



Geologic Resources Division

2001 Annual Report





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Geologic Resources Division
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Cover: Canyonlands National Park, photo by John Burghardt

Opposite: Glacier National Park, photo by Deanna Greco.



Bifrost room, Carlsbad Caverns National Park, photo by Ronal C. Kerbo.

CONTENTS ♦

Comments from the Division Chief.....	1
The Division refines its GPRA connections.....	2

Challenge

Shifting sands: The challenges of managing NPS coastal resources.....	5
<i>SEGSA marine and coastal science and sediments session.....</i>	5
Cave and karst coordination.....	6
The challenge to protect paleontological resources in the Park Service.....	8
The Geologic Resources Inventory.....	9
Geology outreach - Earth Science Week 2001	11

Science Based Management/Professionalization

Days in the life of a mineral examiner in Denali National Park and Preserve.....	13
<i>Gravel planning progress pays off in Alaska and Pacific West Parks.....</i>	14
Rock mechanics assessment: Geohazards & risk.....	15
Contaminants Technical Advisory Group assists parks on oil and gas site cleanups.....	16
Survey of NPS paleontology needs and paleontology resource inventory initiative.....	17
Reflecting on the GIP program's successes and needs: A one year summary	18
Natural resources law & policy course for superintendents.....	19
Fair market value for mineral rights: The action behind the scenes.....	19
Inventory and monitoring of geothermal resources becomes a hot issue.....	20

Resource Protection

2001 Minerals management program highlights.....	23
Shi Shi beach: A case study underscoring the importance of verifying mineral ownership.....	26
<i>Special thanks to the Solicitor's Office.....</i>	27
Enforcement action in the oil patch: Case study of Premium at Big Thicket.....	28
<i>Fossils in the NPS: The big picture.....</i>	29
Dredging and disposal in park waters - A policy issue that surfaced in 2001.....	30
The new energy boom - How do we protect NPS resources and values?.....	31
New Grand Staircase-Escalante National Monument takes gravel-planning lessons from the Division.....	32
<i>Oil and gas management planning update.....</i>	33

Restoration

Disturbed lands restoration & abandoned mineral lands reclamation programs.....	35
<i>Division spearheads NRPC restoration group.....</i>	37
First steps towards dam removal, Lassen Volcanic National Park.....	38
Geomorphology and human activities.....	39
Flood damage assessment at New River Gorge National River	40

Collaboration

- 2001 Geologic Society of America annual convention.....43
 - GSA field trip at Cape Cod National Seashore.....43*
 - GeoScientists-in-the-Parks sponsored positions in 2001.....44*
- National Cave and Karst Research Institute-progress and activities45
 - The NPS partnership with the Association of American State Geologists.....46*
- Speleological volunteers aid the NPS.....47
- National Park Service/United States Geological Survey partnership advances park resource management.....48

Park Assistance

- Division park assistance listing.....51
 - Alaska Region.....51*
 - Intermountain Region.....51*
 - Midwest Region.....53*
 - National Capitol Region.....54*
 - Northeast Region.....54*
 - Pacific West Region.....54*
 - Southeast Region.....56*
 - Servicewide.....56*
- Geologic Resources Division staff profiles.....59
- Organization and addresses.....63

Comments from the Division Chief

by: David B. Shaver

It is indeed a pleasure to introduce the 2001 Geologic Resources Division Annual Report. As you look through the report and read the particular items, I think you'll agree that



2001 was a good year for the Division. The year saw significant growth and development in the Division's "new" program areas, such as coastal resources, paleontology, and disturbed lands restoration. This progress was a direct result of new staff capabilities added in late FY2000 due to a Natural Resource

Challenge funding increase. The year 2001 also saw continued strong accomplishments in the Division's efforts to assist park managers in dealing effectively with mineral development in and near park boundaries. With much gratitude, I note that none of the program accomplishments could have been achieved without dedicated staff in the parks, regions, and support offices and the robust support from attorneys with the DOI Solicitor's Office. This is true in all areas, whether establishing new Servicewide programs or implementing NPS minerals management and restoration efforts in parks. Our programs only succeed and bring value to the NPS through the committed staff in these other organizational areas -- our thanks to all of you!

