARKS	NUMBER PROJECTS
Alaska	\$ 200,000	2	7
Intermountain	200,000	11	12
Midwest	200,000	10	13
National Capital	200,000	10	27
Northeast	200,000	5	7
Pacific West	200,000	7	8
Southeast	200,000	6	7
TOTAL	\$ 1,400,000	51	81

NRPP Small Park Projects Funded in FY 2003

REGION	STATE	PARK	PROJECT TITLE	FUNDING
AKR	AK	Sitka NHP	Conduct Stream Surveys and Water Quality Assessment on Indian River	\$ 10,000
AKR	AK	Klondike Gold Rush NHP	Evaluate Resource Protection at the Historic Town Site of Dyea	10,000
IMR	AZ	Walnut Canyon NM	Assess Breeding and Habitat Status of Mexican Spotted Owl	14,900
IMR	NM	Pecos NHP	Eradicate Exotic Trees	6,000
IMR	WY	Fossil Butte NM	Riparian Restoration	14,000
IMR	WY	Devil's Tower NM	Control Non-native Plants	13,800
IMR	CO	Yucca House NM	Spring Water Source and Quality	10,000
IMR	NM	Aztec Ruins NM	Restore Native Plants to West Ruin	5,400
IMR	TX	San Antonio Missions NHP	Assess Mammals and Inventory of Land Mammals Including Bats	1,700
IMR	AZ	Sunset Crater Volcano NM	Assess Soil Genesis and Disturbance Impacts Within Unique Volcanic Cinder Terrain	4,600
IMR	CO	Colorado NM	Control Non-native Plants and Plan for Revegetation	20,000
IMR	UT	Timpanogos Cave NM	Determine Cave Microbial Diversity	9,900
IMR	AZ	Navajo NM	Repair Monument Boundary Fence Line to Prevent Livestock Intrusion	19,300
IMR	UT	Cedar Breaks NM	Survey Cave Resources	13,400
IMR	AZ	Tonto NM	Document Nuisance Rattlesnake Movements and Behavior	20,000
IMR	UT	Cedar Breaks NM	Suppression of Spruce Bark Beetle Infestation in Developed Areas	5,000
IMR	OK	Washita Battlefield NHS	Manage Non-native Plants in Oldfield Restorations	10,000
IMR	OK	Washita Battlefield NHS	Perform Historical Vegetation Study	10,000
IMR	UT	Timpanogos Cave NM	Develop a Comprehensive Integrated Pest Management Plan	10,000
IMR	AZ	Pipe Spring NM	Restore Native Bunch Grasses	19,700
IMR	TX	Lyndon B Johnson NHP	Provide Game Management Options for the Ranch	12,500
IMR	AZ	Montezuma Castle NM	Develop and Implement Exotic Plant Management Plan	20,000
IMR	MT	Grant-Kohrs Ranch NHS	Fencing Repairs to Improve Resource Management	20,000
IMR	UT	Hovenweep NM	Reestablish Historic Vegetation Long-term Monitoring Plots	8,400
IMR	AZ	Casa Grande Ruins NM	Restore Native Plants Along Park Boundary Fence	12,400
IMR	TX	San Antonio Missions NHP	Assessment of Bird Species—A Parkwide Bird Inventory Including Migratory Birds	8,400
MWR	SD	Jewel Cave NM	Upgrade Cave Survey Equipment	4,900
MWR	NE	Agate Fossil Beds NM	Fossil Locality Evaluations	7,000
MWR	AR	Arkansas Post NM	Ant Diversity	9,700
MWR	NE	Homestead NM of America	Planning and Compliance for Park Trails	11,000
MWR	ND	Fort Union Trading Post NHS	Develop Resource Management Plan With New Guidelines	14,000
MWR	MN	Pipestone NM	Restore Disturbed Lands and Exotic Weed Control	14,700
MWR	NE	Midwest Regional Office	Regional RAMS and PMIS Training and Isle Royale Plant Inventory	22,600
MWR	SD	Mount Rushmore NMem	Implement Pest Management Plan	10,000
MWR	MN	Grand Portage NM	Soil Resource Inventory	19,900
MWR	IA	Effigy Mounds NM	Design Sedimentation Protocol for Sny Magill Creek	20,000
MWR	MO	Wilson's Creek NB	Locate Historic Trees	11,500
MWR	IA	Herbert Hoover NHS	Prairie Restoration Plan	8,000
MWR	OH	Hopewell Culture NHP	Resource Management Plan Scoping Session	\$ 10,700

(continued on next page)

NRPP Small Park Projects Funded in FY 2003 (continued)

REGION	STATE	PARK	PROJECT TITLE	FUNDING
MWR	MO	George Washington Carver NM	Special Natural History	\$ 10,000
NCR	VA	George Washington Mem Parkway	Fish Species Inventory—Dyke March on the Potomac River	10,000
NCR	VA	Harpers Ferry NHP	Assessing Aquatic Environmental Associations and Ecological Vulnerability	10,000
NER	MA	Boston Harbor Islands NRA	Boat Wake Impacts and Their Role in Shore Erosion	25,000
NER	MA	Saugus Iron Works NHS	USGS Watershed Assessment	17,800
NER	NJ	Morristown NHP	Develop Forest Management Plan	21,600
NER	PA	Valley Forge NHP	Assess Sediment Pollution in Valley Creek	24,500
NER	VA	Colonial NHP	Develop Shoreline Conservation Mitigation Plans	40,000
PWR	CA	Devils Postpile NM	Meadow Restoration/Wildlife Protection/Interpretation	30,000
PWR	OR	Fort Clatsop N Mem	Tidal Zone Vegetation Survey	17,200
PWR	ID	Hagerman Fossil Beds NM	Acquire Paleontological Reference Materials	7,000
PWR	CA	Muir Woods NM	Decommission Abandoned Road	21,000
PWR	ID	Nez Perce NHP	Remove Non-native Woody Species	23,000
PWR	GU	War in the Pacific NHP	Assess Sedimentation Patterns on Coral Reefs	20,000
PWR	OR	Fort Clatsop N Mem	Eradicate English Ivy and English Holly	14,000
PWR	WA	Whitman Mission NHS	Replace Exotic Grass with Native Grasses	2,000
PWR	CA	Manzanar NHS	Survey Amphibian and Reptile Species	8,000
PWR	CA	Manzanar NHS	Survey Bird Species	10,000
PWR		NP of American Samoa	Resuscitate Weed-infested Rainforest on Mt. Alava	11,000
SER	GA	Chickamauga & Chattanooga NMP	Construct a GIS Database of All Known Water Intakes and Withdrawals	16,500
SER	GA	Chickamauga & Chattanooga NMP	Control Exotic Asian Rice Eel	24,500
SER	NC	Kings Mountain NMP	Inventory and Treat Invasive Exotic Plant Species	19,100
SER	FL	Timucuan E&HPres	Determine Impacts of Power Boats on Tidal Creeks	20,000
SER	GA	Chickamauga & Chattanooga NMP	Document Land Use Easements/Right of Ways	24,000
SER	FL	Timucuan E&HPres	Control Exotic Plants on Newly Acquired Lands	15,000
SER	GA	Chickamauga & Chattanooga NMP	Cooperative Water Quality Project at Local Schools	3,000
SER	FL	Timucuan E&HPres	Investigating Changes in Water Quality at Ft. George	7,000
SER	FL	Timucuan E&HPres	Obtain Historical Aerial Photographs	15,000
SER	NC	Kings Mountain NMP	Provide Term Resource Management Assistance	40,400
SER	TN	Obed W & SR	Exotic Plant Survey and Eradication Project	19,800
TOTAL				\$ 999,800

NRPP Regional Block Allocation Projects Funded in FY 2003

REGION	STATE	PARK	PROJECT TITLE	FUNDING
AKR	AK	Alaska SO	Alaska Regional Bear Management Initiative	\$ 40,000
AKR	AK	Alaska SO	Host Alaska Science Symposium	10,000
AKR	AK	Alaska SO	Initiate Publication to Promote and Publicize Science in Alaska Parks	25,000
AKR	AK	Alaska SO	Create Public Outreach Materials for Ecological Tour of Alaska	30,000
AKR	AK	Alaska SO	Develop Web-based Curriculum Project on the Culture of Wilderness	30,000
AKR	AK	Yukon Charlie Rivers NP	Final Synthesis Study—Effectiveness of Mitigation	58,100
AKR	AK	Wrangell-St Elias NP & Pres	Communicate Resource Findings With the Public	6,900
IMR	AZ	Grand Canyon NP	Resident Eagle Inventory: Emphasis on Declining Golden Eagles	20,000
IMR	CO	Florissant Fossil Beds NM	Collect and Propagate Native Seed	5,700
IMR	WY/MT	Yellowstone NP	Restoration Stream Flow Allocation to Protect Native Fish	17,000
IMR	CO	Florissant Fossil Beds NM	Control Four Species of Noxious Weeds	13,400
IMR	AZ	Wupatki NM	Assessment of Juniper Woodland Succession	19,800
IMR	TX	San Antonio Missions NHP	Controlling Exotic Plant Species in Mission Labores Area	20,000
IMR	AZ	Southern Arizona Group	Monitoring avian migration	20,000
IMR	UT	Bryce Canyon NP	Soundscape Monitoring	20,000
IMR	TX	Lake Meredith NRA	Complete Urban Interface Boundary Fence	20,000
IMR	UT	Timpanogos Cave NM	Assess Water Quality and Air Mass Movements in the Cave System	20,000
IMR	CO	Curecanti NRA	Determine Lamb Productivity and Survival as a Factor Limiting Bighorn Sheep Sustainability	18,000
IMR	CO	Colorado NM	Conduct Paleontological Inventory in Partnership with Museum of Western Colorado	6,100
MWR	MI	Pictured Rocks NL	Black Bear Ecology in Relation to Consumptive and Non-consumptive Human Use	24,000
MWR	SD	Wind Cave NP	Drafting Quadrangles Maps	8,300
MWR	MI	Isle Royale NP	Develop a Strategy to Prevent or Mitigate a Zebra Mussel Infestation	16,700
MWR	WI	Saint Croix NSR	Sampling for Pesticides in Listed Mussel Habitats	18,000
MWR	WI	Saint Croix NSR	Evaluate Air Pollution Effects on Lichens of the Riverway	21,800
MWR	MN	Voyagers NP	Estimate Summer Use	24,800
MWR	SD	Wind Cave NP	Cave and Karst Inventory	6,900
MWR	AR	Buffalo NR	Control Exotic Species/Feral Swine	21,800
MWR	NE	Missouri NRR	Zoological Survey	9,500
MWR	SD	Jewel Cave NP	Impact of Wildfire on Composition, Abundance, and Distribution of Exotic Plants	16,800
MWR	NE	Scotts Bluff NM	Restore Native Prairie Species	15,700
MWR	MI	Isle Royale NP	Assess Threats to New Plant Species/Resurvey Rare Plant Plots	5,700
MWR	MN	Mississippi NR & NRA	Identify Open Space and Habitat Opportunities	10,000
NCR	NCR	National Capital Regional Office	Building a Vegetation Classification for the Region	24,900
NCR	VA	Manassas NBP	Classification and Mapping of Forested Natural Communities	3,800
NCR	MD	Chesapeake & Ohio Canal NHP	Evaluate Impacts of White-tailed Deer	10,000
NCR	NCR	National Capital Central	Restoration of Ecological Balance in Constitution Gardens Lake	8,900
NCR	VA	George Washington M Pkwy	Classification of Ecological Communities in Potomac Gorge Section	10,000
NCR	WV	Harpers Ferry NHP	Butterfly Inventory	\$ 2,800

