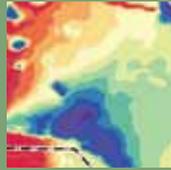


Perspectives on Select Natural Resource Programs

We begin this edition of *Natural Resource Year in Review* with reports from a variety of national programs that focus specialized expertise and resources on



natural resource management of the National Park System.

The programs range from those that have been in existence for decades to those that are only a few years old. Many are administered by the Natural Resource Program Center; all are coordinated as part of the Directorate of Natural Resource Stewardship and Science. One of the goals in presenting program reports under this theme is to gain a sense

of how the National Park Service is doing with respect to its natural resource conservation responsibilities. The articles that follow provide insights that demonstrate progress on many fronts. For example,

“We intend to sustain the standard of excellence and personal commitment that the American public has come to expect from the National Park Service. We serve as guardians of vast public treasures, and we plan to pass them along to the next generation in even better condition than we find them today.” — William Penn Mott, Jr.

after years of monitoring, the Air Resources Division is able to give scientific answers to many questions about air quality in the national parks. Research learning centers are developing into an effective network for advancing national park research. Ocean



and coastal resources are becoming the focus of intensified and coordinated planning and conservation efforts. Public review of park management and policy proposals is facilitated over

the Internet. Partnerships continue to provide significant benefits to the parks. In addition, 12 monitoring networks have begun to monitor park vital signs, a key function for effective park management now and in the future. Not all reports indicate forward movement, but most include encouraging examples of results that come only from focused efforts to improve the understanding, management, and protection of our



national parks.

Air Quality Program: Information + collaboration = results

By Christine Shaver

THE NPS AIR QUALITY PROGRAM was created shortly after the Clean Air Act was amended in 1977 to protect clean air, especially in national parks and wilderness areas. Since then, the Air Resources Division, which administers the program, has developed an extensive monitoring network and a wealth of knowledge about the causes and effects of air pollution in parks. Collaborative relationships have been formed with regulatory agencies and stakeholders who have the authority or ability to develop and implement air quality management programs. The National Park Service has been challenged by its lack of control over air pollution that comes largely from outside park boundaries. In addition, as with many natural resource management issues, it usually takes many years to document and disseminate information about resource conditions and trends and to develop and implement solutions. Despite these challenges, the Air Quality Program is an excellent example of how long-term investment in monitoring, research, and relationship-building can promote better protection of park resources.

In 2005, overall air quality was stable or improving in 68% of the parks that have at least six years of on-site data. The most positive trends stem from significant reductions in sulfur dioxide emissions:

sulfate concentrations in the air and precipitation (acid rain) have been reduced or stabilized in almost every park, and visibility is stable or improving in all parks. This trend should last because pollution reductions are expected to continue as a result of regulatory or voluntary programs aimed at improving visibility and public health. For

The Air Quality Program is an excellent example of how long-term investment in monitoring, research, and relationship-building can promote better protection of park resources.

example, almost every power plant in the West has installed or has committed to install sulfur dioxide pollution controls. In fact, agreements reached on emission reduction targets and timelines are being not only fulfilled but exceeded. These actions result from more than a decade of collaboration among western states, tribes, federal land managers, and stakeholders.

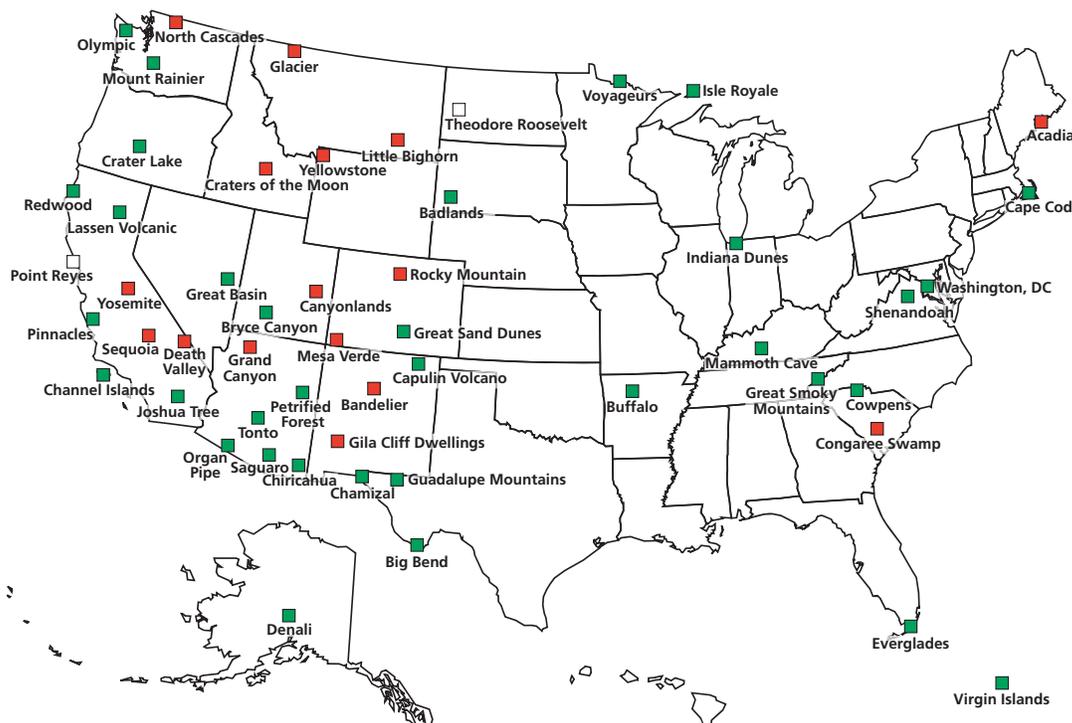
Ozone- and nitrogen-related pollution presents more of a challenge. Ozone affects human health and vegetation; nitrogen-related

FY 2005 ANNUAL PERFORMANCE REPORT FOR NPS GPRA AIR QUALITY GOAL 1a3 FOR REPORTING NPS AREAS

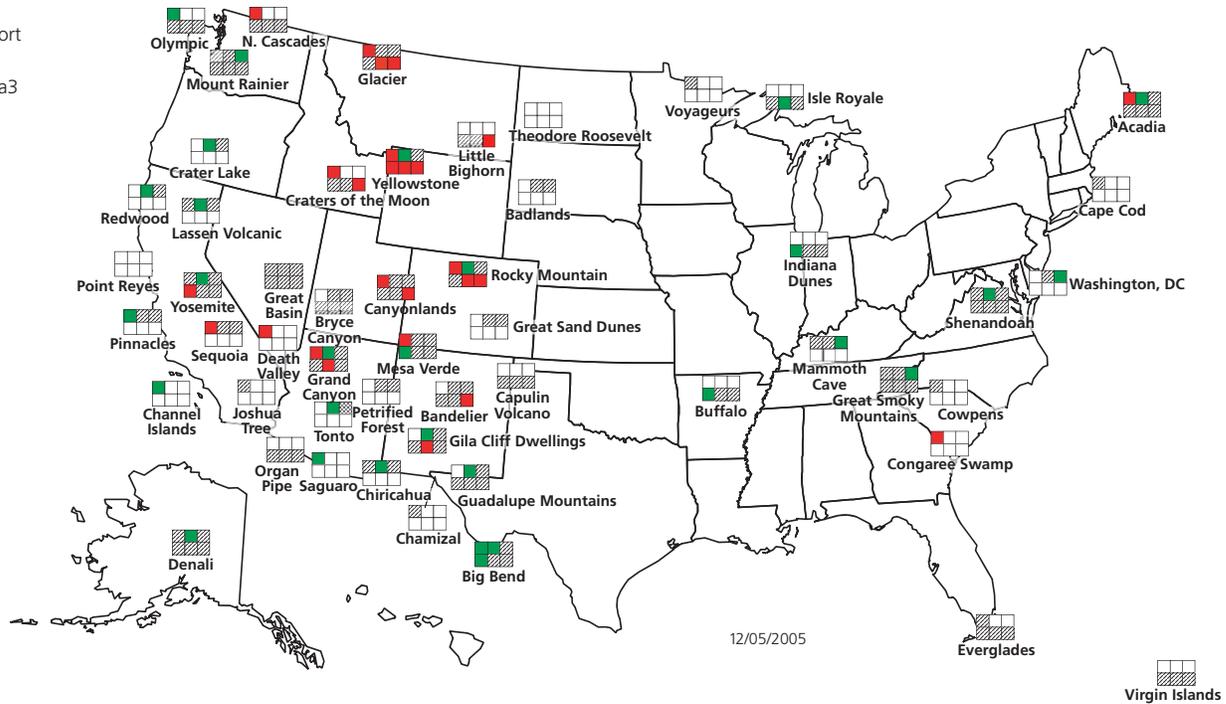
The NPS Air Resources Division reported in its FY 2005 performance assessment for GPRA (Government Performance and Results Act) that it exceeded goal 1a3 for air quality in units of the National Park System that report air quality. The goal is for 70% of reporting parks to have demonstrated stable or improving air quality by 30 September 2008. The planned performance target for FY 2005 was 64% of reporting parks meeting this goal, and the actual measure was 68% (34 of 50 reporting parks) that demonstrated improving or stable air quality.

