

National Park Service
U.S. Department of the Interior

Geologic Resources Division
Denver, Colorado



2004 Geologic Resources Division Natural Resources Challenge Report





Bryce Canyon National Park, Utah

2004 Geologic Resources Division *Natural Resources Challenge Report*

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U.S. Department of the Interior
Washington, DC



Canyonlands National Park, Utah

Executive Summary

This program coordinates Servicewide activities and supports the Directorate in the geologic sciences and minerals management functional areas. It provides park managers with geologic science and regulatory expertise to assist resource management decisions related to cave and karst systems, coastal and surficial geologic processes, disturbed land restoration, environmental effects of mineral extraction, fossil resources, geologic hazards, mineral extraction technology and engineering, and associated NPS policy and legal authorities. The program began in the 1980s with a budget of about \$1.5 million and staff of 28 focused on assisting park manager address energy, mining and mineral development in and around parks. In 1995, the program's functional responsibility was expanded to include broader geologic resource management areas, at that time staffing was 21 FTE. Since its inception, the program has had limited travel and project support funding with base budget essentially limited to professional staff personnel costs. In 2000, the program received a Natural Resource Challenge increase of \$695,000 to add six geologic specialists.

The current Geologic Resources Division has 29 staff engaged in five broad areas: Geologic Processes and Features, addressing geologic resource management concerns, research coordination, and public awareness efforts; Disturbed Lands Restoration, assisting parks to remediate resource damage caused by previous human activities; Geologic Resource Evaluation, focused on geologic mapping and issue evaluation; Minerals Management, assisting park to prevent and mitigate effects from mineral development in and

adjacent to parks; and the efforts to establish the National Cave and Karst Research Institute. The Division accomplishes many of its projects by utilizing and leveraging funds from other NPS sources, such as Fee Demo and NRPP, and working with geologic organization partnerships.

As of FY 2004, the Division's work has lead to heightened NPS awareness of geology issues and an increase in geoscience expertise in the Service. Since 1995, NPS geoscience staff has grown over 30% to an estimated 100 positions across the Service in 2004. At least 10 of these new positions resulted from the Challenge, and many parks have also restructured positions to address geology concerns. For example, Assateague Island recently hired a coastal geologist, complementing the coastal geologist position hired in the Division in FY 2000 with Challenge funding.

The geoscience community is deeply aware of and committed to advancing understanding of the National Park System's geologic resources. Through its geoscience staff the NPS has been able to channel this interest of the geoscience community to yield positive results for parks. Partnerships with organizations, such as, the American Geological Institute, Geologic Society of American, the U. S. Geological Survey and State Geologic Agencies, have facilitated geologic research, education and interpretation efforts and leverage NPS funds for park resource management projects. For example, the Geoscientists-in-the-Parks partnerships have provided about \$4 million for volunteers and interns in recent years, outmatching NPS funds by almost 5 to 1. These



Through a partnership with the Geological Society of America, Neil Kelly was a GIP at Fossil Butte National Monument, giving visitors the opportunity to observe and participate in the scientific collection of fossils.

partnerships have lead to improved park resource management decisions and improved information sharing by the NPS with the public.

The program directly assists NPS in meeting its Strategic Plan goals. The cave specialist serves as the NPS goal contact for GPRA Goal 1a9B - Cave Floors for the restoration of disturbed areas in visited park caves. The goal target established in the NPS Strategic Plan was to restore 129,306 square feet of cave floor by September 30, 2004. The NPS exceeded the target in FY 2004 with parks reporting a cumulative total of 172,820 square feet of restored cave floor. The Division's paleontologist is the Servicewide goal contact for GPRA NPS Goal 1a9A - Paleontological Localities. The Strategic Plan 2004 goal target was to have 17% of known paleontological localities in parks in good condition, which the NPS exceeded with parks reporting 1,202 (23%) out of 5,149 localities in good condition. Division staff also serves as the NPS goal contact for GPRA Goal 1a1A - Disturbed Lands Restoration. The NPS Strategic Plan goal target to restore 18,000 acres in parks by September 30, 2004, was exceeded with parks reporting a total of 20,125 acres restored. The Division also contributes to NPS Inventory goal 1b1 completing geologic baseline inventories through its Geologic Resource Evaluation initiative.

Highlights of program accomplishment in FY 2004 include the following:

- Program staff assisted NPS Vital Signs Network programs to develop geology monitoring protocols and geoscience components of conceptual system models. The cave and karst specialist worked with the Klamath, Cumberland



Jennifer Young, a GIP at Florissant Fossil Beds, leads an experiment to test protective coatings to minimize weathering of the petrified giant redwood stumps.

Piedmont, and Mojave Networks. Coastal staff coordinated with NASA and USGS to provide Northeastern, Gulf of Mexico, Atlantic, and Pacific coast networks with monitoring tools and protocols for coastal geologic mapping.