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NRPP Regional Block Allocation Projects Funded in FY 2003 (continued)

REGION	STATE	PARK	PROJECT TITLE	FUNDING
NCR	NCR	National Capital Central	Installation of Pollinator-friendly Plant Communities	\$ 6,000
NCR	VA	Prince William FP	West Nile Virus Monitoring	8,000
NCR	VA	George Washington MPkwy	Subterranean Explorations: Groundwater Amphipods	9,600
NCR	NCR	National Capital East	Aquatic Beetle Inventory of Piscataway and Fort Washington Parks	5,000
NCR	NCR	National Capital East	Bee Inventory of Piscataway and Fort Washington Parks	5,000
NCR	VA	Prince William FP	Survey for the Small Whorled <i>Pogonia</i> , a Threatened and Endangered Plant	9,700
NCR	MD	Chesapeake and Ohio Canal NHP	Provide River Navigation Services and GPS Mapping for Potomac Gorge Wetlands Study	2,200
NCR	NCR	National Capital Central	Bat Inventory	7,800
NCR	VA	George Washington MPkwy	Protecting the Parkway's Piedmont Streams Through Surface Water Quality Monitoring	6,200
NCR	VA	Prince William FP	Initiate a Vegetation Monitoring Program	9,700
NCR	WV	Harpers Ferry NHP	Hack Support for Peregrine Falcons	3,900
NCR	MD	Chesapeake and Ohio Canal NHP	Monitor West Nile Virus	8,000
NCR	DC	Rock Creek Park	Inventory of the Vascular Flora of Glover Archibold and Palisades Parks	6,000
NCR	MD	Catoctin Mountain Park	Control Invasive Exotic Plants	9,400
NCR	MD	Monocacy NB	Conduct Rare, Threatened, and Endangered Species Survey on the Thomas Farm	4,000
NCR	MD	Chesapeake and Ohio Canal NHP	Inventory Exotic Plants for Suppression Program	1,500
NCR	DC	Rock Creek Park	Restoring Meadows	5,900
NCR	MD	Antietam NB	Rehabilitation of Disturbed Areas	10,000
NCR	MD	Antietam NB	Wildlife Education Outreach	3,600
NCR	VA	Manassas NBP	Analysis and Interpretation of White-tailed Deer Enclosure Data	6,000
NCR	NCR	National Capital Regional Office	Fostering Natural Resource Stewardship	12,100
NER	NY	Fire Island NS	White-tailed Deer Monitoring	25,000
NER	NY	Gateway NRA	Prepare Environmental Assessment for Experimental Restoration of Salt Marsh in Jamaica Bay	75,000
NER	MD	Assateague Island NS	Estimate Nitrate Load in Stream-flow Discharge to Chincoteague Bay	42,200
NER	PA	Delaware Water Gap NRA	Restore Wood Turtle Habitat	8,400
NER	PA	Delaware Water Gap NRA	Hemlock Woolly Adelgid Bio-control Monitoring	5,000
NER	VA	Shenandoah NP	Control Oriental Bittersweet	22,000
NER	MD	Assateague Island NS	Assess Vegetation Impacts of Non-native Sika Deer	22,400
PWR	CA	Golden Gate NRA	Restore Fort Funston Habitat	17,400
PWR	CA	Pinnacles NM	Yellow Star Thistle Control	25,000
PWR	CA	Point Reyes NS	Preserve Federally Endangered <i>Sonoma alopecurus</i>	25,000
PWR	CA	Point Reyes NS	Protect/Restore Degraded Natural Resources in Pastoral Zone	25,000
PWR	CA	Santa Monica Mountains NRA	Abundance/Distribution of Small Mammals	25,000
PWR	CA	Sequoia-Kings Canyon NP	Distribution/Association of Fishers/Rare Forest Carnivores	25,000
PWR	CA	Sequoia-Kings Canyon NP and Yosemite NP	Inventory of Karst Fauna	32,600
PWR	CA	Whiskeytown NRA	Survey and Map Exotic Plants	25,000
SER	TN	Great Smoky Mountains NP	Inventory American Chestnut Trees to Assess Restoration Potential	\$ 20,000

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Eastern red bats were captured at Franklin Delano Roosevelt Memorial as part of a study to identify bat species and sensitive roosting areas within the National Capital Parks-Central area. Objectives of the project include increased public awareness and development of management plans to protect bats that may roost in major memorials.

NPS PHOTO



NRPP Regional Block Allocation Projects Funded in FY 2003 (continued)

REGION	STATE	PARK	PROJECT TITLE	FUNDING
SER	SC	Congaree Swamp NM	Conduct Acoustic Monitoring for Endangered Bird, Amphibian Calls, and Aircraft Overflights	\$ 35,600
SER	LA	Lean Lafitte NHP & Pres	Quantify Deer Population and Develop a Hunting Management Plan for the Barataria Preserve	45,000
SER	KY	Mammoth Cave NP	Restoration of Abandoned Oil/Gas Well Roads	35,000
SER	FL	Gulf Islands NS	Determine Concentrations of Mercury Compounds in Fish, Water, and Sediment	24,000
SER	VI	Virgin Islands NP	Determine Endangered St. Thomas Prickly-ash Population, Distribution, Status, and Trends	25,000
SER	TN	Great Smoky Mountains NP	Hemlock Woolly Adelgid Beetle Predator Survey	15,400
TOTAL				<u>\$ 1,400,000</u>

NRPP Special Alaska Projects Funded in FY 2003

PROJECT TITLE	FUNDING
Identify Levels and Dynamics of Subsistence Resources Harvests for Buckland, Alaska	\$ 60,000
Document Cape Krusenstern Muskoxen Range Use and Develop Muskoxen Public Information Site	32,600
Escapement, Population Structure, Genetics, and Morphology of Sockeye Salmon Within Aniakchak	126,700
Identify Marine Bird Distribution and Evaluate Visitor Impacts	160,700
Prepare a Management and Monitoring Plan Based on Visitor Experience and Resource Protection (VERP)	39,700
Nutritional and Contaminant Assessment of Lynx and Snowshoe Hare in the Brooks Range near Wiseman, Alaska	48,450
Determine the Status of Steller Sea Lions in Wrangell-St. Elias National Park and Preserve	11,250
Investigate Limnological Conditions in Tanada Lake Affecting Sockeye Salmon Production	17,750
TOTAL	<u>\$ 497,150</u>

**NPS-USGS Biological Resources Division, Park-Oriented Biological Support
Summary of Progress Made for Projects Funded in FY 2003**

PROJECT TITLE	FY 2003 REPORT
Integrating Beaver, Water, and Willow in the SAVANNA Model at Rocky Mountain National Park	FY 03 results included completing the computer program and user code as the final beaver submodel of the SAVANNA ecological model for Rocky Mountain National Park and preparing two draft scientific papers. Model results showed that when elk density reached a threshold of about 40-60 elk/km ² , then asymmetrical competition between elk and beaver excluded beaver and the natural riparian-willow ecosystem collapsed. FY 2004 plans include presenting the beaver-willow model to park staff in a seminar format and submitting the modeling results for journal publication.
Ecological Integrity of McDonald Watershed, Glacier National Park: Biotic Indicators of Water Quality Impairment at the Reconstruction of Going-to-the-Sun Road	The assessment of ecological integrity analyzed macroinvertebrate communities along the elevational and longitudinal gradient of McDonald Creek and established a "reference-condition" for biomonitoring studies using multivariate approaches to assessing water quality impairment. This reference condition will permit assessing potentially impacted sites that may occur during Sun Road reconstruction. The next step will be to complete the final report.
A Decision Support System for the Saint Croix National Scenic River	National Park Service staff required an easy, but accurate, system to enter data about plants and animals in the Riverway to ensure data consistency among studies. Using these criteria, the park developed a relational, Access database on unionid mussels, rare plants, and rare animals in the Riverway. This database contains data entry screens with drop-down menus to reduce errors associated with data entry conducted by multiple individuals, and to ensure that each individual enters the same type of data. Database users can search and output information from the Access database into GIS to perform more detailed spatial analyses that will ultimately aid in decision making in the Riverway. This work is now completed.
Bighorn Sheep in Great Basin National Park: An Assessment of Population Status, Limiting Factors and Potential Enhancement Alternatives	Field work was completed. A panel of scientists visited the park to review background information on vegetation and the existing bighorn sheep population and to evaluate the quality of available habitats. A draft report was completed and will be finalized in early FY 2004.
Determine Wind Erosion Rates to Support Protection of Natural and Cultural Resources at Bandelier National Monument, New Mexico	This project provides technical assistance to Bandelier National Monument on the effects of accelerated soil erosion on natural and cultural resources. Water erosion is known to be a major problem, but wind erosion rates have been unexamined. In late FY 2002 the park established an array of 28 wind erosion samplers to collect wind-borne particles in a circular pattern in the midst of a Bandelier watershed where water erosion has been studied for 10 years. In FY 2003 the park collected samples weekly or bimonthly, developing a baseline on the magnitude and variability of wind-driven erosion. Staff will continue to collect data in FY 2004 to further determine patterns and trends of wind-borne erosion. In FY 2004 staff will summarize their findings to date to inform an ongoing EIS for ecological restoration activities at Bandelier.
Develop and Populate an Avifauna Database at Mesa Verde National Park	More than 10,000 individual reference sources on the bird fauna of Mesa Verde National Park, including published and unpublished reports, various counts, field notes, and wildlife record cards, have been gathered. Approximately 40 percent of this information has been entered into an Access database that follows NPS format. Park staff have been very supportive and interested. We have begun synthesizing data in relation to species and habitat to provide a comprehensive overview of bird occurrence, distribution, and population trends at Mesa Verde National Park.