In an effort to facilitate the reader's understanding and to link the Division's program areas to broader NPS themes, we have organized this report under the following five general themes:

- ▶ The Natural Resources Challenge
- ▶ Science Based Management and Professional Support
- ▶ Resource Protection
- ▶ Restoration of Disturbed Lands
- ▶ Collaboration with Partners

The final section of the report, Park Assistance, contains a listing that summarizes most of the particular park resource management assistance that Division staff was involved in during the year.

The Natural Resources Challenge Section includes articles addressing the Division's new program areas funding by the FY2000 base funding increase. These are program areas that the Division was given nominal responsibility for at the time of our formation in 1995, but did not have the funding and staff expertise necessary to implement until the Challenge increase was provided. Specifically, this includes our cave and karst, coastal, and paleontology resource management

agendas, as well as geologic inventories and education-related efforts. The Challenge increase also provided funding for two additional disturbed lands restoration specialists/geomorphologists in the Division, and a significant increase in funding for park projects through the Natural Resources Preservation Program account. The on-the-ground project accomplishments of this program were noteworthy and are described in the Restoration Section of this report.

The Science Based Management Section includes articles about selected cases where the Division's professional staff provided technical geoscience and policy or regulatory assistance to NPS field staff in carrying out complex park projects. These cases are broad-ranging from hands-on fieldwork (such as rock mechanics and placement of geologists in parks) to involvement in park planning to very specialized expertise areas (such as mining claim validity and mineral appraisal) to law and policy training for superintendents.

The Resource Protection Section includes overview articles about the Division's long established minerals management program and also a selection of rather broad ranging park case studies. Many more of the park specific case studies could have been presented. However, in the interest of brevity, most park assistance efforts of the Division are summarized in the last section of the report entitled, Park Assistance.

The Restoration Section begins with an overview of the Division's disturbed lands restoration and abandoned mineral land reclamation program followed by some selected case examples. Again, most park specific projects are noted in the Park Assistance Section. As noted above, this is a program area that experienced significant growth beginning with FY2000 Natural Resource Challenge-related funding and staffing increases, both within the Division and other divisions within the Natural Resources Program Center (NRPC). The Division's role in coordinating this integrated NRPC program is noted in a sidebar in the Restoration section.

The Collaboration Section presents articles on selected topics chosen from the Division's broad ranging work to develop partnerships with external agencies and organizations. All of these partnership efforts are aimed at providing parks with access to and field assistance from geoscience specialists in academia, other governmental agencies, and the private sector. We are continually amazed at the interest of these external groups and the enthusiasm and commitment they display toward work in and with parks. While it requires a significant amount of staff time, this program area also brings very positive feedback to Division staff.

It is indeed a joy to work with people, within the Service and outside our organization, who are committed to and derive great personal satisfaction from working with resource preservation in parks. We hope you enjoy this report and find it of value. Please let me know if you have comments or suggestions for improvement. ◆

The Division refines its GPRA connections

by: Bob Higgins, Chief, Science and Technical Services Branch, and Carol McCoy, Chief, Policy and Regulations Branch

Mention GPRA - the Government Performance Results Act of 1993 - and one usually prompts groans from fellow workers and an irrepressible wave of fatigue. While very bureaucratic sounding, the act has a simple message to agencies--be results oriented. It directs agencies to think about how they are allocating resources (people and dollars) and focus those resources on yielding results that achieve their agencies' mission. In the mid-1990s, the NPS dove headfirst into implementing the act. Each subsequent year the Service has produced an annual report of its accomplishments and has systematically refined its goals and measures of success.

In 2001, the Division continued its role as the Service's national goal coordinator for 4 Servicewide GPRA goals related to geology as described below, and came up with recommendations for improving the breadth and utility of the goals for the future. The existing Servicewide GPRA goals are part of the NPS performance management package. Individually, the goals help structure the division's work and provide for accountability. Collectively, these goals and others like them, provide the means for measuring the Service's progress towards achieving natural resource management objectives and accomplishing its overall mission. The revisions that the Division is recommending for the existing goals are designed to make the goals more relevant to a broader array of parks and hopefully yield more meaningful information for use by scientists and park resource managers.