- Park meets 1a3 goal, park air quality stable or improving
- Park does not meet 1a3 goal
- No data / insufficient data

12/05/2005



FY 2005 Annual
Performance Report
for NPS GPRA
Air Quality Goal Ia3



- Improving ($p \leq 0.05$)
- Degrading ($p \leq 0.05$)
- No Trend / Stable
- No Data / Insufficient Data
- Ozone
- Visibility — Clear Days
- Visibility — Hazy Days
- Sulfate in Precipitation
- Nitrate in Precipitation
- Ammonium in Precipitation

Note: Statistical significance of $p \leq 0.05$ means a 5% or lower probability exists that an identified trend in air quality could be caused by chance.

compounds not only help form ozone but also cause changes in natural systems (e.g., unnatural fertilization, species shifts, nutrient enrichment of water bodies). Pending regulatory programs will reduce ozone pollution in eastern US park units, many of which continue to have unhealthy air but appear to be on the way to recovery. In western parks, however, ozone- and nitrogen-related pollution has been increasing, especially in the Colorado Plateau and Rocky Mountains. Though reductions in emissions from mobile sources are expected owing to federal programs, pollution from other sources—including widespread energy development—could continue to increase.

The trend toward increasing ozone and nitrogen in western parks was detected several years ago through NPS Air Quality Program performance evaluations. Evidence of deteriorating air quality was shared with western state regulatory agencies, and a collaborative effort was initiated to understand why some pollution was increasing and to evaluate the federal program to protect clean air. The National Park Service and western states reached consensus on numerous steps that could be taken to improve effectiveness and accountability. These efforts led to a dialogue about creating a new framework for managing air quality to protect ecosystems.

Growing concerns about nitrogen deposition have helped identify and prioritize new projects involving data synthesis, field studies, and modeling. Existing data at Rocky Mountain National Park were sufficient to convince the State of Colorado that ecological health needs to be protected. A memorandum of understanding signed in 2005 among the National Park Service, the State of Colorado, and the EPA provides the framework to develop strategies to reverse deteriorating trends at the park.

Energy development near national parks—including oil, gas, and coalbed methane and construction of new coal-fired power plants—continues to be a significant challenge facing the NPS Air Quality Program. The National Park Service routinely encourages permitting authorities to require the best pollution controls on new plants and succeeded in lowering the emission limits at five proposed plants in 2005. It also secured commitments from three new power plants to offset their pollution increases with pollution reductions elsewhere in the area. Much of the energy development is not subject to air quality permitting, however, so different strategies are pursued. In 2005 the Park Service helped form the Four Corners Air Quality Task Force (composed of state, federal, and tribal agencies and other stakeholders) to explore technological and adaptive management strategies for

energy development to avoid further air quality degradation. A similar collaborative effort is under way in the Powder River Basin in Wyoming and Montana.

The National Park Service has attracted many partners who share an interest in protecting air quality in national parks. In nurturing these partnerships, quality-assured, long-term data have proven invaluable, as has the Service's increasing ability to model the effects of local and regional pollution increases and reductions. Monitoring technicians, resource managers, and interpreters do an excellent job of ensuring data quality and delivering information to the public. The Air Resources Division has enhanced its ability to perform localized and regional scale modeling and to disseminate information through the Internet (e.g., the Air Resources Information System and Air Atlas make access to data easy, and the air quality Web site receives a million visits per week). Finally, the Park Service has earned a seat at the consensus-building table because of its willingness to engage in constructive dialogue about cost-effective solutions. ■

chris_shaver@nps.gov

Chief, Air Resources Division, Natural Resource Program Center;
Lakewood, Colorado

Developing technology and advancing knowledge in soundscape monitoring and protection

By Frank Turina

"Only when one comes to listen, only when one is aware and still, can things be seen and heard. Everyone has a listening-point somewhere. It does not have to be in the north or close to the wilderness, but some place of quiet where the universe can be contemplated with awe."

—Sigurd Olson, *Listening Point*

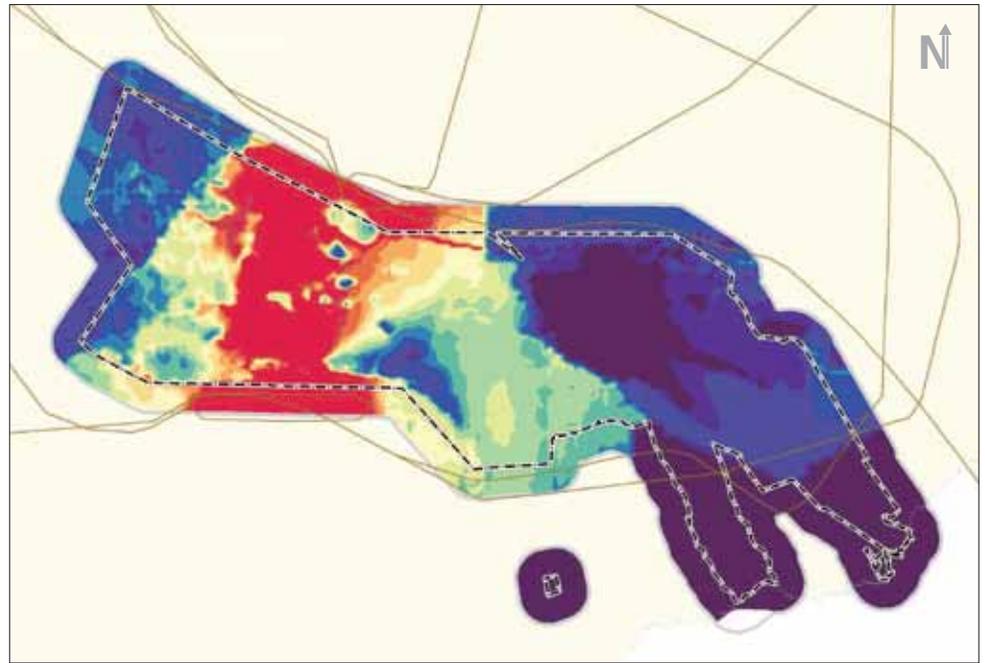
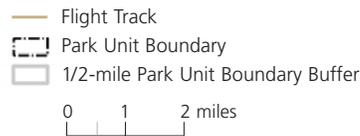
MANY PEOPLE REPORT THAT one of their primary reasons for visiting the national parks is to escape the clamor of everyday life and to enjoy the peace, quiet, and solitude that the parks can offer. Noise is a real issue for many Americans. In fact, by 1993 the Environmental Protection Agency estimated that more than 40% of the US population lived in areas where the daily average noise levels exceeded the safe level identified by the agency. Whether park visitors are searching for a lack of noise or for specific sounds, such as an elk bugling in the cool air of a Rocky Mountain autumn, the rancor of bird life in the Everglades, or the thunderous falls in Yosemite Valley, the opportunity to experience an appropriate soundscape can be degraded by unwanted noise from a variety of sources. In 2005 the Natural Sounds Program, part of the Air Resources Division, made great strides in protecting this important aspect of the park experience by developing technical expertise, presenting soundscape management workshops, and advancing scientific investigations in the areas of acoustic monitoring, planning, and protection.

Whether park visitors are searching for a lack of noise or for specific sounds, ... the opportunity to experience an appropriate soundscape can be degraded by unwanted noise from a variety of sources.