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**NPS-USGS Biological Resources Division, Park-Oriented Biological Support
Summary of Progress Made for Projects Funded in FY 2003 (continued)**

PROJECT TITLE	FY 2003 REPORT
Development of a Model to Evaluate Impacts of Fuels Reduction/Prescribed Fire in Pinyon-juniper Habitats on Avian Communities Within Colorado Plateau National Parks (19 parks)	A review of all published and non-published works associated with breeding birds from Zion National Park was completed. Updated species lists are being developed of all birds that have been reported within mature, mid-aged, and young-aged pinyon-juniper habitat in the park; next, resident, migrant, and vagrant nonbreeding species lists will be developed. Historical accounts have been compiled of information on population dynamics of breeding species within the park. All areas of each pinyon-juniper vegetation type scheduled for fuels reduction have been visited. Because habitat to be burned in Zion does not include mid-aged habitats, permanent transects established prior to the proposed fuels reduction have been stratified by only mature and young vegetation types. Coordination with park staff and utilization of available park GIS vegetation data themes will permit future correlation of vegetation and avian population transect data with other biotic and abiotic parameters. Initial avian surveys conducted at permanent transects collected baseline data prior to the fuels reduction effort. Oral reports were given to Zion staff in both 2002 and 2003 and to other Colorado Plateau parks in 2003. Geographic information data themes of pinyon-juniper habitat have been done for four parks.
Research in Support of Endangered Kemp's Ridley Sea Turtles at Padre Island National Seashore	Documented 19 Kemp's Ridley sea turtle nests along the Texas coast during 2003. Nesting turtles included one associated with an experiment to establish a secondary nesting colony and two other head-started turtles. Hatchling emergence was about 85 percent. Collected blood and tissue samples for later DNA analyses.
Estimating Black Bear Abundance in Great Smoky Mountains National Park Using DNA Extracted from Hair Samples	More than 1,300 DNA samples were collected from 65 sites in Great Smoky Mountains National Park during 10 weekly sampling periods. Microsatellite DNA analysis is being performed on 250 randomly selected samples. Bear population abundance and density will be determined based on capture histories derived from the DNA samples. Results will be combined with a second year of DNA sampling in 2004 to establish protocols for a long-term black bear population monitoring program.
Testing and Evaluation of Remote Sensing Methods for Estimating Refuge Characteristics of Karst Wetlands (Everglades National Park)	The project goal is to determine the feasibility of estimating density of solution holes by aerial imagery. Digital imagery of transects in Everglades National Park was captured by aerial overflights during the 2003 dry season. The images were orthorectified and post-processed. While successful identification of vegetation-free limestone areas was possible, conditions were too dry to pick up any water/shadow in the holes themselves. As an alternative, a search is underway of historic archives for imagery from wetter periods that might provide distinction between open limestone area vs. limestone with solution hole. The possibility that all visible open areas may be depressions will be tested by ground-truthing. A high-resolution camera purchased at year's end will provide a very high-resolution foundation for rectification of, and change detection from, imagery to be collected in the future when ground conditions are more suitable for analysis of the holes. In FY 2004 transect overflights will be conducted to collect images when conditions are optimal, and a final report of the data will be prepared.
Distribution, Population Dynamics, and Herbivory Impacts of a Pioneering Elk Herd on Chaco Culture National Historic Park	Four cow and seven bull elk were radio-collared in April 2003. Cow elk averaged 6.2 percent body fat in April 2003, the highest end-of-winter fat levels seen in monitoring of more than 10 elk populations throughout western North America. The majority of bull elk captured on the park dispersed off the park onto adjacent Tribal and Bureau of Land Management holdings. Cow elk captured on the park remained on or adjacent to the Park. Elk locations were entered into a GIS database for analysis of elk use areas. Elk will be captured again in December 2003 to increase sample sizes of resident adult females.

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**NPS-USGS Biological Resources Division, Park-Oriented Biological Support
Summary of Progress Made for Projects Funded in FY 2003 (continued)**

PROJECT TITLE	FY 2003 REPORT
Effects of Suspended Load on Stream Biota (Redwood National Park)	More than 400 suspended sediment samples were collected in four streams. Lab analysis is completed for turbidity, particle size distribution, and organic/inorganic composition. Fish feeding behavior and benthic macroinvertebrates were sampled under eight different flow conditions in four streams. Statistical analysis is now under way, and invertebrate identification must be completed. A final report on the effects of suspended sediment loads on stream biota will be issued in 2004.
The Importance of Walnut Canyon National Monument as Habitat for Cougars (<i>Puma concolor</i>) in an Urban Interface Environment	Four cougars were marked and monitored a total of 503 animal-days, producing a total of more than 900 successive movements. The marked cougars rarely crossed paved highways, exhibited selection for rough terrain, often used areas near (less than one mile) urban areas, and increased their use of protected areas with advent of the big game hunting season. Twenty-five recorded kills included four coyotes and one bobcat. A one-year continuation proposal was submitted to a private foundation and a three-year proposal was submitted to the research NRPP. The work involved eight students and 16 volunteers. Talks were given at two conferences, and two posters were presented at one conference. Capture of two additional animals, monitoring, and GIS development will continue through FY 2004 along with report preparation and development of future research plans.
Gaining Baseline Data on State-listed Lake Sturgeon (<i>Acipenser fulvescens</i>) and Their Spawning Habitat Across the International Boundary Between Minnesota and Ontario (Voyageurs National Park)	In May and June 2003, radio/acoustic tags were implanted in an additional 20 lake sturgeon. Aerial and boat tracking of those fish and the 13 tagged in Fall 2002 was conducted weekly throughout the summer and early fall. Some fish moved extensively, while others remained in a relatively small area throughout the summer. Tracking of fish will continue in the spring and summer of 2004 with emphasis on identification and characterization of areas apparently being used for spawning. A final report will be completed by the winter of 2004-05.
Technical Assistance in Determining Size and Composition of Non-native and Native Ungulate Populations at Point Reyes National Seashore	Completed a peer reviewed study plan with a focus on the population of fallow deer (<i>Dama dama</i>), the more abundant of the two non-native deer species. Captured fallow deer from November 2002 through October 2003 using aerial net-gunning (37 animals) and modified Clover traps (five animals). Fitted captured animals with radio-collars and collected biological samples (an incisor, blood, and feces) before release to assess age and reproductive and disease status. Instrumented animals have been located from the ground bimonthly. Completed an aerial census of the seashore's fallow deer in January 2003. At that time, all visible fallow deer were counted from the air, and instrumented animals were located both from the air and on the ground. Obtained both average group size and a Lincoln-Petersen index using the detectability of instrumented animals as a correction factor. The first-year estimate for the Seashore fallow deer population was 859 animals (90% CI = 547-1170). This estimate, as well as herd composition data collected using telemetry, has been included in the park's Exotic Deer Management Plan Environmental Impact Statement, to be released in draft form January 2004. A second aerial census is scheduled for January 2004 to secure a population estimate with a narrower confidence band.
Vegetation Classification and Mapping Tools for National Parks: Demonstration Products for Voyageurs National Park	Research and analysis of the USGS-NPS Vegetation Mapping Program's vegetation sampling data initiated in FY 2003 will be concluded early in FY 2004. Results will be incorporated into both a vegetation field key and a scientific journal article regarding plant communities at Voyageurs National Park. For the field key, an outline and page format for each plant community were derived and representative ground photos for each plant community were identified and selected. In FY 2004 all graphical and manuscript pieces will be compiled, analysis will be completed, and the scientific article will be drafted and submitted for journal publication. A journal article regarding photointerpretation

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**NPS-USGS Biological Resources Division, Park-Oriented Biological Support
Summary of Progress Made for Projects Funded in FY 2003 (continued)**

PROJECT TITLE	FY 2003 REPORT
Vegetation Classification and Mapping Tools for National Parks: Demonstration Products for Voyageurs National Park (continued from previous page)	methods for mapping plant communities at Voyageurs National Park drafted in FY 2003 will be finalized and submitted in FY 2004. The article presents the importance of collaboration between ecologists and mappers for developing quality vegetation map products. An outline and page format for the Resource Application report booklet was derived so each resource application page contains four sections: Introduction, Application, Results, and Graphics. The report booklet will be finalized and prepared for publication in FY 2004. Demonstrations of the vegetation field key tool and resource applications using the USGS-NPS Vegetation Mapping Program's vegetation map, were presented at the 2003 George Wright Society Biennial Conference.
Baseline Monitoring of Floodplain Vegetation and Geomorphology Prior to Dam Removal, Elwha River, Olympic National Park	Six cross-valley transects were sampled within Olympic National Park in Summer 2003: three in the "control" reach in Geyser Valley (upstream of Glines Canyon Dam), and three in the reach between the two dams on the Elwha River. Transect topography was surveyed; vegetation patch types and geomorphic surfaces were identified; vegetation plots were established; tree, shrub and herbaceous vegetation was sampled; and up to 12 more transect locations for future sampling were identified. FY 2003 results included topographic cross-sections for the six transects; tree ages, tree density, cover, and basal area by species; shrub species composition and cover; herbaceous species composition and cover; and dominant sediment particle sizes within the vegetation plots. In FY 2004 all remaining field data collection will be conducted, including parallel sampling to that conducted in FY 2003 along up to 12 more transects (three more in Geyser Valley, three more between the dams, and six below both dams). Data entry and preliminary data analysis will also occur in FY 2004. Final data analysis and report preparation will extend into FY 2005.
Protecting Ecological Resources at Acadia National Park Through Landscape Scale Conservation and Easement Planning	The principal investigators obtained relevant biological inventories from park staff to incorporate into the decision support process. The investigators also met with park staff and the Maine Land Trust to obtain their input. The park asked USGS to also include boundary decisions currently being discussed by the park as well as prioritizing lands for conservation easements. The principal investigators met with USGS personnel developing the vegetation classification for Acadia NP to incorporate vegetation data into the modeling process. A preliminary decision tree structure has been developed and discussed with park staff.
Water Developments in Theodore Roosevelt National Park, North Dakota: Implications for Ungulates and Herbivory	Developed portable videography units that resolve many problems associated with using cameras for vertebrate monitoring. Deployed seven units at water developments and monitored ungulate use from June through September. Developed a vegetation sampling protocol and collected data on plant community composition in the vicinity of water developments. Data collection will continue, and data processing will begin during FY 2004.
Impact of Stocking Non-indigenous Salmonids on a Federally Endangered Freshwater Mussel Within the Delaware Water Gap NRA	The project study plan was approved in May 2002. Field work needs to be conducted during the winter and early spring. No work was conducted during the winter of 2002-2003 because the principal investigator changed jobs, and too much rain caused poor field study conditions.
Evaluating the Impacts of White-tailed Deer (<i>Odocoileus virginicus</i>) on Vegetation Within Pea Ridge National Military Park	Twenty deer exclosures were constructed within the park between January and March 2003. Vegetation data on all 53 deer browse plots and the 20 deer exclosure plots were collected in August 2003. All vegetation data have been entered into a database and error checked. The field work has been completed. During FY 2004, data will be analyzed, a report will be prepared for park management, and a journal manuscript will be prepared for submission.