- The Geoscientists-in-the-Parks program placed 45 geoscientists in 29 parks, using \$50,000 in NRPP funds and achieved a more than 4:1 private partner funding match. These volunteer and partner-sponsored specialists worked across the System to address park geoscience needs in interpretation, resource management, research, and public safety. They worked in geoscience areas ranging from fossil preparation to coastal erosion and guided visitor tours. Partner organizations included the Geological Society of America, the Association for Women Geoscientists, the American Geological Institute, museums, universities, and park associations.
- Paleontology staff supported fossil surveys at Colorado NM, Zion NP, and Santa Monica Mountains NRA, and coordinated a project evaluating in-situ stabilization of fossil logs and stumps at Florissant Fossil Beds NM. A major project supported excavation of newly discovered fossilized bones of the small horse, *Mesohippus*, at Wind Cave NM. Staff provided oversight during the removal of a large fossil-bearing block, and arranged partner assistance for preparation of the excavated fossils by staff at the Mammoth Site in Hot Springs, South Dakota, and qualified volunteers from the Denver Museum.
- Disturbed land restoration staff managed NRPP funding and oversaw 13 restoration projects in 12 parks across the System, which restored nearly 300 acres of severely disturbed land. Division specialists also responded to over 30 park technical assistance requests involving disturbed lands, abandoned mine safety, geomorphological issues, and geologic hazards. Staff provides key professional analysis, mitigation and landform restoration designs, cost estimates, and project oversight assistance that will lead to park proposals for project funding to implement the recommended actions.
- Program staff consistently supported park managers and the Director's Office in addressing the often contentious issues surrounding private mineral develop in and adjacent to parks across the Service. The staff team with expertise in mining and oil and gas technology, regulations, policy, impact mitigation, and reclamation helps NPS managers to effectively protect park resources from the adverse effects of past, current, and future mining and drilling inside and adjacent to parks. To enhance NPS resource protection and compliance efforts, the program convened a 2004 workshop on nonfederal oil and gas development designed to improve park managers' implementation of the Service's regulations and environmental responsibilities.

Geologic Resources Programs



Denali National Park, Alaska

Overview

The Geologic Resources Division was established by the NPS in 1995 and included in the Natural Resources Program Center, which was also created at that time to coordinate national resource management programs and provide specialized professional expertise to parks throughout the System. The Division was formed by redirecting and broadening the functional responsibility of the prior Mining and Minerals Branch and adding two additional staff with geology expertise from other offices. No additional funding was made available at that time for geologic work. However, in FY 2000 the Natural Resources Challenge provided \$695,000 in new funding for geologic resource management programs, which supports six new geoscience specialists in the division in the areas of cave and karst resource management, coastal geology, disturbed land restoration, geologic hazards management, and paleontology, complementing the expertise of existing division staff. Also that year, the Division assumed responsibility for developing the National Cave and Karst Research Institute. The fledgling Institute received its initial funding in FY 2001 through a separate Congressional authorization.

The creation of the Division and NPS advances in resource management as a result of the Natural Resource Challenge have led to an increase in geoscience expertise in the Service. In 1995, NPS estimated there were less than 70 geologists in the Service. The 2004 estimate is now over 100 geologists, with almost 60 working in park-based positions. At least 10 of

these new geology positions are a direct result of Challenge funding with the remaining positions created from the restructuring of non-geology positions. These specialists provide unique expertise to manage geology projects and to partner with non-NPS geoscience organizations. This additional expertise has facilitated the NPS understanding of its geologic resources and natural system interdependencies, resulting in improved park management decisions and the provision of better information to the public, as outlined below.

The geoscience community is deeply aware of and committed to advancing sound management and understanding of the geologic resources of the National Park System. Because NPS geology staffing remains limited, most of the geologic research, education and interpretation and many resource management projects are done through or funded by external partners. Utilizing the external geoscience interest in parks, NPS geologists have developed cooperative ventures with other organizations to significantly increase the geologic capabilities within the Service and created an awareness of NPS issues in the broader geoscience community. For example, partner funding has resulted in placing about 450 Geoscientists-in-the-Parks student volunteers and experienced professionals in parks in recent years. It appears that this external support is limited only by the Service's ability to provide coordinating staff and matching funds to meet the community's offers.

The Division's functions and FY 2004 accomplishments are summarized below under five broad program areas: Geologic Processes and Features, Disturbed Lands Restoration, Geologic Resource Evaluation, Minerals Management, and the National Cave and Karst Research Institute. It is important to note that the Division accomplishes many of its projects by utilizing and leveraging funds from other NPS sources and partner organizations. The discussion below includes these linkages.