A major emphasis for the Natural Sounds Program in 2005 continued to be implementation of the Air Tour Management Program, a joint effort with the Federal Aviation Administration (FAA) to develop air tour management plans for park units where air tour operators have applied for operating authority. These planning efforts are ongoing at 10 parks in the Midwest, Intermountain, and Pacific West Regions. One of the most significant accomplishments for 2005 was the development of an implementation plan for the Air Tour Management Program. This plan represents an agreement between the FAA and the National Park Service on the procedures and protocols for collecting data, modeling, and describing ambient sound conditions in parks that must develop air tour management plans.

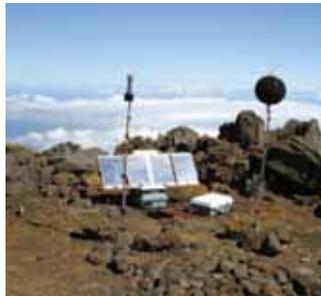
The implementation plan is an important step forward because it addresses program-wide implementation and management issues and describes the process for developing individual air tour management plans, including scoping, alternatives development, and impact analysis. Standards and protocols for measurement techniques, acoustic equipment, and soundscape inventory and monitoring are also presented. Additionally, the acoustics portion of the plan provides an introduction to

% Time Above	% Park
>= 65	11
60 to < 65	13
55 to < 60	15
50 to < 55	18
45 to < 50	21
40 to < 45	25
35 to < 40	31
30 to < 35	42
25 to < 30	47
20 to < 25	51
15 to < 20	57
10 to < 15	71
5 to < 10	80
0 to < 5	100



The implementation of the Air Tour Management Program, a joint effort with the FAA to develop air tour management plans for more than 100 national park units, continued to be a primary focus for the Natural Sounds Program in 2005. The two agencies reached an agreement on the procedures and protocols for collecting data, modeling, and describing ambient sound conditions in parks that must

develop air tour management plans. This map of Haleakala National Park, Hawaii, shows current ambient sound levels, indicating the amount of time that sound levels are greater than natural conditions. This information will serve as a scientific baseline for assessing impacts from current and future activities on the park's acoustic environment.



Acoustic monitoring equipment at Haleakala (left) and Grand Teton National Parks is used to address and monitor natural ambient sound levels for use in park planning.

acoustic principles, terminology, metrics, and measures used to describe and manage soundscapes in national parks. Overall, the implementation plan will assist in maintaining an efficient and effective process for implementing the Air Tour Management Program.

In 2005 the Natural Sounds Program also directly assisted individual parks on a variety of technical issues. For example, to support the development of the air tour management plans, NPS and FAA staffs conducted acoustic monitoring at several national parks, including Yosemite, Acadia, and Great Smoky Mountains. To meet a growing demand from parks for technical assistance, Natural Sounds Program staff presented soundscape management workshops at Mount Rainier and Yosemite National Parks and at several other units in the Northeast Region.

Advancing technology and exploring the effects of various sounds on visitors were also important areas of focus in 2005. Natural Sounds Program staff assisted in the development of a software package for

handheld computers that allows staff to easily identify and record specific sounds within a park. The program is also working with Colorado State University (CSU) and others to assess the effects of various sounds on park visitors. For example, in a study at Muir Woods National Monument, California, CSU researchers interviewed 280 people to identify the sounds visitors are hearing at the park and to understand the feelings and thoughts they associate with specific sounds. The findings will be used to inform the development of soundscape indicators and standards at the park. Early in 2006 the Natural Sounds Program will partner with CSU in sponsoring a symposium to discuss research needs and advancements in assessing soundscape preferences in park settings.

The National Park Service is working to address a wide range of challenges affecting not only the natural resources in national parks but also the ability of visitors to enjoy all park resources. In the case of the sounds visitors hear, the Park Service is making tremendous progress in understanding and managing the intrusion of inappropriate sounds through the Natural Sounds Program. ■

frank_turina@partner.nps.gov

Natural Resource Specialist, Colorado State University, Fort Collins, Colorado

Office of Inventory, Monitoring, and Evaluation advances mission-critical efforts to document and track park resources

By Gary Williams

For the National Park Service the words *inventory* and *monitoring* in recent years have come to mean that it has reached a critical watershed in how it goes about managing the incredibly diverse and widespread natural resources entrusted to its care: with high-quality scientific information. The importance of these functions for realizing the mission of the National Park Service cannot be overstated. Knowing exactly which plants and animals inhabit the parks, where they occur,

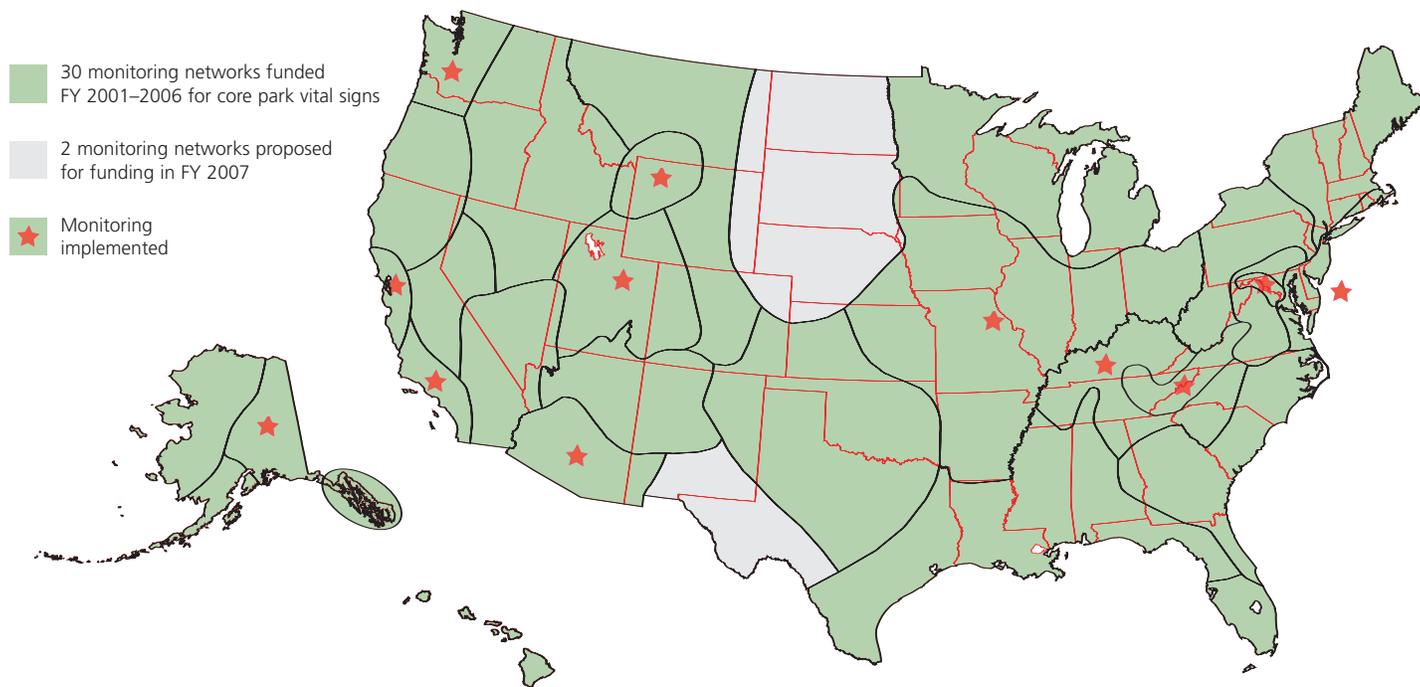
In 2005 the National Park Service advanced monitoring and inventory efforts, assembling 1,750 data sets and completing monitoring plans for more than 100 parks.

and in what numbers, as well as the condition of the natural systems they rely on, is the only reasonable starting point for making a broad array of management decisions. The Office of Inventory, Monitoring, and Evaluation (OIME) oversees inventory and monitoring programs throughout the National Park Service, including assisting parks, regions, and other NPS offices with the acquisition of natural

resource inventory and monitoring information and its application in management decision making and resource protection. In 2005 the National Park Service advanced monitoring and inventory efforts, assembling 1,750 data sets and completing monitoring plans for more than 100 parks. A comprehensive planning effort to manage NPS information systems was also initiated in 2005.