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**NPS-USGS Biological Resources Division, Park-Oriented Biological Support
Summary of Progress Made for Projects Funded in FY 2003 (continued)**

PROJECT TITLE	FY 2003 REPORT
Development of Parasite Risk Assessment and Control Strategies for Captive Breeding of Island Fox (<i>Urocyon littoralis</i>) at Channel Islands National Park	From November 2002 to July 2003 an intensive parasite monitoring project was instituted for each park captive fox breeding facility. The College of Veterinary Medicine at the University of Tennessee analyzed fecal samples using multiple parasite identification and quantification procedures to produce a complete picture of the parasites impacting the foxes. In June 2003 the Island Fox Parasite Working Group met a second time to review the draft parasite risk assessment and control plan developed in 2002 in light of the parasite monitoring project results. Currently the Parasite Working Group is revising and proofreading the Parasite Risk Assessment and Control Report in preparation for submission of a final draft.
Habitat Requirements of the Endangered California Freshwater Shrimp (<i>Syncares pacifica</i>) in Streams on the Point Reyes National Seashore and Golden Gate National Recreation Area	California freshwater shrimp were sampled using a combination of methods on four occasions (February, May, August, and November 2003) from 16 sites in Lagunitas Creek and four sites in Olema Creek, a small tributary of Lagunitas Creek. Shrimp were detected in Lagunitas Creek at no more than 13 sites on any given sample trip. Shrimp have not been caught in Olema Creek. Water quality and other habitat variables from each site were measured, and fish were sampled for gut contents. Preliminary observations indicate that shrimp typically inhabit submerged substrates such as root hairs of riparian vegetation where water current velocities are low or nonexistent. Gut contents of native sculpins (<i>Cottus</i> spp.) yielded evidence of predation on shrimp. Three additional sampling trips are scheduled for 2004 (February, May, and August).
Assessing the Risk of Aerially Borne Pesticides to Declining Amphibian Species in the National Parks of the Sierra Nevada Mountains, California (Sequoia/Kings Canyon, Yosemite, and Lassen Volcanic National Parks)	The Pacific chorus frog (<i>Pseudacris regilla</i>) was used as a surrogate species to test effects of atmospherically transported pesticides on declining amphibian species in the Sierra Nevada Mountains. Field translocation experiments conducted in three national parks in California examined differences among two impacted sites and a reference site. A laboratory experiment conducted in Spring 2003 attempted to replicate, in a controlled environment, pesticide exposure effects seen in the field. Egg masses of <i>P. regilla</i> collected at Point Reyes National Seashore (containing approximately 480 embryos) were shipped overnight to the Patuxent Wildlife Research Center. Upon arrival, egg masses were held in environmental chambers until hatching. After hatching, 6 tadpoles (pre-Gosner stage 25) were placed per 8-liter pesticide-spiked aquarium for a total of 80 aquaria and 480 tadpoles. <i>P. regilla</i> tadpoles were exposed for 10 weeks to one of three dosage levels of malathion, chlorpyrifos, diazinon; to a mixture of the three; or to acetone and blank controls. Animals were weighed and staged at 28 days and again at the end of the experiment when snout-vent-length and proximal joint measurements were taken. Samples are stored at -80° C awaiting tissue, cholinesterase, and DNA analyses. Survivorship, growth, time to metamorphosis (or Gosner Stage 41-45), and percent malformations are being determined relative to pesticide exposure.
Evaluation of Canid Scents as a Management Tool to Reduce Mammal Predation on Piping Plover Nests in Coastal Barrier Parks (Gateway National Recreation Area and Cape Cod, Cape Hatteras, Cape Lookout, and Fire Island National Seashores)	Experiments to evaluate the use of natural predator odors in deterring red foxes and other medium-sized mammals from predating piping plover nests were undertaken at all five sites. Work was terminated in October when Hurricane Isabel washed out all sampling stations. Data are now being compiled and organized for analysis and a report is expected by summer 2004.

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Canyonlands National Park received Natural Resource Challenge funding to study amphibian habitat in Salt Creek. Strings of Woodhouse toad eggs were placed in pools (left) and counted after vehicle drive-throughs at 5 mph. Counts were also conducted in pools closed to vehicles. A count done 24 hours later showed that fewer eggs remained in pools where vehicles had driven (right).

NPS PHOTOS



NPS-USGS Biological Resources Division, Park-Oriented Biological Support Summary of Progress Made for Projects Funded in FY 2003 (continued)

PROJECT TITLE

FY 2003 REPORT

Southern Colorado Plateau
Park Network: Vegetation
Mapping Needs Assessment
(19 parks)

At the request of the Southern Colorado Plateau network, the project was refocused to develop more specific information for three parks for which the network planned to initiate vegetation mapping work in late FY 2003 and FY 2004. Initial work for Canyon de Chelly National Monument, Mesa Verde National Park, and Petrified Forest National Park identified existing plot data, vegetation maps, aerial photography, and vegetation literature. A detailed work plan for vegetation mapping within each park was developed that included identification, description, and assignment of mapping tasks; cost estimates; and a projected work schedule. A scoping meeting was held at each park to initiate vegetation mapping activities and to get each park's input on the work plan and schedule. A field plot sampling plan was developed for Petrified Forest NP, and field data collection and data compilation of field measurements was accomplished.

Determining Rates and Causes
of Summer Elk Calf Mortality
in Yellowstone National Park

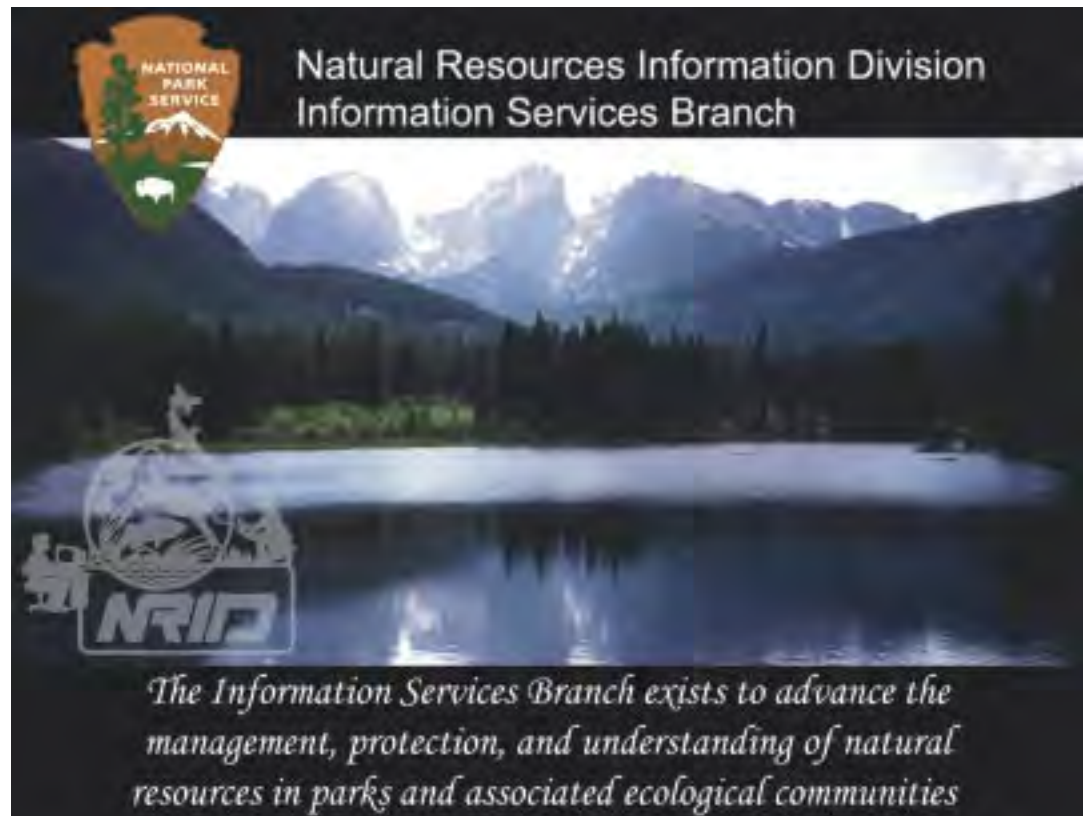
Fifty-one newborn elk calves in Yellowstone's Northern Range were outfitted with mortality-sensing transmitters, weighed, examined, and sampled for blood. As of September 30, preliminary indications indicate that bears killed 19 (37%); wolves, 5 (10%); coyotes 3 (6%); other predators, 2 (4%); bears or wolves, 2 (4%); and other causes, 3 (6%). The survival rate was 33 percent. Blood parameters are being analyzed. Calves will be monitored for cause of death through May 2004.

Amphibian Habitat Fragmentation
in Salt Creek,
Canyonlands National Park:
Implications for Reproduction
and Distribution

Bufo woodhousii (Woodhouse toad) eggs were placed in pools in the road and closed-road sections. Pools in the road were driven through once at a speed of about 8 km hr⁻¹ (5 mph) and remaining eggs counted. Eggs were counted again after 24 hours in both open-road and closed-road pools. Significantly fewer eggs remained in pools that had been driven through, and even fewer remained after a day. There was no difference in closed-road pools in number of eggs after 24 hours. Pitfall traps and visual encounter surveys along transects in open-, closed-, and no-road segments were also conducted May-July and September. Very few amphibians were seen; populations in all areas appear to be greatly reduced by drought conditions over the past five years.