In FY 2004 the Geologic Resources Division funding, including the Challenge addition was:	
Funding available in FY 2003	\$2,695,000
Pay increase	+16,000
	\$2,711,000
Net across- the- board reductions	- 26,000
IT reduction	- 4,000
General reduction	- 5,000
IT assessment	- 15,000
Reduction total	- 50,000
Total available in FY 2004	\$2,661,000

The Division existing base funding limitations were compounded in FY 2004 by the across-the-board reductions noted above. This resulted in the Division relying on over \$79,000 in travel funding from other sources, including other NPS offices and other Federal agencies to provide critical geologic resources management technical assistance and support services to parks. Of particular concern was the need for parks to fund \$12,000 for Division staff participation in field projects, causing a financial burden for those parks needing geologic resources management services. The Division also cut back on program travel in FY 2004, for example reducing planned Geologic Resources Evaluation travel by over \$16,000. Finally, numerous park requests for technical assistance were not undertaken due to travel constraints.



Cabrillo National Monument, California

Caves and Karst



Staff from Wupatki National Monument and the Flagstaff Group discuss the restoration of the entrances of three earth crack features. These earth cracks near the Lomaki ruin were covered in the past to protect livestock from possibly falling in. NPS staff is interested in restoring the entrances to a more natural state.

The NPS manages over 3900 significant caves as defined by the Federal Cave Resources Protection Act. In 2004, the Division's cave and karst resource management staff supported park cave stewardship efforts across the NPS and assisted with the developing National Cave and Karst Research Institute. Technical support highlights include development of alternatives to restore the entrances to several earth cracks at Wupatki NM, evaluation of conservation efforts in the Ice Cave at Sunset Crater NM, developing a cooperative agreement for survey and inventory of John Brown's Cave at Harpers Ferry NHS, guidance and review of cave management planning documents at Russell Cave NM, participation in cave management scoping sessions for Wind Cave NP, Jewel Cave NM, and Carlsbad Caverns NP, support on off-trail guided visitor tours at Oregon Caves NM, assistance on cave and karst vital signs monitoring protocols for the Klamath, Cumberland Piedmont, and Mojave Networks, lead NPS review of video script on park caves with the Discovery Channel and the National Parks Foundation, and work with the BLM and USFS to establish a cave and karst internship program. Division staff also serve as the NPS goal contact for GPRA Goal 1a9B - Cave Floors regarding the restoration of disturbed areas in NPS visited caves. The goal target established in the NPS Strategic Plan was to restore 129,306 square feet of cave floor by September 30, 2004. The NPS exceeded the target in FY 2004 with parks reporting a cumulative total of 172,820 square feet of restored cave floor.

Coastal Geology

The coastal geology staff provides technical oversight and support to the almost 100 NPS units with coastal and lakeshore geology concerns. In 2004, staff worked closely with NPS Inventory and Monitoring Networks to define coastal resource monitoring plans and inventory needs. The shoreline change monitoring efforts with NASA and USGS partners along Northeastern coastal parks continues to provide monitoring tools and templates for other areas, particularly parks along the Gulf of Mexico and Atlantic coasts. Staff assisted the Pacific coast monitoring networks with marine monitoring protocols and assisted parks with obtaining remotely sensed data, particularly LIDAR and CODAR. Collaboration with a variety of partners continues to develop new protocols for coastal geologic mapping to integrate submerged marine resources with adjacent lands at Dry Tortugas National Park and Virgin Islands parks (see Geologic Resources Evaluation section). The "Vulnerability of Coastal Resources to Climate Change" project with the USGS, undertaken with NRPP and Recreational Fee Demonstration funds, resulted in the publication of assessments of vulnerability to sea-level rise at 6 parks.

Division staff assisted Cape Hatteras National Seashore following Hurricane Isabel (September 2003), working with the U.S. Army Corps of Engineers on compliance and decision documentation and participating on a multi-disciplinary team from the park, region, and Solicitor's Office to proactively address anticipated beach nourishment proposals. The team developed guidance for managers and the public that describes the natural barrier island processes, why the NPS discourages interference with these processes, and the procedure that park managers will use when considering requests for beach nourishment. Other specific accomplishments include debut of a web-based education center, publication of peer-reviewed research articles, supervision of coastal Geoscientist-in-the-Parks projects and research conducted by graduate and undergraduate students, and a field review of the NRPP-funded boat wake study at Boston Harbor Islands National Recreation Area. At the close of an exciting year, Hurricane Ivan made landfall on the Florida units of Gulf Islands National Seashores in September, forcefully demonstrating how coastal shoreline processes can affect people's daily lives and leaving permanent reminders that barrier islands are extremely dynamic, transient features. Division staff coordinated with other agencies and university scientists to provide coastal process expertise to park managers. Post-hurricane response decision-making was greatly aided by the existence of baseline geologic information and remote sensing data.