The Inventory and Monitoring Program component of the office provides park managers with information about what they manage (through inventories) and the condition of the resources they manage (through monitoring) so that good decisions can be made about actions that affect those natural resources. The program, which began in the early 1990s, has expanded greatly as a result of Natural Resource Challenge funding increases. In FY 2000, the National Park Service organized 270 natural resource parks into a system of 32 networks to provide an efficient means of carrying out expanded inventory and monitoring activities. Park networks will develop and implement programs to monitor the most critical “vital signs,” which are measurable indicators of park ecosystem health.

PARK VITAL SIGNS MONITORING NETWORK FUNDING STATUS FY 2006



Six new monitoring networks came online with FY 2006 funding, bringing the total number of funded networks to 30 (green); 2 networks (gray) are proposed for funding in FY 2007 and would complete the planned system of 32 monitoring networks. Altogether, 270 parks have been organized into 32 networks that share

staff and other resources for documenting the status and trends of park natural resources in support of management decision making and resource protection. On 30 September 2005, 12 networks (stars) completed their monitoring plans and began to implement vital signs monitoring in their member parks.

Natural resource inventories

As of FY 2005, more than 1,750 park data sets (64% of those outstanding) have been developed. This resulted in essentially completing seven inventory data sets for all natural resource parks in addition to making progress on the remaining five inventories. Inventory efforts documented not only species that were commonly found in individual parks, but also threatened and rare species and some that were new to science. For example, the Ozark hellbender (*Cryptobranchus alleganiensis bishopi*), an exclusively aquatic giant salamander that was recently listed as a new federal candidate endangered species, was documented at six new locations within Ozark National Scenic Riverways, Missouri, during recent surveys (see article, page 56). Similarly, biologic inventories at Padre Island National Seashore, Texas, turned up a toad possibly new to science. It appears that the toad population's genetic isolation for several thousand years may have resulted in its distinctive characteristics.

Vital signs monitoring

The vital signs monitoring portion of the program began in FY 2001, and by the end of FY 2005, 24 networks encompassing 207 parks had been funded to monitor vital signs. Six additional networks are scheduled to receive funding in FY 2006, with the final two networks to come on line in FY 2007. The 24 networks are involved in a three-phase planning process to develop high-quality monitoring program designs that will provide the best possible information for management use. Each phase is guided by a group representing park managers and undergoes peer review and refinement before being approved for implementation. Overall effectiveness and efficiency are achieved by (1) leveraging costs and expertise through partnerships with more than 150 universities and numerous federal and state agencies, (2) relying on available data and methodologies whenever possible, and (3) organizing and sharing monitoring efforts among parks in the networks.

During FY 2005 the monitoring plans for the first 12 networks, consisting of 101 parks, received final peer review and approval (see article, page 45). As a result, monitoring of key natural resource vital signs will be implemented for these parks beginning in FY 2006. The indicators selected as vital signs vary by park and region. For example, monitoring natural shoreline dynamics and land retreat 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 and historical sites and natural resources, such as breeding habitat for the threatened piping plover (*Charadrius molodus*) and endangered roseate tern (*Sterna dougallii dougallii*), is of paramount concern to park managers. Understanding shoreline dynamics will contribute to these management decisions. Other regions may focus monitoring activities on individual species. White

spruce (*Picea glauca*) is one species that typifies the boreal forest of the Central Alaska Network. This species constitutes a primary habitat and food source for several bird and small mammal species; therefore, the extent of white spruce across 22 million acres (8.9 million ha) will generally inform the network about boreal forest health.

PRIDE project

The Office of Inventory, Monitoring, and Evaluation, in partnership with the Office of Natural Resource Information Systems, recently initiated the PRIDE project in an attempt to plan natural resource information systems with a long-range, comprehensive perspective. This perspective is needed to ensure that managers have accurate information in the format and time frame required. In the past, information systems that provide critical inventory and monitoring data to NPS planners and managers often have not been developed in a coordinated, cohesive manner, resulting in unnecessary redundancies, omissions, and inefficiencies. Just as building a house requires blueprints that show how all components (plumbing, electrical, structural, etc.) relate to each other, so information systems should be developed with the whole picture in mind and with defined relationships between different types of data. This is a relatively new concept for information technology in the government, but one that has proven to be very efficient and cost-effective in the business world.

Over the next 12–14 months, the PRIDE project will focus on five major activities: (1) describing major NPS natural resource management processes, (2) identifying information needed to implement those processes, (3) assessing current information systems, (4) identifying information gaps and redundancies, and (5) developing a modernization blueprint that describes a transition process for going from current to desired conditions. In this manner, PRIDE will undertake a strategic planning effort for natural resource information systems development and deployment from the parks' perspective.

Documenting the plants and animals found in national parks throughout the nation is no small task, involving numerous partners and untold volunteers to get the job done. Similarly, monitoring and data management activities require the prolonged focus of many skilled people. Years of effort have led to a new understanding of the great diversity of life-forms found in the parks and to delivery of information on the conditions of park ecosystems. The ultimate payoff will be the ability of park managers to make better decisions based on science. The programs of the Office of Inventory, Monitoring, and Evaluation are helping to realize this mission-critical goal. ■

gary_williams@nps.gov

Manager, Office of Inventory, Monitoring, and Evaluation; Natural Resource Program Center; Fort Collins, Colorado

Scientific discoveries for park managers and the public: Research learning centers make a difference

By Lynne Murdock

INTRODUCED IN 2000 AS PART of the Natural Resource Challenge, research learning centers advance research in national parks. Fifteen centers now serve more than 100 units in the National Park System. This year the centers and their partners carried out around 660 park research projects valued at more than \$8 million. These efforts are increasing the ability of park managers to make resource decisions that are informed by sound science. The centers also hosted more than 240 events this year, including science seminars, teacher workshops, conferences, citizen science projects, and staff trainings, sharing park research results with more than 9 million people in communities near parks and around the world. Another benefit of research learning centers is their capacity to provide low-cost housing and work space for scientists and their students. In 2005, research learning centers provided bunk space, campsites, laboratory and office space, and other amenities that enable researchers to make maximum use of their time and project funds.

By leveraging facility and staff resources, the centers are reaching outside park boundaries to engage their neighbors and acquire new knowledge for managers.

Research learning centers facilitated a wide variety of research in 2005, addressing natural, cultural, and historical resources; visitor use and satisfaction; effectiveness in education and community outreach; and park operations and safety. By leveraging facility and staff resources, the centers are reaching outside park boundaries to engage their neighbors and acquire new knowledge for managers. A good example is the public response to loss of marshland in Jamaica Bay, a part of Gateway National Recreation Area, New York. Anecdotal information from local residents and fishers concerned about the shrinking of salt marshes prompted the Jamaica Bay Institute, a research learning center, to facilitate analysis of historical and recent aerial photography. Results showed that 50 acres (20 ha) of wetlands are disappearing annually. If this trend continues, the marsh islands will vanish by 2025. Such credible information prompted many actions within and beyond Gateway's boundaries. A blue-ribbon panel was established to consider the critical loss of wetlands, and funding was obtained for several research projects. A symposium hosted by the institute kept land managers and policy officials up-to-date with the evaluation of salt-marsh loss. The prominence of this issue has guided large-scale restoration of Jamaica Bay, and the mayor of New York City recently decided to develop a Jamaica Bay Watershed Management Plan.

Research learning centers are also proving their usefulness in coordinating research among many parks. A prime example is the ongoing inventory of eumycetozoa, an interesting group of organisms with the common name of slime molds that includes species



Amanda Johnson from Tuscola High School in Waynesboro, North Carolina, looks for brownish purple markings and yellowing on plant leaves in Great Smoky Mountains National Park. Such discoloration can indicate high ozone concentration in the air. Johnson's work is part of a project coordinated by a research learning center, and the school's data contribute to researchers' assessment of air quality in the park.