Various hardware and database systems for all NPS natural resource programs are maintained by the Natural Resources Information Division. A significant effort to improve the Division's website, NatureNet, was completed in 2003.

NPS GRAPHIC



NRPP Servicewide Projects Funded in FY 2003

EXPENDITURES	FUNDING
Recurring Funding Expenditures	
Director's Natural Resource Awards	\$ 50,000
Support for Professional Meetings (Society for Ecological Restoration, Natural Area Association, George Wright Society)	30,000
Natural Resource Publications	108,000
TOTAL	\$ 188,000
Servicewide Database Initiatives Expenditures	
Research Permitting and Reporting System (RPRS)	\$ 78,000
Natural Resource Management Assessment Program (NR-MAP)	30,000
TOTAL	\$ 108,000
Special Projects Expenditures	
Coordination of CESU Network	\$ 107,800
WACAP Snow Sampling	26,200
Peer Review Sensitivity of Plants	5,000
Acoustical Data Collection	100,000
Museum of Natural History/Center for Biodiversity and Conservation	10,000
World Heritage Meeting	5,000
Vulnerable Coastal and Glacial Resources	184,000
Natural Resource Laureate Program	50,000
Prototype Natural Resource Information Synthesis	133,000
Scientific Publications	13,000
Marine Protection Cooperation	4,000
TOTAL	\$ 638,000
Reprogrammed	\$ 292,000
TOTAL	\$ 934,000



New surveillance techniques are being tested at Capitol Reef National Park to protect endangered cacti that have been advertised for sale on the Internet.

PHOTO © RUSS FINLEY/FINLEY-HOLIDAY FILMS

Appendix C: Resource Protection Program Projects

Resource Protection Fully Funded Projects

PARK	PROJECT TITLE	TOTAL FUNDING	FY 2003 FUNDING
Mount Rainier NP	Evaluate Potential for and Extent of Legal and Illegal Mushroom Harvest in Park	\$ 24,000	\$ 24,000
TOTAL		<u>\$ 24,000</u>	<u>\$ 24,000</u>

Resource Protection New and Ongoing Projects

PARK	PROJECT TITLE	TOTAL FUNDING	FY 2003 FUNDING
Yosemite NP	Resource Stewardship and Protection Curriculum—Phase 2	\$ 125,000	\$ 105,000
Shenandoah NP	Develop and Test Biome Level Protection Model—Phase 2	150,000	106,000
Capitol Reef NP	Establish Procedures for Use of Surveillance Systems to Protect Rare Cacti From Illegal Collecting	115,000	65,000
TOTAL		<u>\$ 390,000</u>	<u>\$ 276,000</u>



Using coordinates provided by USGS, a GIS specialist navigated to a water gauge at Zion National Park, where a new GPS reading was taken and added to the park's water resources GIS layer. NPS PHOTO

Appendix D: Water Resource Protection Projects and Aquatic Resource Specialist Positions

Water Resource Protection Projects, FY 2003 Funding			
PARK	REGION	PROJECT TITLE	FUNDING
ALL	ALL	Support to the Office of the Solicitor	\$ 164,500
AZ Parks	IMR	Hydrologic Data Collection in Support of the Adjudication of the Little Colorado River Basin in Arizona	20,900
BLCA	IMR	Participation in the Adjudication of Colorado Water Div. #4	13,000
CAVE	IMR	Hydrologic Investigation, Restore Streamflow	21,100
CHIC	IMR	Hydrologic Data Collection, Participation in State Administrative Process	111,000
GRCA	IMR	Groundwater Study, Spring Protection	65,500
MEVE	IMR	Implementation of Water Rights Decree	1,200
MOCA	IMR	Hydrologic Data Collection in Support of the Adjudication of the Verde River Basin in Arizona	43,900
MT Parks	IMR	Implementation of the Montana-NPS Compact	1,800
SAGU	IMR	Investigation of Hydrology and Water Related Values	145,900
UT Parks	IMR	Participation in the Adjudication of Various Areas in Utah	3,000
BUFF	MWR	Investigation of Hydrology and Water Related Values	80,000
SLBE	MWR	Hydrologic Data Collection, Crystal River	13,000
THRO	MWR	Investigation of Hydrology and Water Related Values	11,500
CRLA	PWR	Assessment of Feasibility and Cost, Improve Priority Date	18,800
DEVA	PWR	Devil's Hole and Spring Flow Monitoring, Groundwater Study, Participation in Groundwater Model Development	105,100
GRBA	PWR	Assessment of Hydrologic Conditions and Vulnerability of Park Streams to Groundwater Development	40,000
LAME	PWR	Spring Flow Monitoring, Participation in Cooperative Aquifer Stress Test, Groundwater Model Development	329,000
OBRI	SER	Stream Flow Monitoring, Investigation of Hydrology and Water Related Values	73,600
ALL	ALL	Technical and Administrative Support to All Projects	66,200
TOTAL			<u>\$ 1,329,00</u>

Water Resources Division Competitive Projects, Final-Year Funded Projects

PARK	REGION	PROJECT TITLE	FUNDING
GRTE	IMR	Baseline Water Quality Parameters/Land Use Characteristics of Five Snake River Headwater Tributaries	\$ 29,400
ISRO	MWR	Develop Water Resources Management Plan	25,000
SACN	MWR	Historical Trends in Phosphorous Loading from Permitted Point Source Discharges	25,000
CATO	NCR	Evaluate Water Quality for all Park Streams	14,000
ACAD	NER	Assess Current and Historic Atmospheric Deposition of Toxic Contaminants	49,000
DEWA	NER	Develop Groundwater Monitoring	41,000
MORR	NER	Distribution of Consumer Chemical Tracers to Evaluate Potential Septic System Sources of Fecal Bacterial Contamination	42,500
LAVO	PWR	Restoration of Drakesbad Meadow	25,000
MOJA	PWR	Perform Baseline Hydrologic and Biologic Inventory of Wetlands	25,000
OLYM	PWR	Analyze Channel Dynamics on the Hoh and Quinault Rivers to Protect Fish and Aquatic Resources	15,000
OLYM	PWR	Lake Ozette Tributary Sediment Sources, Transport, Potential, and Control	50,000
PORE	PWR	Hydrologic and Ecological Impacts of Commercial Oyster Framing on the Biota of Drakes Estero	25,000
REDW	PWR	Evaluate Watershed and Stream Channel Conditions Related to Disturbance History and Coho Habitat in Mill Creek	20,700
REDW	PWR	Install Streamflow Gaging Station on Prairie Creek	14,700
BISC	SER	Develop Waterflow Needs in Biscayne NP Using Adjacent Coastal Wetlands Indicators	72,300
CANA	SER	Develop Water Quality Monitoring Program	50,000
MOCR	SER	Restore Native Vegetation to Savannah Wetland	18,200
TOTAL			<u>\$ 940,700</u>

Water Resources Division Competitive Projects, Continuing Projects, FY 2003

PARK	REGION	PROJECT TITLE	FUNDING
WRST	AKR	Investigate Liminological Conditions in Tanada Lake Affecting Sockeye Salmon Production	\$ 17,300
CURE	IMR	Data Collection & Analysis of Required Water Quality Parameters; Outstanding Waters Designation	49,800
PEFO	IMR	Stream and Riparian Characterization and Analysis	26,800
WABA	IMR	Conduct Riparian Corridor Restoration Study at Washita Battlefield NHS	49,500
BUFF	MWR	Characterization of Macroinvertebrate Community and Drift in a Tributary of BUFF, Prior to Damming	19,200
BUFF	MWR	Ground and Surface Water Interactions of the Buffalo NR	42,500
BUFF	MWR	Inventory and Assess Springs and Perennial Streams Buffalo NR	50,000
ISRO	MWR	Assess Hydrocarbon Pollution Threats to Park Waters	49,500
SACN	MWR	Determine Groundwater Impacts to the St. Croix NSR	40,000
SACN	MWR	Classify Critical Aquatic Habitat for the St. Croix NSR	45,200
NCRO	NCR	Capture and Assess Stream Health in Highly Fragmented Parks	52,200
CACO	NER	Management of Dune Slack Wetlands	16,000
CACO	NER	Pilgrim Lake Dynamics	50,000
DEWA	NER	Regional Point Source Management to Support Special Protection Water Quality Regulations	50,000
GOGA	PWR	Plan Rodeo Lagoon Watershed Wetland Riparian Habitat Restoration	43,500
GRBA	PWR	Aquatic Survey and Condition Assessment of GRBA	58,500
HAFO	PWR	Water Quality Impacts to the Snake River from Landslides	25,000
PORE	PWR	Enhanced Wetlands Mapping for Tomales Bay Watershed	47,600
PORE	PWR	Restoration of Horseshoe Pond to Coastal Lagoon	62,500
REDW	PWR	Evaluate Stream Temperature Regimes for Juvenile Coho	29,100
BISC	SER	Identify Restoration, Reservations and Minimum Flows and Level Targets for Biscayne NP	50,000
MACA	SER	Develop Water Resource Management Plan	25,000
TOTAL			<u>\$ 940,700</u>

Aquatic Resource Specialists, FY 2002 and FY 2003 Funded Positions

REGION	DUTY STATION/DISCIPLINE	STATUS*
AKR	YUCH/Aquatic Ecologist	FY 02 funded and filled
AKR	LACL/Fishery Biologist	FY 02 funded and filled
IMR	UT State Coord Office/ Fishery Biologist	FY 02 funded and filled
IMR	Sonoran Desert Network/ Groundwater Hydrologist	FY 02 funded and filled
IMR	GRTE/Hydrologist	FY 02 funded; to be filled in FY 04
IMR/MWR	CHIC/Groundwater Hydrologist	FY 03 funded; to be filled in FY 04
MWR	SACN/Aquatic Ecologist	FY 02 funded and filled
MWR	ISRO/Fishery Biologist	FY 02 funded and filled
NER/NCR	Center for Urban Ecology/ Aquatic Ecologist	FY 02 funded and filled
NER	DEWA/Hydrologist	FY 02 funded and filled
NER	FIIS/Marine Ecologist	FY 03 funded; to be filled in FY 04
PWR	PORE/Aquatic Ecologist	FY 02 funded and filled
PWR	MORA/G geomorphologist	FY 02 funded and filled
PWR	LAME/Groundwater Hydrologist	FY 03 funded; to be filled in FY 04
SER	CHAT/Fishery Biologist	FY 02 funded and filled
SER	CHAT/Wetlands Ecologist	FY 02 funded and filled

* The recruitment process did not allow for the FY 2003-funded positions to be filled in the fiscal year. Additionally, one position funded in FY 2002, the Intermountain Region hydrologist at Grand Teton NP, will not be filled until FY 2004. Therefore, lapsed funding was incurred. The lapsed funding was used at the regional level to support park water resource management issues.