Disturbed lands restoration (Ia1A)

The Servicewide GPRA plan set a goal of restoring approximately 2% of the disturbed lands in parks during 2001. That year the NPS restored 12,165 acres, which exceeded expectations by 1.4%. Over 195 parks contain lands that have been disturbed by abandoned roads, dams, canals, railroads, campgrounds, mines, agricultural uses and other abandoned sites. In 1998 the parks identified 241,000 acres of damaged NPS-managed lands. Restoration of these lands is necessary to maintain healthy functioning ecosystems. Since 1998, the NPS has developed a multifaceted strategy to implement this goal through expanded cooperation with other organizations both for the purpose of augmenting limited federal funds and the sharing of expertise. At present no changes are planned for this goal beyond ever increasing refinements to baseline information and improving how parks report information to this goal.

Paleontological site surveys (Ia9A)

To date, 150 parks have known paleontological resources within their borders yet incomplete records as to fossil localities (i.e., the primary context in which fossils are found). The Servicewide goal for fossils called for 5% of

known paleontological localities in parks being in good condition in 2001. The key means for documenting and measuring success under this goal is through surveys. In 2001, 31 parks reported on the paleontology goal. While far fewer parks reported than anticipated, those that did report identified a cumulative total of 2,963 fossil sites and considered 684 of these sites (23%) to be in good condition. Paleontological resources are important and unique resources that document the history of life. They are subject to damage from natural processes, theft, or disturbance, all of which reduce their scientific and educational value. Accurate documentation and assessment of condition is key for enabling parks to evaluate damage or disturbance to a site and its fossils and to mitigate the problem. In the future, the Division is recommending that this goal be folded into a broader framed goal focused on an array of geologic features, including fossils. The Division also plans stepped-up efforts to encourage parks to report to this goal.

Cave floor restoration, (Ia9B)

Because it is an easy to measure parameter, the Servicewide GPRA goal for caves tracks cave floor restoration as an indicator of improvements in resource conditions in those caves where guided tours are given to the public on NPS lands. Unfortunately, this goal leaves resource management activities at most parks with caves outside its scope because only 15 caves in 13 parks are open to the public. The NPS has 3900 known caves in 81 parks. In 2001, with only 8 of



Cleaning flowstone

the 13 parks reporting, the NPS exceeded this narrowly framed goal by restoring a total of 66,820 square feet of cave floors. These parks exceeded the goal by 3110 square feet. The Division is recommending that this goal undergo major revision when it is incorporated into the expanded goal on geologic features mentioned above. At that

time, the focus will change from restoration of cave floors in specific parks to protection of cave features in all caves administered by the NPS. Cave features include speleothems, stalactites, stalagmites, towers, veils, curtains, and boxing. The changes will allow a much broader and comprehensive treatment of cave management.

Geologic processes (Ib4)

This goal calls for parks to inventory their geologic processes and document the human influences that affect those processes. This is a very important goal. It underscores the essential role that geology plays in the long-term health of park ecosystems and the need to integrate geologic information into park decision making. By identifying human impacts to geologic processes, the Service can then begin to learn how to protect, mitigate, and restore such processes and the other resources, like vegetation and wildlife that are

dependent on them. The goal of this phase is to scope the issues and generate written reports at 54 (20% sample) of the 270 parks that are characterized as natural resource parks. As an interim step, 12 parks were to have fulfilled the goal's requirements in 2001. Unfortunately, only 5 scoping meetings were held at the following parks: Fire Island National Seashore, Rocky Mountain National Park, Olympic National Park, Sleeping Bear Dunes National Seashore, and Ozark National Scenic Riverways. While limited in number, these scoping meetings yield very telling results. They identified significant human impacts on geologic processes in the 5 parks, a need for long-term geologic monitoring, and information gaps that could be addressed by research.

In FY-2003 the goal will be revised to reflect hydrologic as well as geologic processes. At that time, the Water Resources Division will be a full partner in implementing the goal. Lessons learned from this goal will be applied in developing

a new goal for FY 2006. We hope to address the need to mitigate impacts to geologic processes in the revised goal.