Acoustic research at Congaree National Park, South Carolina, involves placing autonomous recording units in trees to sample park sounds over several years. In addition to establishing a baseline of the park soundscape, managers are interested in determining the presence or absence of Bachman's warbler and ivory-billed woodpecker, both thought to be extinct, as well as other species of ecological interest: cerulean warbler, northern cricket frog, Fowler's toad, and little grass frog. The Old Growth Bottomland Forest Research and Education Center provided on-site lodging, a work area and computer lab, and access to the old-growth forest. More than 20,000 hours of sound sampled at 10 sites in 2005 is being analyzed.

important in the study of Alzheimer's disease. The project, described on page 68, aims to establish an inventory of the organisms across the National Park System. The work is often carried out by volunteers, who become highly trained citizen scientists who learn culturing techniques and study cell organization, and may also help researchers monitor the health of soil communities. The project is currently being conducted by 11 research learning centers nationwide.

Engaging the public in park science and stewardship issues is a major goal of the centers. For example, at Great Smoky Mountains National Park (Tennessee and North Carolina), high school students are investigating the effects of ground-level ozone using biomonitoring gardens. Managed by the Appalachian Highlands Science Learning Center, the study trains students to measure plant growth of common species such as milkweed and coneflower. They also examine the leaves for evidence of overexposure to ozone, a toxic air pollutant. The project benefits both students and researchers, says Education Specialist Susan Sachs, who coordinates the program. "We have better information to pass on to ... researchers, who are often only in the park for a couple of weeks each year, and the students gain an in-depth understanding of air pollution in their community."

Serving national parks in the Pacific Northwest, the North Coast and Cascades Research Learning Network brought together park interpreters and university educators to develop a series of articles for publication in the *Seattle Times* as part of its "Newspapers in Education" program. The idea behind the project was to encourage students to explore science topics using real-world management applications from Pacific Northwest national parks. The related Web site (www.nps.gov/noca/nie) posts articles, accompanying curriculum, and interactive pages for students on a variety of topics relevant to park resources management, such as forest carnivores, forest ecology, volcanology, migratory birds, and glaciology. Students learn about the scientific method and how to apply science methodologies to investigating and understanding the natural world.

Research learning centers are an example of how the National Park Service is actively engaging park neighbors in resource stewardship activities while creatively meeting management needs for quality scientific information. Through methods such as online catalogs that list and describe park-prioritized research needs, enhanced Web sites, resource bulletins, newsletters, roundtable discussions, and science seminars, these centers are making a difference to national park managers, the public, and researchers alike. The future of this vibrant program lies in the centers' collaboration with more than 250 partners, including nonprofits; volunteers; universities; federal, state, and tribal agencies; and a range of internal Park Service programs. Through these partnerships, research learning centers will continue to facilitate research, communicate results, leverage funds, and serve a broad range of park units in 2006 and beyond. ■

lynne_murdock@nps.gov

Interpretive Liaison, Natural Resource Program Center, Office of Outreach and Education, Washington, DC

Park planning streamlined through online review and comment system

By Julie Fleming, Mohammed Chowdhury, and Shane McGregor

PARK PLANNING AND ENVIRONMENTAL IMPACT assessment began harnessing the power of the Internet to reach broad audiences in March 2005 when the Environmental Quality Division publicly launched the Planning, Environment, and Public Comment system. Known as "PEPC," the online system is a collaborative tool that tracks a wide variety of National Park Service activities relating to conservation planning, environmental impact analysis, and informed decision making in park management. The new system tracks progress with park projects, including the legal compliance process outlined in the National Environmental Policy Act; public comment, analysis, and response by the National Park Service; and implementation of the projects. A significant benefit is the improvement in communication with the public about how parks are being managed. The Internet site, which facilitates public review of project plans, is at <http://parkplanning.nps.gov>; the internal site at <https://pepc.nps.gov> allows park staffs to post plans and related documents and review and analyze public comments. The system also improves efficiency of the National Park Service by integrating several key online project and financial planning tools to reduce the number of times data about management projects need to be entered into various systems.

A significant benefit is the improvement in communication with the public about how parks are being managed.

In its first year of use, 2005, PEPC is proving popular among NPS employees and the public. Park Service staff and contractors are using it to create and track projects, document site visits and compliance with laws for the protection of cultural and natural resources, and organize and respond to public comments. Washington Office personnel, NPS regional directors, and park superintendents are using PEPC to view detailed and summary reports of planned projects and their funding status, the status of projects with respect to compliance, and trends in public comments. The public, both those with interest in park management and those directly affected by projects, is able to access and comment on notices, updates, related documents, and policies throughout the planning process.

A real time-saver for parks is PEPC's ability to centralize all documents related to a project or activity for internal review; hard copies no longer need to be routed for this purpose. Project milestones, compliance status, images, team member lists, and tasks can all be reviewed quickly and conveniently online. Environmental Quality Division staff, which is developing PEPC, has plans to further reduce the use of paper in park planning by incorporating a mechanism for electronically authenticating signatures in the transaction of park business related to the projects. The staff also plans to develop a system for archiving documents with the NPS Technical Information Center through the use of XML (extensible markup language).



The Planning, Environment, and Public Comment system facilitates online public review of conservation planning, environmental impact analysis, and other planned park management projects. Two recent management activities available for public input are an impact analysis of a trail rehabilitation and access improve-

ment project on Dias Ridge (above) in Golden Gate National Recreation Area (California) and a proposed update to the fire management plan for Wind Cave National Park, South Dakota (below). Nearly 4,000 park planning projects were registered in the PEPC system as of November 2005.

As of 1 November 2005, PEPC was being used to manage nearly 4,000 park planning projects with hundreds of NPS users. The system is also accessible by contractors and other federal partners, such as the Federal Highway Administration. Its success as a public communications system on park planning is exemplified by the nearly 80,000 comments made during the public review period of the "Proposed petroleum exploration well in Glen Canyon National Recreation Area." Another use is the review of proposed updates to NPS management policies, which was open for public comment from 19 October 2005 through 18 February 2006. ■

julie_e_fleming@nps.gov

Project Manager, Environmental Quality Division,
Fort Collins, Colorado

mohammed_chowdhury@partner.nps.gov

PEPC Programmer, Colorado State University, Fort Collins, Colorado

shane_mcgregor@partner.nps.gov

PEPC Programmer, Colorado State University, Fort Collins, Colorado



Creativity and dedication to carry National Natural Landmarks Program through budget cut

By Margi Brooks

ESTABLISHED IN 1962, THE NATIONAL NATURAL LANDMARKS (NNL) Program aims to encourage and support voluntary preservation of nationally significant sites that exemplify the geological and ecological history of the United States. Because the program is voluntary, NNL designation is not a land withdrawal, does not change the ownership of an area, and does not dictate activity. The program involves 587 private, municipal, state, and federal landowners voluntarily preserving sites as national natural landmarks. The regulations that govern the NNL Program were revised in 1999 to better protect the interests of private landowners who participate in it. Publication of these new regulations ended a 10-year moratorium on new NNL designations.

The NNL Program will continue to support conservation at these nationally important natural areas.

Though no new national natural landmarks were approved in 2005, progress was still good in many ways. Evaluation of potential landmarks continued, as did projects to interpret and improve conditions at existing national natural landmarks. Similarly, NNL staff visited more than 200 landmarks to document their condition and discuss conservation assistance available from the National Park Service and other partners. The first NNL photo contest was held in 2004, and calendars featuring the award-winning photography at 18 landmarks were distributed worldwide; a second photo contest was held in 2005, with photos depicting 13 landmarks selected as prize winners. The National Park System Advisory Board voiced enthusiastic support for the program at their meeting in September. Additionally, chair of the House Committee on Resources Richard Pombo sent a letter to the Secretary of the Interior supporting the designation of a potential new landmark and the basic tenets of the program.

In spite of a significant budget reduction in FY 2006, creative solutions have been developed to ensure that the program remains effective. For example, regional staff will be reduced from 11 to 6



This photograph of a late-summer thunderstorm at Medicine Lake in northeastern Montana won first place in the 2005 NNL photo contest; it was taken by Carter Thurman of Sewanee, Tennessee, and will appear in a 2006 calendar. Managed by the US Fish and Wildlife Service, this national natural landmark highlights a landscape shaped by the processes of continental glaciation.

through retirement incentives, job sharing, and attrition. Remaining program staff members met in late September to hammer out a detailed work plan for 2006 that highlights tactics for addressing the funding cut, including seeking grants, increasing the use of donated services, reducing costs associated with site visits, and increasing promotional and educational opportunities that do not require much travel. In short, despite a significant budget reduction, the NNL Program will continue to support conservation at these nationally important natural areas both within and outside the National Park System. ■

margi_brooks@nps.gov

Service-wide Program Manager, National Natural Landmarks Program; Natural Resource Stewardship and Science, Washington, DC

How can the National Park Service improve stewardship of ocean parks?