Watershed Condition Assessment Program, FY 2003

PROGRAM ELEMENT	FUNDING
Watershed Condition Assessment Methods Compendium	\$ 250,000
Water Resources Competitive Project Program	1,102,700
NPS-USGS Water Quality Assessment Partnership Program	365,000
WRD Watershed Condition Assessment–Critical Projects	500,000
Coastal Parks Phase I Watershed Condition Assessments	289,000
Marine Science Advisor	170,000
Other (including development of data systems)	189,000
TOTAL	\$ 2,865,700

Watershed Condition Assessment Critical Projects, FY 2003 Funding

REGION/STATE	PARK	PROJECT TITLE	FUNDING
PW/CA	WHIS	Sampling Water and Sediments for Contaminants: Supplemental Assistance for a Cooperative Project	\$ 24,000
PW/IM	GLCA/	Development of a Comprehensive Water Quality	75,000
NV, AZ, UT	LAME	Monitoring Plan for Glen Canyon and Lake Mead NRAs	
PW/NV	GRBA	Susceptibility of Great Basin NP Resources to Groundwater Withdrawals in Cross-Boundary Ground-Watersheds	164,000
SE/FL	BISC	Groundwater Characterization and Assessment of Contaminants in Marine Areas of Biscayne NP	75,000
SE/SC	COSW	Effects of Modified Dam Operations and Run-of-River Flow in the Congaree River to Floodplain Hydrology	68,500
Western States	SEKI/ ROMO	Assessing Airborne Contaminants in Water, Fish, and Sediment in Western U.S. Parks	93,500
TOTAL			\$ 500,000



A field plot sampling plan was developed for Petrified Forest National Park, and field data collection and data compilation of field measurements was accomplished.

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Appendix E: Cooperative Ecosystem Studies Unit (CESU) Projects Supported With Natural Resource Challenge Funding

Alaska Region - North and West Alaska Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
No challenge funding				

Intermountain Region - Colorado Plateau Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
DINO	Stratigraphy and Dating of the Lower Cretaceous Cedar Mountain Formation	\$ 8,000	R	
GLCA	Plesiosaur Excavation and Late Cretaceous Paleontological Research	15,000	R	
PEFO	Revised Geologic Assessment of Sonsela Sandstone	13,000	R	
ARCH	<i>Lomatium latilobum</i> Monitoring	13,000	TA	
COLM	Inventory of Exotic Plants and Development of Long-Term Strategies for Control	15,000	TA	
MEVE	Population Status Survey for Schmoll's Milkvetch	15,000	TA	
TICA	Controlling Invasive Plants	10,000	TA	
ZION	Upgrade Stream Gauge on the East Fork of the Virgin River	7,000	TA	
ZION	Restore Natural Riparian Function on the Virgin River	3,000	TA	
MULTI	Haskell Indian Nations College Fieldwork	\$ 15,000	E	
TOTAL				<u>\$ 114,100</u>

Intermountain Region - Desert Southwest Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
CHIR	Bat Species Diversity Study	\$ 4,400	R	
CORO	Food Resources and Winter Avian Abundance	5,000	R	
GUMO	Red Squirrel Survey	4,200	R	
TUMA	Kino Fruit Trees (Phase 1)	5,000	R	
MULTI	Hummingbird Monitoring Network Field Sites (JOTR, TUMA, CORO, CHIR)	26,300	R	
MULTI	Arizona-Sonora Avian Monitoring Program (FOBO and two Mexican sites in Sister Park)	8,000		
MULTI	Use of Remote Sensing to Quantify Border Impacts (CORO, ORPI)	9,000	R	
MULTI	CESU Assistant Research Scientist Position	35,000	R	
CAVO	Erosion Control and Restoration	10,200	TA	
MOJA	Workshop on Mohave Tui Chub Recovery Plan	4,500	TA	
PAAL	Mesquite Eradication	4,800	TA	
PAIS	Printing of Shoreline Trash Study	7,000	TA	
MULTI	Mission Parks Initiative (Phase 2) (TUMA, PECO, SAPU, SAAN)	5,000	TA	
	Printing CESU Brochure (Sonoran Institute)	600	TA	
ORPI	A Field Guide to Sonoran Desert Pollinators	5,000	E	
SPCO	PBS Program on El Camino Real Adentro	4,500	E	
MULTI	Hummingbird Monitoring Network Website (JOTR, TUMA, CORO, CHIR)	\$ 3,000	E	
TOTAL				<u>\$ 141,500</u>

Intermountain Region - Rocky Mountains Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
BLCA/CURE	Determine Bighorn Sheep Lamb Productivity	\$ 10,000	R	
GLAC	Survey of Fish Populations along the Going-to-the-Sun Road	10,000	R	
GRTE	Pronghorn Migration Corridors	10,000	R	
FOLA	Conservation of Historic Structures and Weed Control	10,000	R	
YELL	Snowshoe Hare Distribution and Abundance	10,000	R	
ROMO	Herbivory by Biological Control Agents on Toadflax	5,330	R	
BICA	Bighorn Sheep Distribution and Abundance	9,580	R	
MULTI	Wilderness Travel Simulation Modeling	10,000	R	
GRTE	Restoration of Snake River Riparian Habitat	5,000	TA	
ROMO	Certification of Vascular Plant Lists	10,000	TA	
GRKO	Weed Control in Irrigated Pastures	5,000	TA	
BEOL	Vegetation Management Planning	4,000	TA	
BLCA/CURE	Natural Resource Interns	5,000	TA	
GLAC	Herbarium and Database Organization	2,100	TA	
FLFO	Paleontology Database and Web Site	1,975	TA	
BLCA/CURE	Staff Training in Biostatistics	2,475	E	
GLAC	Research Learning Center–Workshop	2,500	E	
ROMO	Research Learning Center–Workshop	2,500	E	
YELL	Workshop on Management of Grizzly Bears	2,500	E	
GLAC	Salish Kootenai College NR Intern	5,400	E	
GRKO	Curriculum Development and Teacher Training	2,500	E	
GRSA	Video on Dunes Parks	2,500	E	
GLAC	Bull Trout Education Brochure	2,500	E	
MULTI	Weed Text Book for NPS units	4,000	E	
MULTI	Wilderness Management Workshop	2,500	E	
MULTI	NR Managers Annual Meeting	\$ 6,125	E	
TOTAL				<u>\$ 143,485</u>

Midwest Region - Great Lakes-Northern Forest Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
NIOB	Effects of Red Cedar Removal on Bird Populations in Upland Habitats of Niobrara Valley (administered through Great Plains CESU)	\$ 35,000	R	
EFMO	Baseline Information for Dousman Creek– Yellow River Project	1,000	R	
ISRO/KEWE	Geographic Information Systems Project Support	30,000	TA	
MULTI	Identify Research, Technical Assistance, and Education Needs in National Parks in the Great Lakes-Northern Forest Biogeographic Region	17,000	TA	
VOYA	Publication: Aquatic Synthesis of Voyageurs NP NPS contribution for initial award to Upper and Middle Mississippi Valley CESU	1,000 \$ 10,000	TA	
TOTAL				<u>\$ 94,000</u>

Midwest Region - Great Plains Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
CAVO/ FOUN/LAMR MULTI MULTI	Noxious Weeds Inventory and Mapping at Capulin Volcano NM, Fort Union NM, and Lake Meredith NRA Develop a Research and Technical Assistance Needs Catalog for National Parks in the Great Plains Grant Writing Training for Resource Managers	\$ 28,493 10,000 \$ 5,094	TA TA E	
TOTAL				<u>\$ 43,587</u>

Midwest Region - Upper and Middle Mississippi Valley Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
No challenge funding				

National Capital Region - Chesapeake Watershed Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
CHOH	Effects of Aluminum on Benthos of the Potomac River	\$ 40,000	R	
TOTAL				<u>\$ 40,000</u>

Northeast Region - North Atlantic Coast Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
CACO/FIIS/ GATE/ASIS CACO/FIIS BOHA Servicewide	Creation of a GIS-Based Automated Coastal Change Analysis Toolbox Feasibility of Sampling Surf-Zone Fishes in NS Waters Analysis of Shoreline Process, Boston Harbor Islands Support of Scientific Sessions and Special Publications Honoring Dr. James Allen (former NPS and USGS Coastal Geomorphologist)	\$ 18,687 47,195 7,495 8,000	R R R TA	
GATE	Conduct Topographic Survey and Establish Volume Data for Marsh Restoration at Jamaica Bay	4,755	TA	
NER	North Atlantic Coast CESU operations	\$ 18,975	TA	
TOTAL				<u>\$ 105,107</u>

Pacific West Region - Californian Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
No challenge funding				

Pacific West Region - Great Basin Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
JODA	Study of Bat Roots in the John Day Fossil Beds NM	\$ 30,900	R	
YOSE	National Register Documentation	6,000	TA	
MOJN	Website Development for the Mojave Inventory and Monitoring Network	6,000		
GRBA	Baseline Assessment of the Inventory of Bird Species at Great Basin National Park and update of the NPS NPSpecies Database	3,800	TA	
MOJN	MS Access and ArcView training for Mojave Inventory and Monitoring Network	\$ 2,000	E	
TOTAL				<u>\$ 48,700</u>

Pacific West Region - Pacific Northwest Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
FOVA	Lead isotope and Trace Element Analysis of 19th-Century Lead Artifacts Recovered from Lewis and Clark, Hudson's Bay Company, and U.S. Army sites of the Pacific Northwest	\$ 2,850	R	
OLYM	Hyperspectral Imaging Acquisition and Analysis of the Elwah River Corridor	25,000		
CCSO	Administrative Support for NPS Research Coordinator Including the Production of PNW CESU Newsletter, Maintaining NPS Information on the PNW CESU Website, Charges for Peer Review, Small Technical Assistance Efforts, and Administrative Assistance at the UW	\$ 25,150		
TOTAL				<u>\$ 53,000</u>

Southeast Region - Gulf Coast Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
MULTI	Gulf Coast Workshop for All Units	\$ 31,000	TA	
MULTI	Student Intern for All Gulf Coast Units	\$ 6,500	TA	
TOTAL				<u>\$ 37,500</u>

Southeast Region - Piedmont-South Atlantic Coast Cooperative Ecosystem Studies Unit

PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
No challenge funding				

GPS coordinates are collected by a Geoscientist-in-the-Park to define the location of a survey marker in Cumberland Island National Seashore as part of a coastal geology study sponsored by the Geological Society of America.