Education and Outreach

FY 2004 saw continued development of the Division's active geology education and outreach effort, initiated in 1996 to increase public awareness of the unique geologic resources in national parks and to engage the professional geology community and earth science educators in using parks for teaching and research. A centerpiece of this effort is the NPS Geology website, with content ranging from park geology tours for visitors to scientific knowledge centers. Also posted are the Division's Cave Management and Paleontology newsletters. The site is constantly upgraded, has very high visitation, and receives frequent inquiries and rave reviews from the external community. Cooperative education initiated in 2004 utilizing Recreational Fee Demonstration funds includes a University of Colorado geology department project to create computerized, three dimensional animations of geologic events that created the landforms of Colorado NM, Grand Canyon NP, Canyonlands NP, and Carlsbad Caverns NP, for use in visitor center films kiosks, websites, and CDs sent to schools. Another project with Oregon State University will provide geology interpretive training to new park seasonal employees at Yosemite, Crater Lake, Craters of the Moon, Canyonlands, and several other parks. Division managed fee demo funds also supported 10 NPS interpreters participation in on-line college level training in Geology of National Parks (GEO 307) through Oregon State University. Staff also assisted Yosemite NP efforts to design new visitor center exhibits by recruiting a volunteer panel of geology experts to work with the park on key geologic stories being presented to visitors.



Jenny Cook, a GIP at Grand Canyon National Park sponsored by GeoCorps America, helped visitors understand the geology of the canyon and the fossils. She had children act as crinoids to help others understand these creatures. Jenny provided guided walks and campfire programs.

The Division reviewed and provided letters of support to several grant proposals to improve the general public access to research experiences and discoveries including an on-line college course on Geology of the National Parks, developing a hands-on traveling kit on geology of national parks for use by inner-city and suburban multigenerational groups, and helping earth science teachers utilize national parks as inspiration for their students to understand the concepts and processes of geology. Finally, staff continued efforts to facilitate cooperative geoscience research by working with the scientific community to meet parks' research needs. Staff provided parks with experts to identify key research needs that would facilitate understanding and management of the park resources, helped park staff examine research proposals, and linked parks with specialists qualified to do peer reviews.

Geoscientists-in-the-Parks

In FY 2004, the Division's Geoscientists-in-the-Parks (GIP) Program placed 45 geoscientists in 29 parks, using \$50,000 in NRPP funds with more than 4:1 private partner matching funds. These specialists helped small to large parks across the United States, from George Washington Memorial Parkway to Grand Canyon National Park. The physical scientists ranged from undergraduate students to seasoned professionals who served as volunteers and partner-sponsored specialists to address NPS geoscience needs in interpretation, resource management, research, and public safety. They worked in many geoscience areas including paleontological preparation, geologic history, coastal erosion, watersheds mapping, cave inventories and monitoring, guided visitor tours, and explaining the national EarthScope project. Partners included the Geological Society of America, the Association for Women Geoscientists, the American Geological Institute, museums, universities, and park associations.

Geohazards

In 2004, staff assisted parks in evaluating and mitigating geohazards by providing technical expertise to assess uncertainty and develop appropriate actions to reduce the risk to visitors and staff from potential hazards in parks, e.g., rock fall, land slides, geothermal vents, lava flows, flash floods, and mud flows. Highlights for the year included investigation of rock fall concerns at Jewel Cave NM, evaluation of an historic tunnel preservation project at Cowpens NB, assessment of geohazard potential associated with the drilling additional water intake tunnels in Lake Powell for continued operation of the Navajo Generating Plant, and field assessment of the deadly flood and debris flow in Furnace Creek Wash at Death Valley NP. The Jewel Cave evaluation of rock fall potential in the immediate area of the cave elevator doors will get further assistance from a partnership with the Colorado School of Mines (CSM) Senior Engineering Design Class to research and prepare comprehensive design specifications. The Cowpen's project to preserve the Kosciuszko Tunnel, constructed in the 1780's to breach the fort wall at this American Revolutionary War fort held by the British forces, requires a delicate balance of historic preservation with the high priority for visitor safety.



In mid-August, 2004, as much as 4 inches of rain fell in just 6 hours over the Funeral and Green Mountains in Death Valley NP. Extensive flooding washed out roads and mobilized sediment in alluvial fans over a widespread area. Two people lost their lives when their vehicle was entrained in flows within Furnace Creek Wash. NRPC staff from Water Resources and Geologic Resources Divisions assisted the park by identifying field evidence used to determine the magnitude and frequency of this event, as well as flood behavior during various stages.