By Gary E. Davis

A 2001 REPORT BY THE NATIONAL PARK SYSTEM Advisory Board examining the prospects of the National Park Service (NPS) in the first quarter of the 21st century found that NPS stewardship of ocean resources lagged behind land management. Specifically, it expressed concern that marine environments may be degrading faster than terrestrial areas because of pollution, overfishing, and coastal development. The challenge set by the advisory board was for the National Park Service to be a leader in marine resource protection and restoration and to “think beyond the vision of maintaining sustainable parks to encourage sustainable communities and ecosystems with parks as a part of them.”* This challenge prompted creation of a task force of seven ocean park superintendents and seven national program leaders from cultural resources, natural resources, and visitor services directorates, appointed by the NPS deputy director in June 2004. The task force developed a four-point Ocean Park Stewardship Action Plan for 2005–2008, and in 2005 realized several important accomplishments.

*National Park System Advisory Board. 2001. Rethinking the national parks for the 21st century. Report. National Geographic Society.

Addressing the plight of the oceans, the action plan focuses on the cooperative establishment of a coordinated system of ocean parks, sanctuaries, refuges, and reserves. Because the management of ocean resources often varies by agency and oversight responsibility, the National Park Service must work with many partners to develop consistent mechanisms for maintaining and restoring marine resources. The plan also calls for the exploration, mapping, and protection of ocean parks. To ensure success, the Park Service must find more effective ways of engaging visitors in ocean park stewardship as it increases its own technical capacity for ocean exploration and stewardship.

In 2004 the National Park Service worked with the Department of the Interior and the White House to develop the US Ocean Action Plan (December 2004), including provisions for the Park Service to pursue its Ocean Park Stewardship Action Plan goals and increase coordination with other ocean agencies. In August 2005 the National Park Service and the US Fish and Wildlife Service (Wildlife Refuge System) signed an agreement on cooperative law enforcement with the National Oceanic and Atmospheric Administration (NOAA, National Marine Sanctuaries and Fisheries). This agreement will



Marine resources in the National Park System are as varied as they are widespread, occurring in 74 parks from the South Pacific to the Caribbean, and from Alaska to Maine. An action plan to improve their stewardship emphasizes cooperation with other federal and state agencies in developing consistent mechanisms for their

maintenance and restoration. Pictured clockwise from upper left are Point Reyes National Seashore (California), Kenai Fjords National Park (Alaska), Virgin Islands National Park (US Virgin Islands), Everglades National Park (Florida), and Assateague Island National Seashore (Maryland).

Geologic Resources Division unearths solutions for park resource management

By Dave Shaver

enhance visitor safety and resource protection in adjacent or overlapping ocean parks, sanctuaries, and refuges. In addition, members of the Ocean Park Task Force met with staffs of the Wildlife Refuge System and NOAA Sanctuaries and Estuarine Research Reserves to develop a broad agreement to expand joint programs for natural and cultural resource monitoring, management, and education and outreach, scheduled for completion in summer 2006.

Recognizing the importance of raising public awareness of ocean park resources and their condition, the National Park Service contributed data that describe 40 ocean parks to a comprehensive inventory of national marine managed areas. The inventory is available to the public at www.mpa.gov. Additionally, the NPS Water Resources Division guided coastal park watershed assessments in 2005 (see article, page 47). Looking to the future, the task force explored ways to improve its effectiveness by coordinating marine habitat mapping and other activities with the NPS Natural Resource Program Center, and by helping to organize an ocean park task force in the Northeast Region.

Overall, 2005 was a year of substantial progress for ocean programs. In 2006 the National Park Service will intensify efforts among the parks, regional offices, and Washington Office programs to realize its vision of preserving unimpaired ocean “wild life,” natural processes, wilderness, cultural resources, and recreational opportunities in the National Park System. Activities will focus on increasing the organizational and scientific capacity of the National Park Service for stewardship of ocean natural and cultural heritage, to include developing and nurturing effective partnerships. Achieving these goals will require broad National Park Service involvement and civic engagement. ■

gary_davis@nps.gov

Visiting Chief Scientist, Ocean Programs, Washington, DC

GEOLOGY IS A CRITICAL ELEMENT in prudent resource stewardship in most units of the National Park System. Not only does it serve as the foundation of landscapes and scenery, but it is also an important factor in determining life-forms, water bodies, and microclimates. Identifying and understanding geologic processes in parks, in addition to managing less obvious issues such as the protection of endangered species and emergency response to hurricanes, is a fundamental role for geoscience. Accordingly, the NPS Geologic Resources Division (GRD) works with parks, regions, and monitoring networks to incorporate geoscience information into park decision making. The Geologic Resources Division—part of the Natural Resource Program Center and composed of staff with specialized knowledge in the sciences, policy, and regulatory arena—provides support to park managers and the directorate on a range of geologic resource management issues in and adjacent to parks. Specific program areas include cave and karst systems, coastal and surficial geologic processes, disturbed lands restoration, paleontology, geologic hazards, soil resources management, geologic mapping and issue identification, minerals management, and associated NPS policy and regulatory or legal authorities.

Geology is a critical element in prudent resource stewardship in most units of the National Park System.

Highlights of program accomplishments in FY 2005 include restoration of disturbed lands, reaching a milestone in the number of volunteer geoscientists placed in parks, assisting park managers with often contentious minerals management issues, helping to establish the National Cave and Karst Research Institute, initiating a comprehensive monitoring manual, assessing geologic hazards, addressing coastal and marine resource issues, and completing many soil surveys. Specifically, GRD staff assisted managers in more than 30 parks with issues concerning abandoned mines, disturbed lands, geomorphologic resources, and geologic hazards by providing analysis, restoration designs, and project oversight. The division administered NPS funding and managed projects in 12 parks, restoring nearly 300 acres (122 ha) of severely disturbed land. Staff expertise in mining and oil and gas technology, impact mitigation, regulations, and policy helped managers in more than 25 National Park System units protect park resources from the adverse effects of mining and drilling. Using Recreational Fee Demonstration Program funds, the division initiated a comprehensive geologic monitoring manual, which the Geological Society of America will publish in 2006. Specialists assessed geologic hazards such as landslides, rockfalls, snow avalanches, debris flows, floods, and severe erosion at eight parks. Coastal geology staff assisted managers in more than 30 parks with coastal and marine resource issues, in particular helping to evaluate hurricane damage and response. Inventory and mapping staff helped guide the development of new mapping protocols for barrier islands and marine resources, for example at Kaloko-Honokōhau National Historical Park (Hawaii) and Dry Tortugas National Park (Florida).

In FY 2005 the division also helped the National Park Service meet its strategic plan goals for disturbed lands restoration and paleontology, exceeding the targeted estimate for restored acreage and the number of fossil sites held in good condition, respectively. The division contributed to the NPS natural resource inventory goal 1b1 by completing 17 digital geologic maps for parks and 11 soil inventories through the Geologic Resource Evaluation initiative and the Soil Resources Inventory.

Cooperative ventures with professional organizations significantly expanded the division's geologic capabilities in 2005. Partnerships under the Geoscientists-in-the-Parks (GIP) program placed 51 geoscientists in parks and offices across the country to address needs in interpretation, resource management, and research. Since the inception of the GIP program in 1995, these partnerships have placed approximately 500 volunteers (students and experienced professionals) in parks. This contribution is valued at more than \$4 million. Partners such as the American Geological Institute, Association for Women Geoscientists, Geological Society of America, US Geological Survey (USGS), and state geologic surveys facilitated research, education, and interpretation and enhanced NPS funds for park projects. These partnerships demonstrate the commitment and effectiveness of these organizations in advancing sound management and understanding of NPS geologic resources. Particularly noteworthy in 2005 was the strengthening of the partnership with the USGS by facilitating joint project development, supporting targeted

USGS science in parks, and directing the National Cooperative Geologic Mapping Program toward park applications. Moreover, the USGS "Understanding the Appalachians" workshop brought in \$75,000 for mutually beneficial projects. In addition, the division initiated a promising partnership among local geologic societies and parks, with a pilot effort between the Rocky Mountain Association of Geologists and Great Sand Dunes National Park (Colorado), which has already provided useful education and resource management products.