Planned changes in the goals

As noted above, changes are being planned to enhance the breadth and usefulness of the goals. To track the geology discipline in general, the goals will be consolidated into two goals: one for geologic features and one for geologic processes. The current geologic processes (Ib4) goal will continue through the next strategic planning cycle, while a new process mitigation goal will eventually take its place. A new geologic features goal that incorporates the existing goals for caves and paleontological resources is being developed and will begin implementation in FY-2003. At this time, no decision was made regarding changes to the disturbed lands goal. It will continue "as is." ◆



Sleeping Bear Dunes scoping meeting to identify geologic processes and assess human influences.

Challenge



Glacier Bay National Park, Alaska

Shifting sands: The challenges of managing NPS coastal resources

by: Rebecca Beavers, Coastal Geologist, and Julia Brunner, Policy and Regulatory Specialist

Citizen demands regarding the coastlines of the United States are both extensive and contradictory. Americans want miles of undeveloped shoreline for walking, bird watching, and spiritual renewal, in addition to wide beaches to protect coastal homes and cities from hurricanes and the rising sea. These goals require naturally functioning ecosystems, including the natural movement of sand. Yet, citizens also want the benefits of engineered coastlines, such as reliable navigation channels, submerged fiber-optic cables, and oceanside roads. As the manager of more than 7,300 miles of shoreline and one of the largest federal land managers of coastal areas, the National Park Service strives to protect park resources despite these competing demands. In 2001 the newly formed coastal team within the NPS Geologic Resources Division addressed these issues, providing individual parks and centralized offices with scientific information, technical expertise, and policy analysis.

Many of these modern-day challenges beset Cape Hatteras National Seashore, North Carolina. In 2001 the national seashore continued to steadfastly oppose a 30-year-old U.S. Army Corps of Engineers plan to build mile-long jetties on either side of Oregon Inlet, a major navigation channel within the seashore. Intended to enhance the local commercial fishery by restricting sand flows into the inlet, the jetties, at an estimated total project life (50 years) cost of \$645 million, would harm wildlife such as piping plovers and sea turtles, diminish public recreation, and cause massive erosion at the seashore. Along with the U.S. Fish and Wildlife Service, fishery experts, geologists, and economists, the NPS opposes this proposal, because of environmental issues, the high cost (\$30 M) per existing fishing vessel at Oregon Inlet, and the likelihood that the jetties would not function as intended

In 2001 the Corps of Engineers released the final supplement to the environmental impact statement on this project. With the assistance of the Division and the NPS Southeast Region, the national seashore persistently and persuasively voiced its concerns throughout the year to the Council on Environmental Quality, the General Accounting Office, the Corps of Engineers, and the Department of the Interior. The fate of the project is unresolved, but the seashore's unflagging resistance may play a crucial role in the final decision.

In the past year, Division staff also researched the NPS's ability to protect coastal resources from the negative impacts of laying fiber-optic cable across park coral reefs. Digging of trenches and drilling of tubes for the cables increases siltation, which deprives living coral of light and oxygen. Improperly secured cables can also damage coral. Despite these problems, telecommunication companies are laying thousands of miles of cable around the world and have applied to coastal parks for right-of-way permits. In the

course of assisting War in the Pacific National Historical Park in addressing such an inquiry, the Division found that the NPS's statutory, regulatory, and policy mandates give the bureau the undisputed authority to protect park coral reefs from such activities.

In addition to policy assistance, Division staff assisted the Southeast Regional Office with their hiring of a Coastal Geologist by advertising the position at a regional geology meeting and interviewing applicants. The regional office selected Dr. Linda York, a coastal geologist with beach survey experience and extensive knowledge of coastal stratigraphy. Dr. York began work in the Atlanta office in August 2001 and has been an effective link in the chain of coastal management contacts for the National Park Service. Division staff also gave presentations for Sea Grant Coastal Hazards Specialists at the Coastal Zone meeting in Cleveland, Ohio in July and convened a session on Coastal Geology of the National Parks at the Geological Society of America Meeting in November.