Paleontology

Diverse fossil resources are known to exist in 173 NPS parks and include plants ranging from microscopic algae and pollen to fossil leaves and petrified logs, and animals ranging from marine shells to dinosaurs to Ice Age mammals, as well as trace fossils such as tracks, burrows, and coprolites. Many of these resources are of international significance and are critical to understanding the history of life on Earth. In 2004, staff provided technical support and oversight in response to park requests. Technical assistance highlights in 2004 include supporting paleontological resource surveys at Colorado NM and Zion NP, publishing a technical report on a fossil resources survey in Santa Monica Mountains NRA, coordinating a project to evaluate methods for stabilizing fossil logs and stumps at Florissant Fossil Beds NM, identifying fossil quarry research needs and resource protection issues at Agate Fossil Beds NM, and technical support during an excavation to recover newly discovered fossilized bones of the small horse, *Mesohippus*, at Wind Cave NM. The Wind Cave project included on-the-ground oversight during the removal of a large fossil-bearing block, assistance in preparing the partnership agreement for

preparation of the excavated fossils by staff at the Mammoth Site in Hot Springs, South Dakota, and the recruitment of qualified volunteers from the Denver Museum to assist in the fossil preparation efforts. Division staff serves as Servicewide goal contact for GPRA NPS Goal 1a9A - Paleontological Localities. The NPS Strategic Plan target was to have 25% (1,287) of 5,149 known paleontological localities in parks in good condition by September 30, 2004. In FY 2004, parks reported 1,202 (23%) of the 5,149 baseline localities in good condition. This minor shortfall in Servicewide performance was due primarily to the NPS imposing stricter documentation requirements in FY 2004 to achieve Servicewide consistency in reporting annual performance. Also note that parks reported an additional 148 newly discovered and documented fossil localities (not included in the baseline) in good condition in FY 2004. In addition, staff updated the Technical Guidance and established revised targets for NPS Goal 1a9 in the NPS FY 2005-2008 Strategic Plan and prepared Servicewide quarterly accomplishment reports on DOI Resource Stewardship "Natural Heritage Asset" paleontological localities.



NPS Paleontologist working at a new discovery site in Wind Cave National Park, South Dakota

Paleontologist at the Mammoth Site laboratory in Hot Springs, South Dakota, extracts vertebrate fossils from a large block recovered in Wind Cave NP



Disturbed Land Restoration

The Natural Resource Challenge provided program funding in FY 2000 to hire two new geomorphology specialists who, with the disturbed lands program coordinator and mine safety and reclamation specialists, greatly enhance the capabilities of the Division to assist parks with disturbed lands and surficial geologic issues. The Challenge also established the Disturbed Lands Restoration fund (\$850,000) which is managed by Division staff. Overall, the Division provides three primary functions related to restoration and geomorphological issues: park project funding, technical assistance, and Servicewide coordination.

Restoration project NRPP funds are allocated to parks based on competitive proposals. Division staff prepare technical guidance, review park work plans for technical adequacy, and provide oversight on accounting and accomplishments reporting. In 2004, disturbed land restoration program staff oversaw \$824,000 in NRPP restoration project funding for 13 projects in 12 parks, representing six NPS regions. These projects restored nearly 300 acres of severely disturbed land. Examples include restoration of degraded grasslands at Big Bend NP, reclamation of the Turbid Lake Road through prime grizzly bear habitat in Yellowstone NP, restoration of the Old Pinnacles Road in Pinnacles NM, and restoration of 105 acres of disturbed wetlands at Manassas NBP in cooperation with the Smithsonian.

Division restoration and reclamation specialists responded to over 33 technical assistance requests in 2004 involving disturbed lands, abandoned mine safety, geomorphological issues, and geologic hazards. Staff provide key technical assistance to park restoration efforts through site assessments, safety hazards analysis and mitigation design, geomorphic analyses and landform restoration designs, materials/equipment cost estimates, and project oversight assistance. Many of these projects will lead to park proposals for project funding to implement the recommended actions. Examples of technical support in 2004 include recommendations for land restoration at Canyon de Chelly NM, investigation for contaminants at the Old Yuma Mine in Saguaro NP, a plan to evaluate geomorphic and hydrological changes along the East Alsek River and lagoon at Glacier Bay NP, planning for restoration of former inholdings at Chesapeake and Ohio Canal NHP, mitigation of landslides along George Washington Memorial PKWY, and restoration planning for the removal of stock ponds on the North Rim Road at Black Canyon of the Gunnison NP.

Division staff continued to serve as the Servicewide goal contact for GPRA NPS Goal Ia1A – Disturbed Lands Restoration. The NPS Strategic Plan goal target was to restore 18,000 acres in parks by September 30, 2004. The NPS exceeded the goal target in FY 2004 with parks reporting a



Obliteration and restoration of one of the access roads at an abandoned ski area in Lassen Volcano NP, California. Complete restoration facilitates the reestablishment of native hydrologic patterns, native vegetation, and removes the physical scar. After equipment work, the access road is prepared for hand seeding.

cumulative total of 20,125 acres restored. For the current NPS Strategic Plan, Division staff coordinated updates and review of the Technical Guidance, revising goal targets, and establishing new goal attributes. In addition, Division staff contributed significantly in the development of new GPRA goals regarding watershed health as part of the Department of the Interior's new Strategic Plan.