Finally, as an advocate for the addition of geologic expertise at all levels of the National Park Service, GRD staff worked with parks to increase the number of dedicated geology-related positions across the National Park System from fewer than 70 in 1995 to approximately 100 in 2005, partly as a result of funding increases under the Natural Resource Challenge initiative. The specialists in parks and regions manage projects and collaborate with external organizations to facilitate understanding of park geologic resources and natural system interactions, resulting in improved management decisions and delivery of better public information. The addition of Natural Resource Challenge-funded positions within the division has enabled it to broaden the range of geologic expertise it offers in support of parks and to take on more projects. ■

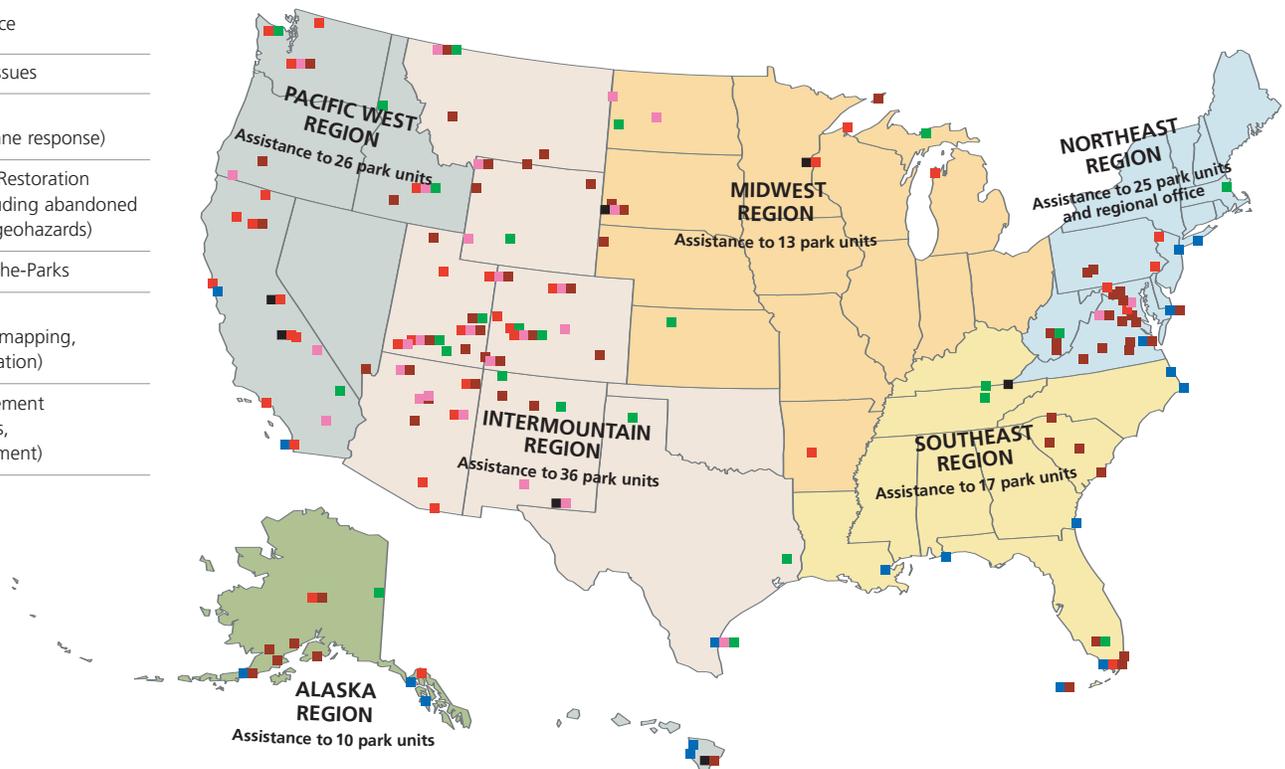
dave_shaver@nps.gov

Chief, Geologic Resources Division, Natural Resource Program Center; Lakewood, Colorado

GEOLOGIC RESOURCES DIVISION ASSISTANCE TO PARKS, FY 2005 (PARTIAL LIST)

Types of Assistance

- Cave and Karst Issues
- Coastal Issues (including hurricane response)
- Disturbed Lands Restoration (restoration, including abandoned mineral lands & geohazards)
- Geoscientists-in-the-Parks
- Inventories (geologic & soils mapping, & issues identification)
- Minerals Management (mining, oil & gas, external development)



Canon Scholars: Training the next generation of conservation scientists

By Jean McKendry and Gary Machlis

THROUGHOUT THE WORLD a better understanding of how to preserve the natural and cultural resources of national parks for future generations is urgently needed. Hence there is a vital responsibility to educate and prepare the next generation of conservation scientists.

Established in 1997, the Canon National Parks Science Scholars Program is developing this next generation of scientists working in the fields of conservation, environmental science, and national park management. The program annually awards eight scholarships to support the education and research expenses of doctoral students for three years. Students are selected from disciplines in the biological, physical, social, and cultural sciences, and technology innovation in support of conservation science. The program is underwritten and supported by Canon U.S.A., Inc., in a collaborative partnership with the American Association for the Advancement of Science (AAAS) and the US National Park Service (NPS). Gary Machlis, NPS visiting senior scientist, directs the program.

In 2005 the program produced a special report titled “The Canon National Parks Science Scholars Program: Training the Next Generation of Conservation Scientists.” This report describes how the program operates, including the contributions of the partners; introduces both past and present Canon Scholars; and highlights many of the parks where their research has been conducted or is under way. It also includes a bibliography of selected scientific articles and presentations they have made and is available on the Internet at http://www.nps.gov/pub_aff/csp_report/index.html.

As the report describes, the program achieved the following from 1997 to 2005:

- More than 60 PhD students have become Canon Scholars.
- Canon Scholars come from seven countries and 46 universities; 64% are women.
- Canon Scholars have conducted or are doing research in 78 national parks, 50 of which are in the United States.
- More than 225 scientific articles have been authored or coauthored by Canon Scholars.
- Canon Scholars are working as tenure-track professors, postdoctoral scientists, park managers, environmental organization professionals, and government scientists.

With the selection of the ninth class of scholars in 2005, the program continues its commitment to the NPS goal of “parks for science” and “science for parks.” NPS Director Fran Mainella said: “The Canon National Parks Science Scholars Program is one of the most inspiring programs our agency is privileged to be a part of. This significant partnership ... provides research that is vital to the preservation and understanding of national park resources.” The 2005 Canon Scholars are studying in national parks from Canada’s Tuktut Nogiat

National Park (Northwest Territories), to Florida’s Everglades National Park, to Chile’s Chiloe National Park.

Park managers throughout the Americas are benefiting from this research. At Virgin Islands National Park, Rikki Grober-Dunsmore (class of 2002) conducted research on using large-scale ecosystem patterns and habitat features to predict reef fish abundance and diversity. Her findings are important for developing effective management strategies to protect coral reef ecosystems worldwide. In Yosemite National Park, Jessica Lundquist (2002) measured the magnitude and timing of daily fluctuations in streamflow in relation to the location and rate of snowmelt in a river basin. Her findings yielded a better understanding of where and when snow melts and how it travels through the river network. These findings are critical in light of the potential impacts of global warming on snowmelt processes.

Canon Scholars have conducted or are doing research in 78 national parks, 50 of which are in the United States.

At Organ Pipe Cactus National Monument, Colleen O’Brien (2005) is documenting the historical and present-day connections of desert people to the area’s natural resources. One result of this effort will be integrating a biocultural component into threatened and endangered species monitoring programs. At the Great Dismal Swamp National Wildlife Refuge, part of the NPS Underground Railroad Network to Freedom, Daniel Sayers (2004) is studying how African Americans used the swamp to escape slavery in the South prior to the Civil War. His findings will provide information relevant to the conservation and interpretation of this and related sites in the Underground Railroad Network.