USGS PHOTO BY ELIZABETH PENDLETON



Southeast Region - South Florida/Caribbean Cooperative Ecosystem Studies Unit				
PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
GUIS	Santa Rosa Beach Mouse Use of Hurricane-Fragmented Landscape	\$ 22,000	R	
TOTAL				\$ 22,000

Southeast Region - Southern Appalachian Mountains Cooperative Ecosystem Studies Unit				
PARK	PROJECT TITLE	COST	R, TA, E	FUNDING
COSW	Inventory and Mapping of Carolina Bogmint	\$ 12,456	R	
DESO	Natural Resource Baseline Inventory (administered through South Florida-Caribbean CESU)	6,945	R	
BISO	Allegheny Woodrat Inventory	4,028	TA	
HOBE	Natural Resource Assessment of the Park	3,500	TA	
HOBE	Technical Assistance with GIS Database	2,000	TA	
CARL	Oral History Interviews	4,025	TA	
BLRI	Update Natural Resources Geographic Information System	\$ 10,000	TA	



Moose graze in a shallow stream at
Grand Teton National Park.

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Appendix F: Parks Included in the NPS Inventory and Monitoring Program (With Acronyms)

NPS Inventory and Monitoring Program Parks With Acronyms

CODE	PARK NAME	REGION	STATE
ABLI	Abraham Lincoln Birthplace National Historic Site	Southeast	KY
ACAD	Acadia National Park	Northeast	ME
AGFO	Agate Fossil Beds National Monument	Midwest	NE
ALAG	Alagnak Wild River	Alaska	AK
ALFL	Alibates Flint Quarries National Monument	Intermountain	TX
ALPO	Allegheny Portage Railroad National Historic Site	Northeast	PA
AMIS	Amistad National Recreation Area	Intermountain	TX
AMME	American Memorial Park	Pacific West	CM
ANIA	Aniakchak National Monument and Preserve	Alaska	AK
ANTI	Antietam National Battlefield	National Capital	MD
APCO	Appomattox Court House National Historical Park	Northeast	VA
APIS	Apostle Islands National Lakeshore	Midwest	WI
APPA	Appalachian National Scenic Trail	Multi	
ARCH	Arches National Park	Intermountain	UT
ARPO	Arkansas Post National Memorial	Midwest	AR
ASIS	Assateague Island National Seashore	Northeast	MD
AZRU	Aztec Ruins National Monument	Intermountain	NM
BADL	Badlands National Park	Midwest	SD
BAND	Bandelier National Monument	Intermountain	NM
BELA	Bering Land Bridge National Preserve	Alaska	AK
BEOL	Bent's Old Fort National Historic Site	Intermountain	CO
BIBE	Big Bend National Park	Intermountain	TX
BICA	Bighorn Canyon National Recreation Area	Intermountain	MT
BICY	Big Cypress National Preserve	Southeast	FL
BIHO	Big Hole National Battlefield	Pacific West	MT
BISC	Biscayne National Park	Southeast	FL
BISO	Big South Fork National River & Recreation Area	Southeast	TN
BITH	Big Thicket National Preserve	Intermountain	TX
BLCA	Black Canyon of the Gunnison National Park	Intermountain	CO
BLRI	Blue Ridge Parkway	Southeast	NC
BLUE	Bluestone National Scenic River	Northeast	WV
BOHA	Boston Harbor Islands National Recreation Area	Northeast	MA
BOWA	Booker T. Washington National Monument	Northeast	VA
BRCA	Bryce Canyon National Park	Intermountain	UT
BUFF	Buffalo National River	Midwest	AR
BUIS	Buck Island Reef National Monument	Southeast	VI
CABR	Cabrillo National Monument	Pacific West	CA
CACH	Canyon de Chelly National Monument	Intermountain	AZ
CACO	Cape Cod National Seashore	Northeast	MA
CAGR	Casa Grande Ruins National Monument	Intermountain	AZ
CAHA	Cape Hatteras National Seashore	Southeast	NC
CAKR	Cape Krusenstern National Monument	Alaska	AK
CALO	Cape Lookout National Seashore	Southeast	NC
CANA	Canaveral National Seashore	Southeast	FL
CANY	Canyonlands National Park	Intermountain	UT
CARE	Capitol Reef National Park	Intermountain	UT
CARL	Carl Sandburg Home National Historic Site	Southeast	NC
CASA	Castillo de San Marcos National Monument	Southeast	FL
CATO	Catoctin Mountain Park	National Capital	MD
CAVE	Carlsbad Caverns National Park	Intermountain	NM
CAVO	Capulin Volcano National Monument	Intermountain	NM
CEBR	Cedar Breaks National Monument	Intermountain	UT
CHAT	Chattahoochee River National Recreation Area	Southeast	GA
CHCH	Chickamauga / Chatanooga National Military Park	Southeast	GA
CHCU	Chaco Culture National Historical Park	Intermountain	NM
CHIC	Chickasaw National Recreation Area	Intermountain	OK
CHIR	Chiricahua National Monument	Intermountain	AZ
CHIS	Channel Islands National Park	Pacific West	CA

(continued on next page)

NPS Inventory and Monitoring Program Parks With Acronyms (continued)

CODE	PARK NAME	REGION	STATE
CHOH	Chesapeake & Ohio Canal National Historical Park	National Capital	MD
CIRO	City of Rocks National Reserve	Pacific West	ID
COLM	Colorado National Monument	Intermountain	CO
COLO	Colonial National Historical Park	Northeast	VA
CORO	Coronado National Memorial	Intermountain	AZ
COSW	Congaree Swamp National Monument	Southeast	SC
COWP	Cowpens National Battlefield	Southeast	SC
CRLA	Crater Lake National Park	Pacific West	OR
CRMO	Craters of the Moon National Monument	Pacific West	ID
CUGA	Cumberland Gap National Historical Park	Southeast	KY
CUIS	Cumberland Island National Seashore	Southeast	GA
CURE	Curecanti National Recreation Area	Intermountain	CO
CUVA	Cuyahoga Valley National Recreation Area	Midwest	OH
DENA	Denali National Park and Preserve	Alaska	AK
DEPO	Devil's Postpile National Monument	Pacific West	CA
DETO	Devils Tower National Monument	Intermountain	WY
DEVA	Death Valley National Park	Pacific West	CA
DEWA	Delaware Water Gap National Recreation Area	Northeast	PA
DINO	Dinosaur National Monument	Intermountain	CO
DRTO	Dry Tortugas National Park	Southeast	FL
EBLA	Ebey's Landing National Historical Reserve	Pacific West	WA
EFMO	Effigy Mounds National Monument	Midwest	IA
EISE	Eisenhower National Historic Site	Northeast	PA
ELMA	El Malpais National Monument	Intermountain	NM
ELMO	El Morro National Monument	Intermountain	NM
EVER	Everglades National Park	Southeast	FL
FIIS	Fire Island National Seashore	Northeast	NY
FLFO	Florissant Fossil Beds National Monument	Intermountain	CO
FOBO	Fort Bowie National Historic Site	Intermountain	AZ
FOBU	Fossil Butte National Monument	Intermountain	WY
FOCA	Fort Caroline National Monument	Southeast	FL
FOCL	Fort Clatsop National Memorial	Pacific West	OR
FODA	Fort Davis National Historic Site	Intermountain	TX
FODO	Fort Donelson National Battlefield	Southeast	TN
FOFR	Fort Frederica National Monument	Southeast	GA
FOLA	Fort Laramie National Historic Site	Intermountain	WY
FOLS	Fort Larned National Historic Site	Midwest	KS
FOMA	Fort Matanzas National Monument	Southeast	FL
FONE	Fort Necessity National Battlefield	Northeast	PA
FOPO	Fort Point National Historic Site	Pacific West	CA
FOPU	Fort Pulaski National Monument	Southeast	GA
FOSC	Fort Scott National Historic Site	Midwest	KS
FOSU	Fort Sumter / Fort Moultrie National Monument	Southeast	SC
FOUN	Fort Union National Monument	Intermountain	NM
FOUS	Fort Union Trading Post National Historic Site	Midwest	ND
FOVA	Fort Vancouver National Historic Site	Pacific West	WA
FRHI	Friendship Hill National Historic Site	Northeast	PA
FRSP	Fredericksburg Spotsylvania National Military Park	Northeast	VA
GAAR	Gates of the Arctic National Park and Preserve	Alaska	AK
GARI	Gauley River National Recreation Area	Northeast	WV
GATE	Gateway National Recreation Area	Northeast	NY
GETT	Gettysburg National Military Park	Northeast	PA
GEWA	George Washington Birthplace National Monument	Northeast	VA
GICL	Gila Cliff Dwellings National Monument	Intermountain	NM
GLAC	Glacier National Park	Intermountain	MT
GLBA	Glacier Bay National Park and Preserve	Alaska	AK
GLCA	Glen Canyon National Recreation Area	Intermountain	UT
GOGA	Golden Gate National Recreation Area	Pacific West	CA
GOSP	Golden Spike National Historic Site	Intermountain	UT
GRBA	Great Basin National Park	Pacific West	NV
GRCA	Grand Canyon National Park	Intermountain	AZ
GREE	Greenbelt Park	National Capital	MD
GRKO	Grant-Kohrs Ranch National Historic Site	Intermountain	MT

(continued on next page)

NPS Inventory and Monitoring Program Parks With Acronyms (continued)