Geologic Resources and Water Resources Divisions staff also coordinated the NPS Cooperative Conservation Initiative (CCI) solicitation and worked closely with Department officials on the project approval and follow-up process for 106 park submitted projects totaling \$7.871 million in Federal funds in FY 2004. CCI projects must have at least one partner to provide the required 1:1 or greater non-Federal match. FY 2004 contributions by the 311 partners exceeded \$10 million. In addition, staff worked directly with Bat Conservation International, the State of California, and other nonfederal and international partners to prepare and undertake an FY 2004 CCI project to protect critical bat habitat in abandoned mines and caves at the Death Valley NP, Joshua Tree NP, Whiskeytown-Shasta-Trinity NRA, Lake Mead NRA, Coronado NMem, and Organ Pipe Cactus NM. Finally, as requested by Department officials, staff solicited FY 2005 CCI proposals from which 118 projects for \$8 million were selected and submitted to the Department. Proposed contributions from 339 partners were almost \$11 million. However, Congress did not provide funds to the NPS for the CCI program in FY 2005.

Geologic Resource Evaluation Program

This effort, managed by the Geologic Resources Division, is funded by the Natural Resource Challenge under the Inventory and Monitoring program. The Geologic Resource Evaluation Program (GRE) helps park managers integrate the use of geologic resource information in resource management decisions. Division activities directly contribute to the achievement of NPS GPRA goal Ibi related to natural resource inventories.

The GRE program provides parks with four main products: an onsite scoping meeting with park staff and geologic experts to evaluate and discuss the park's geologic resources, resource management issues, and any existing geologic map coverage; a comprehensive digital geologic map; a bibliography of geologic literature and maps; and a comprehensive geologic report.

The Division made significant progress in FY 2004 on the individual components of the program including the distribution of the first complete evaluation suite of products to four parks, and completion of bibliographies for all natural area parks. In addition to traditional bedrock and surficial geologic mapping, in FY 2004 GRE funds were used to support unique mapping programs of submarine geologic resources as well as continued support for coastal landform mapping in shoreline parks. At the close of FY 2004, scoping meetings to evaluate park geologic resources and issues had been held at 124 parks in 29 states, 4 territories, and the District of Columbia.

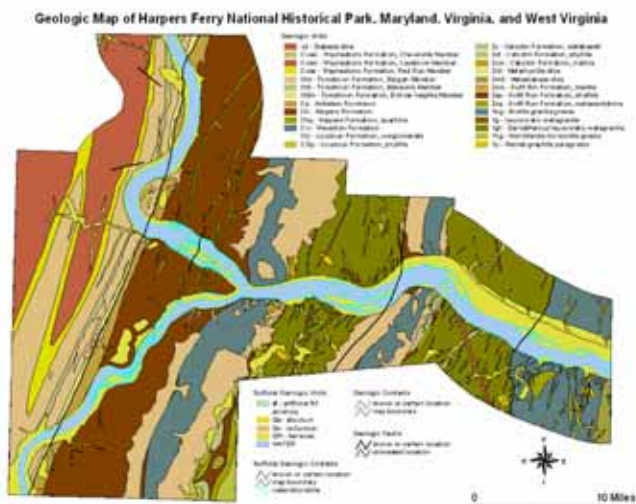
Producing a completed digitized map for a typical park entails converting map data from multiple hardcopy maps, a time intensive and involved process. To enhance the user-friendliness of the digitized maps, Division staff developed extensive pull down help files to incorporate in the maps. Of



the 272 parks characterized as “natural area parks” by the Servicewide Inventory and Monitoring Program, Division staff and partners have completed digital geologic maps for 52 parks. Maps for an additional 21 parks are in various stages of conversion to a digital format. The GRE Program partners with the USGS, state geologic surveys, and numerous academic institutions to complete the mapping effort. Since the advent of the program, new mapping projects with these partners have been initiated in over 40 parks. Staff works with the USGS staff to develop project proposals for work in parks, and assists the USGS National Cooperative Geologic Mapping Program (NCGMP) to evaluate proposed geologic mapping efforts. About 10% of NCGMP's project funding in 2004 supported geologic mapping projects in parks.

The geologic reports developed by Division staff provide park managers with information about the park's geology to enhance their stewardship of these resources, and help address current and anticipated resource management issues. For example, knowledge of a park's geology can help predict the location of endangered plant species and help avoid locating park infrastructure in geohazard areas. The reports also help park staff understand and use the digitized geology maps.

Examples of activities in 2004 that advanced GPRA Goal Ibi include: a new large-scale digital geologic map for Virgin Islands National Park based on a published USGS Professional Paper to aid the park in its resource management decisions, a digital geologic map to assist park staff in better managing cultural resources at Lyndon B. Johnson NHP and to assess areas with the potential for paleo-Indian artifacts, and Jewel Cave staff is already using the digital map to predict the potential for more undiscovered cave passages from surface geologic expressions.