In addition to funding dissertation research, the Canon Scholars Program provides leadership training, professional development, and opportunities to share research findings. Students join a community of scholars and develop a deeper understanding of conservation through activities of the program. In 2000 a retreat was held in Big Sky, Montana, and Yellowstone National Park, focusing on the relationship between science and the media. Presentations were given by professionals from Canon U.S.A., Inc., members of the media, and representatives of the National Park Service. Pulitzer Prize-winning author and journalist William Dietrich gave the keynote presentation. Canon Scholars, working with Canon and media professionals, practiced communicating science findings to the general public. They also toured Yellowstone National Park, met with park staff, and learned about the national vision for Yellowstone.

Science symposia were held in Williamsburg, Virginia, in 2000 and in Washington, DC, in 2001. The program sponsored a special



The 2002–2004 classes of Canon National Parks Science Scholars assembled in Danzante, on the Sea of Cortez in Baja California Sur, Mexico, in April 2005 as part of an annual retreat to enrich their studies of conservation, including national park management issues.

youth session at the Fifth World Parks Congress in South Africa in 2003. Vieques, Puerto Rico, was the location of the 2003 retreat, which focused on the ecological restoration of lands and waters formerly used for military training. The 2005 retreat was held at Danzante, an ecotourism facility on the coast of the Sea of Cortez in Baja California Sur, Mexico. Its purpose was to learn about the region and an ecosystem critical to global conservation. The group met with representatives of the newly created Bahía de Loreto National Park as well as with leaders of local communities and conservation groups.

Each Canon Scholar brings a unique perspective, background, and insight to critical park issues. Each class of scholars expands the capacity of science to help conserve and protect national parks. Collectively the work of Canon Scholars—the next generation of conservation scientists—and the collaboration among Canon U.S.A., Inc., the AAAS, and the National Park Service will contribute to the

advancement of science and create solutions for improving the management of national parks in the 21st century. ■

jeanm@uidaho.edu

Program Coordinator, Canon National Parks Science Scholars Program,
University of Idaho, Moscow

gmachlis@uidaho.edu

NPS Visiting Senior Scientist, University of Idaho, Moscow

Partnership between National Park Service and National Geographic Society under way

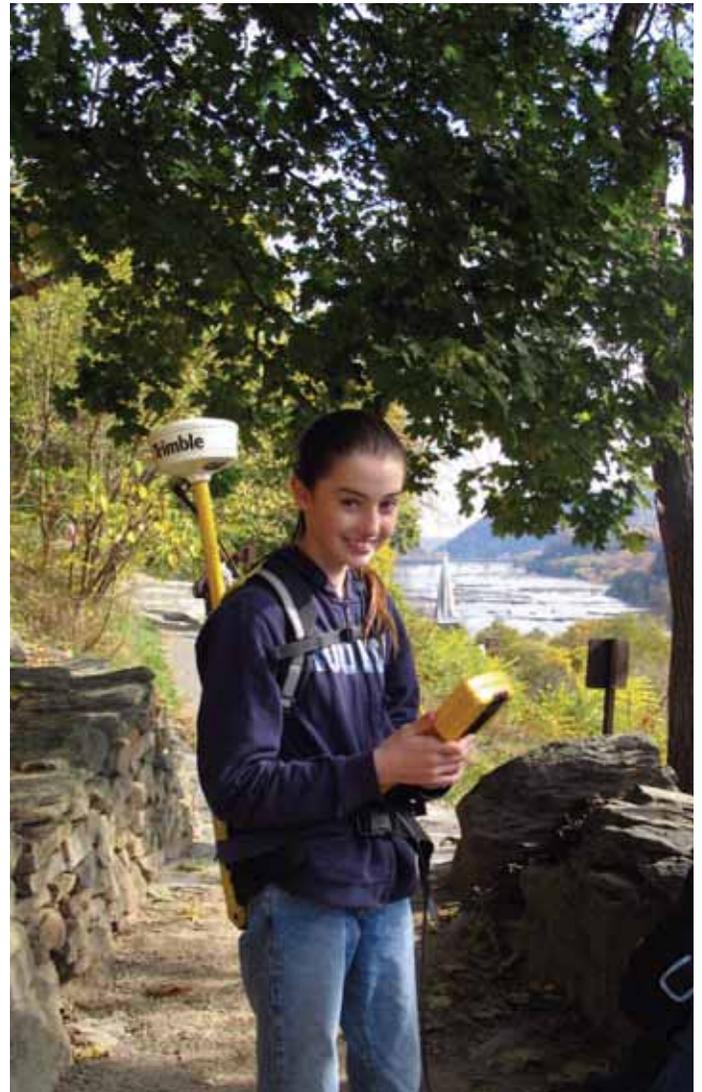
By Diana Maxwell and Pamela Underhill

THE PARTNERSHIP PROGRAM of the NPS Natural Resource Program Center brought together the National Park Service and National Geographic Maps (a division of the National Geographic Society) to sign a formal partnership agreement in November 2004. That agreement was the culmination of five years of collaboration and has the potential for a fruitful partnership between the two organizations that should help each to fulfill its mission. In particular, the National Park Service is excited about the prospects for a rich exchange of information and technology in order to develop communication vehicles that will help it engage the public more effectively in a variety of park management issues and educational opportunities.

The National Park Service is excited about the prospects for a rich exchange of information and technology.

The first products of the partnership are coordinated National Park Service–National Geographic Web sites focusing on Civil War history and geography that were launched in April 2005 (<http://cwar.nps.gov/civilwar/> and <http://java.nationalgeographic.com/maps/civilwar/>). The Park Service site explores the social, economic, political, and military aspects of the war; the related units of the National Park System; battlefield protection; and the roles of African Americans in the war. It also presents a searchable database of soldiers and sailors who served in battle and shares materials for education about the war. The National Geographic site features “MapMachine,” an interactive mapping utility that allows users to explore, print, and save maps of more than 5,200 Civil War battlefields and historic sites. Maps can be tailored to include a variety of GIS layers, showing, for example, the extent of battlefields, modern highways (useful for trip planning), and markers linked to specific information about a site. The maps highlight many units of the National Park System and help users relate history to geography.

A second project stemming from the partnership is just getting started with the goal of contributing to a new era of protection and sustained support for the Appalachian National Scenic Trail. Successful management of this 2,175-mile (3,450-km) footpath, which spans the length of the Appalachian Mountains from Georgia to Maine, requires the participation of thousands of volunteers and multiple jurisdictions of land managers. Following a decades-long land protection effort, Appalachian Trail managers today recognize that long-term protection of the trail depends not only on managing the thin ribbon of protected lands surrounding the footpath but also on fostering positive and collaborative relationships with adjoining landowners and neighboring communities. Engaging these publics



Sixth graders from Harpers Ferry Middle School in West Virginia use GPS units to record the location of the Appalachian National Scenic Trail and other local paths for exploring the town of Harpers Ferry and Harpers Ferry National Historical Park. The students will use the data to produce a brochure for visitors. Like this educational partnership between the National Park Service and the school, a planned partnership with National Geographic Maps strives to foster engaging relationships among trail communities and the 2,175-mile Appalachian Trail itself.



is critical to the sustained stewardship of this national treasure. Two products are envisioned: a geotourism map guide that educates the public about the Appalachian Trail and how it is managed and that guides tourists to key attractions and access points along the trail, and the MapMachine, a robust, interactive, map-based application blending a *National Geographic*-quality supplement-style map with a broad array of Appalachian Trail-specific information that would be available on the Web and at kiosks placed in strategic locations proximate to the trail. These products will combine educational materials and technology to increase awareness of the trail—the richness of its resources, the outdoor recreation opportunities it provides, and its vulnerability—and to foster a conservation ethic that will lead to its sustained stewardship.

Promising programs are now in the works that will offer enhanced and new information to the public about national parks via the Internet. For example, the National Park Service Web site will link to related information about national parks published in *National Geographic Magazine*. With the wealth of articles about national parks in this renowned publication, Web users will benefit greatly from this added feature. Additionally, the National Park Service and National Geographic Maps are exploring new avenues for technology transfer, including equipment, GIS programs, and mapping products to help park staffs manage their fire and law enforcement responsibilities. In 2006 the National Park Service hopes to broaden the partnership to include National Geographic publications. ■

diana_maxwell@nps.gov

Partnership Program Manager, Natural Resource Program Center, Lakewood, Colorado

pamela_underhill@nps.gov

Park Manager, Appalachian National Scenic Trail, Harpers Ferry, West Virginia