CODE	PARK NAME	REGION	STATE
GRPO	Grand Portage National Monument	Midwest	MN
GRSA	Great Sand Dunes National Park	Intermountain	CO
GRSM	Great Smoky Mountains National Park	Southeast	TN
GRTE	Grand Teton National Park	Intermountain	WY
GUCO	Guilford Courthouse National Military Park	Southeast	NC
GUIS	Gulf Islands National Seashore	Southeast	FL/MS
GUMO	Guadalupe Mountains National Park	Intermountain	TX
GWCA	George Washington Carver National Monument	Midwest	MO
GWMP	George Washington Memorial Parkway	National Capital	VA
HAFF	Harpers Ferry National Historical Park	National Capital	WV
HAFO	Hagerman Fossil Beds National Monument	Pacific West	ID
HALE	Haleakala National Park	Pacific West	HI
HAVO	Hawaii Volcanoes National Park	Pacific West	HI
HEHO	Herbert Hoover National Historic Site	Midwest	IA
HOBE	Horseshoe Bend National Military Park	Southeast	AL
HOCU	Hopewell Culture National Historical Park	Midwest	OH
HOFU	Hopewell Furnace National Historic Site	Northeast	PA
HOME	Homestead National Monument of America	Midwest	NE
HOSP	Hot Springs National Park	Midwest	AR
HOVE	Hovenweep National Monument	Intermountain	CO
HUTR	Hubbell Trading Post National Historic Site	Intermountain	AZ
INDU	Indiana Dunes National Lakeshore	Midwest	IN
ISRO	Isle Royale National Park	Midwest	MI
JECA	Jewel Cave National Monument	Midwest	SD
JELA	Jean LaFitte National Historical Park & Preserve	Southeast	LA
JODA	John Day Fossil Beds National Monument	Pacific West	OR
JOFL	Johnstown Flood National Memorial	Northeast	PA
JOMU	John Muir National Historic Site	Pacific West	CA
JOTR	Joshua Tree National Park	Pacific West	CA
KAHO	Kaloko Honokohau National Historical Park	Pacific West	HI
KALA	Kalaupapa National Historical Park	Pacific West	HI
KATM	Katmai National Park and Preserve	Alaska	AK
KEFJ	Kenai Fjords National Park	Alaska	AK
KEMO	Kennesaw Mountain National Battlefield	Southeast	GA
KIMO	Kings Mountain National Military Park	Southeast	SC
KLGO	Klondike Gold Rush National Historical Park	Alaska	AK
KNRI	Knife River Indian Villages National Historic Site	Midwest	ND
KOVA	Kobuk Valley National Park	Alaska	AK
LABE	Lava Beds National Monument	Pacific West	CA
LACL	Lake Clark National Park and Preserve	Alaska	AK
LAME	Lake Mead National Recreation Area	Pacific West	NV
LAMR	Lake Meredith National Recreation Area	Intermountain	TX
LARO	Lake Roosevelt National Recreation Area	Pacific West	WA
LAVO	Lassen Volcanic National Park	Pacific West	CA
LIBI	Little Bighorn Battlefield National Monument	Intermountain	MT
LIBO	Lincoln Boyhood National Memorial	Midwest	IN
LIRI	Little River Canyon National Preserve	Southeast	AL
LYJO	Lyndon B. Johnson National Historical Park	Intermountain	TX
MABI	Marsh-Billings-Rockefeller National Historical Park	Northeast	VT
MACA	Mammoth Cave National Park	Southeast	KY
MANA	Manassas National Battlefield Park	National Capital	VA
MANZ	Manzanar National Historic Site	Pacific West	CA
MEVE	Mesa Verde National Park	Intermountain	CO
MIMA	Minute Man National Historical Park	Northeast	MA
MISS	Mississippi Nat'l River and Recreation Area	Midwest	MN
MNRR	Missouri National Recreational River	Midwest	NE
MOCA	Montezuma Castle National Monument	Intermountain	AZ
MOCR	Moore's Creek National Battlefield	Southeast	NC
MOJA	Mojave National Preserve	Pacific West	CA
MONO	Monocacy National Battlefield	National Capital	MD
MORA	Mount Rainier National Park	Pacific West	WA
MORR	Morristown National Historical Park	Northeast	NJ
MORU	Mount Rushmore National Memorial	Midwest	SD

(continued on next page)

NPS Inventory and Monitoring Program Parks With Acronyms (continued)

CODE	PARK NAME	REGION	STATE
MUWO	Muir Woods National Monument	Pacific West	CA
NABR	Natural Bridges National Monument	Intermountain	UT
NACE	National Capital Parks East	National Capital	DC
NATR	Natchez Trace Parkway	Southeast	MS
NAVA	Navajo National Monument	Intermountain	AZ
NEPE	Nez Perce National Historical Park	Pacific West	ID
NERI	New River Gorge National River	Northeast	WV
NIOB	Niobrara National Scenic Riverway	Midwest	NE
NISI	Ninety Six National Historic Site	Southeast	SC
NOAT	Noatak National Preserve	Alaska	AK
NOCA	North Cascades National Park	Pacific West	WA
NPSA	National Park of American Samoa	Pacific West	HI
OBRI	Obed Wild and Scenic River	Southeast	TN
OCMU	Ocmulgee National Monument	Southeast	GA
OLYM	Olympic National Park	Pacific West	WA
ORCA	Oregon Caves National Monument	Pacific West	OR
ORPI	Organ Pipe Catcus National Monument	Intermountain	AZ
OZAR	Ozark National Scenic Riverways	Midwest	MO
PAAL	Palo Alto Battlefield National Historic Site	Intermountain	TX
PAIS	Padre Island National Seashore	Intermountain	TX
PECO	Pecos National Historical Park	Intermountain	NM
PEFO	Petrified Forest National Park	Intermountain	AZ
PERI	Pea Ridge National Military Park	Midwest	AR
PETE	Petersburg National Battlefield	Northeast	VA
PETR	Petroglyph National Monument	Intermountain	NM
PINN	Pinnacles National Monument	Pacific West	CA
PIPE	Pipestone National Monument	Midwest	MN
PIRO	Pictured Rocks National Lakeshore	Midwest	MI
PISP	Pipe Spring National Monument	Intermountain	AZ
PORE	Point Reyes National Seashore	Pacific West	CA
PRWI	Prince William Forest Park	National Capital	VA
PUHE	Puukohola Heiau National Historic Site	Pacific West	HI
PUHO	Pu'uhonua o Honaunau National Historical Park	Pacific West	HI
RABR	Rainbow Bridge National Monument	Intermountain	UT
REDW	Redwood National Park	Pacific West	CA
RICH	Richmond National Battlefield Park	Northeast	VA
ROCR	Rock Creek Park	National Capital	DC
ROMO	Rocky Mountain National Park	Intermountain	CO
ROVA	Roosevelt-Vanderbilt National Historic Site	Northeast	NY
RUCA	Russell Cave National Monument	Southeast	AL
SAAN	San Antonio Missions National Historical Park	Intermountain	TX
SACN	Saint Croix National Scenic Riverway	Midwest	WI
SAGA	Saint-Gaudens National Historic Site	Northeast	NH
SAGU	Saguaro National Park	Intermountain	AZ
SAHI	Sagamore Hill National Historic Site	Northeast	NY
SAIR	Saugus Iron Works National Historic Site	Northeast	MA
SAJH	San Juan Island National Historical Park	Pacific West	WA
SAMO	Santa Monica Mountains National Recreation Area	Pacific West	CA
SAPU	Salinas Pueblo Missions National Monument	Intermountain	NM
SARA	Saratoga National Historical Park	Northeast	NY
SCBL	Scotts Bluff National Monument	Midwest	NE
SEKI	Sequoia-Kings Canyon National Park	Pacific West	CA
SHEN	Shenandoah National Park	Northeast	VA
SHIL	Shiloh National Military Park	Southeast	TN
SITK	Sitka National Historic Park	Alaska	AK
SLBE	Sleeping Bear Dunes National Lakeshore	Midwest	MI
STRI	Stones River National Battlefield	Southeast	TN
SUCR	Sunset Crater Volcano National Monument	Intermountain	AZ
TAPR	Tallgrass Prairie National Preserve	Midwest	KS
THRO	Theodore Roosevelt National Park	Midwest	ND
THST	Thomas Stone National Historic Site	Northeast	MD
TICA	Timpanogas Cave National Monument	Intermountain	UT
TIMU	Timucuan Ecological and Historic Reserve	Southeast	FL

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A biologist monitors the status of Palmer's agave plants in long-term plots at Coronado National Memorial. The primary food source for endangered lesser long-nosed bats, more than 100 agaves were relocated in preparation for the construction of a vehicle barrier along the the park boundary. NPS PHOTO



NPS Inventory and Monitoring Program Parks With Acronyms (continued)				
CODE	PARK NAME	REGION	STATE	
TONT	Tonto National Monument	Intermountain	AZ	
TUMA	Tumacacori National Historical Park	Intermountain		
TUZI	Tuzigoot National Monument	Intermountain	AZ	
UPDE	Upper Delaware Scenic & Recreational River	Northeast	PA	
VAFO	Valley Forge National Historical Park	Northeast	PA	
VICK	Vicksburg National Military Park	Southeast	MS	
VIIS	Virgin Islands National Park	Southeast	VI	
VOYA	Voyageurs National Park	Midwest	MN	
WABA	Washita Battlefield National Historic Site	Intermountain	OK	
WACA	Walnut Canyon National Monument	Intermountain	AZ	
WAPA	War in the Pacific National Historical Park	Pacific West	GU	
WEFA	Weir Farm National Historic Site	Northeast	CT	
WHIS	Whiskeytown National Recreation Area	Pacific West	CA	
WHMI	Whitman Mission National Historic Site	Pacific West	WA	
WHSA	White Sands National Monument	Intermountain	NM	
WICA	Wind Cave National Park	Midwest	SD	
WICR	Wilson's Creek National Battlefield	Midwest	MO	
WOTR	Wolf Trap Farm Park	National Capital		
WRST	Wrangell St. Elias National Park and Preserve	Alaska	AK	
WUPA	Wupatki National Monument	Intermountain	AZ	
YELL	Yellowstone National Park	Intermountain	WY	
YOSE	Yosemite National Park	Pacific West	CA	
YUCH	Yukon-Charley Rivers National Preserve	Alaska	AK	
YUHO	Yucca House National Monument	Intermountain	CO	
ZION	Zion National Park	Intermountain	UT	



An evening bat flight occurs as the sun sets in Carlsbad Caverns National Park, one of six NPS units in the Chihuahuan Desert Vital Signs Monitoring Network.

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The National Park Service cares for special places saved by the American people so that all may experience our heritage.



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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.



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