Minerals Management

A long-standing responsibility of the Division is to provide park managers, including the Director's Office, with minerals management expertise. Through a cadre of staff with expertise in mining and oil and gas development technology, regulations, policy, impact mitigation, geology, reclamation, and mining claim validity examinations, the Division helps park managers effectively protect park resources and values from the adverse effects of past, current and future mining inside and adjacent to units of the National Park System. Division assistance in the minerals management arena substantively contributes to the accomplishment of NPS Mission Goal Ia related to the protection of natural and cultural resources in parks.

Currently, twenty-five NPS units contain nearly 750 active private mineral exploration or development operations, most involving the production of oil and gas. Private entities that hold property rights to oil and gas, and other minerals located inside parks must submit development plans and performance bonds, and obtain NPS approval before initiating mineral related activities. In FY 2004, the Division assisted park resource managers by reviewing 18 new oil and gas proposals covering 53 operations in 11 parks to ensure that they are technologically feasible, use the least damaging methods, and are in conformance with NPS nonfederal oil

and gas regulations. Division staff also worked partner organizations to oversee the plugging of abandoned wells in parks.

Division staff continued to represent the Service on the Department's Mineral Examiner Certification Panel. This BLM led panel develops nationwide guidance on implementing the Mining Law of 1872 and determines qualification of individual federal employees to undertake validity examinations. A validity examination is a process by which the federal government determines if holders of mining claims possess bona fide property rights. While all units of the National Park System are closed to the location of new mining claims under this statute, 1592 mining claims exist in 18 parks. These claims predate the creation of the park units. The majority of the claims are located in Death Valley National Park (CA/NV), Mojave National Preserve (CA), and Wrangell-St. Elias National Park and Preserve (AK).

On lands adjacent to parks, the NPS works with other federal and state permitting agencies, along with mining project proponents, to have park protection measures incorporated in mineral leasing or other energy development decisions. In FY 2004, Division staff assisted park and regional offices as well as other federal and state agencies on a variety of

Mike Hoyal, surveys the location of an oil well at Big South Fork National River and Recreation Area, Tennessee.



projects, such as TVA's draft EIS for the Koopers Coal Reserve adjacent to Big South Fork National River and Recreation Area; BLM's oil and gas leasing near Bryce Canyon NP, Dinosaur NM, and Zion NP; coal bed methane development near Devils Tower NM and Mesa Verde NP; the Cabrillo Port Liquefied Natural Gas Terminal near Channel Islands NP; and BLM's programmatic Wind EIS for the western U.S.

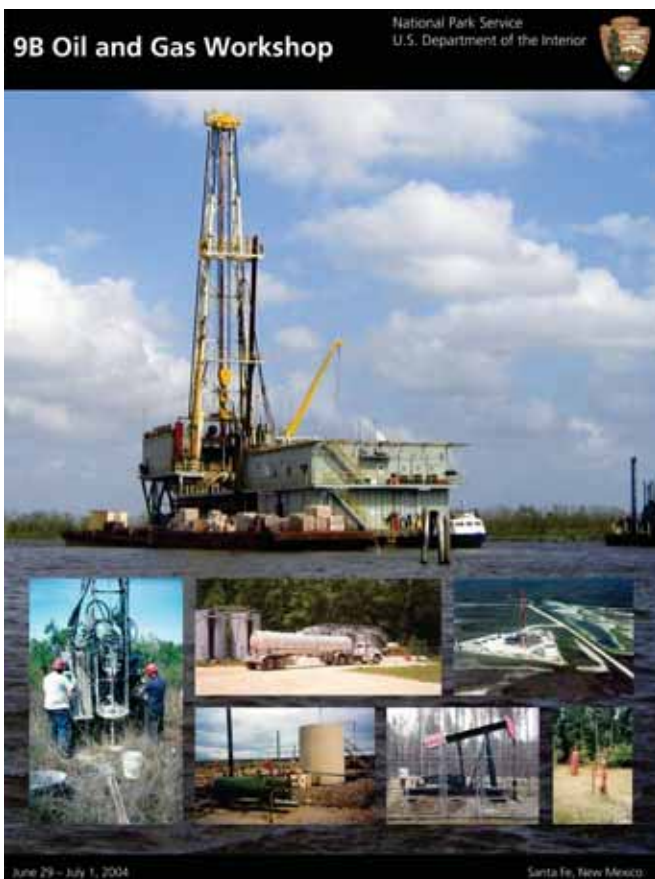
In an effort to work more efficiently and cooperatively with other federal land management and permitting agencies, the Division represents the NPS on the Federal Energy Resources Network (FERN). Initiated in 2001, the FERN workgroup is comprised of representatives from the NPS, Bureau of Land Management, U. S. Forest Service, U.S. Army Corps of Engineers, Minerals Management Service, U.S. Fish and Wildlife Service, Environmental Protection Agency, and the Department of Energy. The goal of this group is to improve communication and efficiencies among federal agencies that have a role in planning, permitting, regulating and oversight of energy development in the United States.

Abandoned mining, and oil and gas exploration and production sites represent a substantial portion of the

disturbed lands requiring restoration in parks. The NPS currently has as estimated 3,200 abandoned mineral sites with over 10,000 hazardous openings, at least thirty miles of streams with degraded water quality, and more than 33,000 acres of disturbed land. In FY 2004 the Division continued to assist parks address this outstanding reclamation need and augmented its efforts through partnerships.

Examples of the Division's efforts that advance NPS Mission Goal Ia include:

- Assistance was provided to staff at Obed Wild and Scenic River to have an exhausted oil well successfully plugged. The well was located in the trailhead parking lot for a scenic overlook. Division assistance to the park included directing the operator through the permit process, impact and mitigation analysis for environmental compliance, and on-the-ground oversight of plugging operations to assure compliance with NPS standards.
- At Jean Lafitte national Historic Park and Preserve in Louisiana, the Division provided technical and regulatory assistance to the help ensure minimal impacts to park resources from an oil and gas exploration well. The Division's participation in technical and regulatory talks among multiple permitting agencies and the operator contributed to the operator moving the well's surface location outside the park.
- At Manzanar National Historic Site in California, Division staff worked with the park superintendent and local government officials to convey park protection concerns regarding a proposal to extract state-owned sand and gravel immediately adjacent to the park's boundary. The proposed mine would have marred the solemn nature of the historic site which commemorates the World War II internment of Japanese-Americans. As a result of the collaborative efforts the proposal was withdrawn.
- Division held a nonfederal oil and gas workshop for park resource managers to enhance implementation of the Service's regulations and various environmental compliance responsibilities. In attendance were representatives from 11 park units, 3 NPS regions, 4 divisions of the NPS Natural Resource Program Center, and the DOI Solicitor's Office.
- The Division staff assisted in revising the Handbook for Mineral Examiners, and preparing for an adjudicatory hearing on the validity of a claim group at Mojave National Preserve.



National Cave and Karst Research Institute



Carlsbad Caverns National Park, New Mexico

A 1998 Act of Congress directed the NPS to establish the National Cave and Karst Research Institute (NCKRI) in the vicinity of Carlsbad, New Mexico. Provisions in the Act included joint administration by the NPS and an administrative partner, and that the expenditure of federal funds be matched by an equal amount of non-Federal funds. The NPS assigned the Geologic Resources Division the lead responsibility for establishing NCKRI in 2000. Congress provided an initial NPS operating appropriation in FY 2001, which led to the Division's hiring of a permanent director duty-stationed in Carlsbad, NM. In FY 2003, Congress appropriated Federal construction funds totaling almost \$2 million for a NCKRI building. The State of New Mexico provided the matching non-Federal operating funds in 2001 and building funds in 2003. The unique legislation mandating NCKRI as presented unusual challenges for the NPS and potential partner organizations in our efforts to structure and formally establish the Institute as a fully operating entity.

In FY 2004, NPS funding for NCKRI was:	
Funding available in FY 2003	\$342,000
Net across- the- board reductions	- 3,000
General reduction	- 1,000
Reduction total	- 50,000
Total available in FY 2004	\$338,000

In 2004 the NPS worked to move NCKRI towards a "jointly administered" management structure and to foster stronger ties with partner organizations, currently the City of Carlsbad and New Mexico Institute of Mining and Technology (NMT). The NPS also worked closely with the City on the design of the headquarters building to be located in Carlsbad and owned by the City. Constraints on NPS travel expenditures and severe constraints on international travel in FY 2004 posed significant challenges for NCKRI in meeting its legislatively mandated national and international mission. These spending and travel limitations hampered efforts to provide services outside the New Mexico region and in some cases inhibited NCKRI's ability to accept non-federal matching support, which is required by the enabling legislation.

FY 2004 NCKRI accomplishments included:

- Completing a Cooperative Agreement to transfer \$1.9569 million of Federal funds to the City of Carlsbad for the construction of the NCKRI headquarters building;
- Holding a two-day scoping meeting with partners to discuss the Institute's operational and administrative vision included representatives from the NPS, other federal agencies, academic institutes, state programs, and non-profit organizations;
- Initiating a free lecture series in Carlsbad, New Mexico. The four, well-received public talks have averaged about 60 attendees;
- Undertaking a program review of the NCKRI program via an outside expert;
- Co-sponsoring with NMT a well-attended theme session at the Geological Society of America National Meeting entitled, *From Subterranean Crawlways to Scientific Hallways: Research on Our Public Cave and Karst Lands*.

National Park Service
U.S. Department of the Interior



NPS Geologic Resources Division
P.O. Box 25287
Denver, CO 80225

<http://www.nature.nps.gov/geology>
(303) 969-2090