From urban coastal parks such as Golden Gate National Recreation Area to rural units like San Juan Island National Historic Park, coastal areas face an increasing array of challenges. By applying a higher level of technical and policy expertise to coastal issues in 2001, we assist the NPS to further its fundamental purpose of preserving natural resources for future generations. ◆

SEGSA marine and coastal science and sediments session

At the Southeastern Section meeting for the Geological Society of America, Dr. Rebecca Beavers co-chaired a session on Marine and Coastal Science and Sediments with Dr. Tom Drake of North Carolina State University. The session was held on April 6, 2001 at Raleigh, North Carolina and consisted of nine presentations that included shoreface sand resources and the role of underlying geology on shoreline processes. Rebecca presented the talk "Beach Nourishment of National Park Lands- Defining Our Policy" where she contrasted the planned mitigation nourishment at Assateague Island National Seashore with beach nourishment of adjacent areas and previous dredge disposal operations at Cape Hatteras National Seashore.

Cave and karst coordination

by: Ronal Kerbo, Cave Specialist

During 2001 the Division's Cave and Karst Coordinator continued to support the efforts of cave conservation, management, protection and science throughout the Service. NPS cave specialists were active in a variety of projects and fields of endeavor. An important component of the year's activities was providing support to Zelda Bailey, interim Director of the National Cave and Karst Research Institute (NCKRI). In concert with the NCKRI, we began a series of projects that include a booklet entitled "Guidelines for Cave and Karst Management for America's Protected Lands" with the Karst Waters Institute. Authors will be members of the Karst Waters Institute and staff from the National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, and U.S. Forest Service. The Karst Waters Institute will edit and publish the booklet. The program also contributed to a U.S. Geological Survey Circular on the subject of cave and karst research and management in Federal agencies. The circular is being produced collaboratively by the Institute and the U.S. Geological Survey Ground-Water Resources Program and publication is anticipated in 2002. After meetings in Kentucky, a cave and karst management educational project with the American Cave Conservation Association is also in the planning stages. With the assistance and support of the Division, some highlights of the year and contributions of Service cave specialists are noted below in their own words.

Carlsbad Caverns National Park

After several years of study regarding the possibility of contamination of Carlsbad Caverns from surface effluent Paul Burger, Park Hydrologist, reported on a dye trace at Carlsbad Caverns. A 1996 report found that there was heavy metal



Stan Allison of Carlsbad Caverns National Park prepares to rappel into a newly discovered cave in Glacier Bay National Park.

contamination in some of the pools in Carlsbad and attributed it to runoff from parking lots. Much like people's driveways, fluids such as oil, antifreeze, and brake fluid leak from the thousands of cars that are parked above the cave each year.

During a rainstorm, these fluids are carried off of the parking lots and into the drainage above the cave. Eventually, this water works its way through the rock and into the cave in the form of drips and pools. On May 10, 2001, Carlsbad Caverns Cave Resources Office personnel released 25,000 gallons of bright green water into Bat Cave Draw, the small valley near the entrance to Carlsbad Cavern. This water is being used to simulate a half-inch rainstorm on the parking area that was built near the cave entrance in the 1930s. Occurrences of the dye in the cavern will help managers make science-based decisions on placements of surface infrastructure and perhaps the removal of specific structures such as parking lots.



Waylon Cox, Stan Allison and Tilo Garcia mix freshwater with fluorescein dye that was then allowed to flow into Bat Cave Draw.

Chattahoochee River National Recreation Area

A very important contribution of documenting the occurrences of caves and karst throughout the National Park Service is being made by David Ek, Chief of Resources Management at Chattahoochee River National Recreation Area. David reported that of the 384 units of the National Park Service as of March 2001, that 81 contain caves and an additional 39 contain karst and associated features. So, a total of 120 parks contain caves and/or karst. This makes caves and karst one of the more dominant ecosystems/habitats/resource types in the entire National Park System. Also, current inventories indicate that the National Park Service manages 3,926 significant caves, as defined by the Federal Cave Resources Protection Act.

Glacier Bay National Park

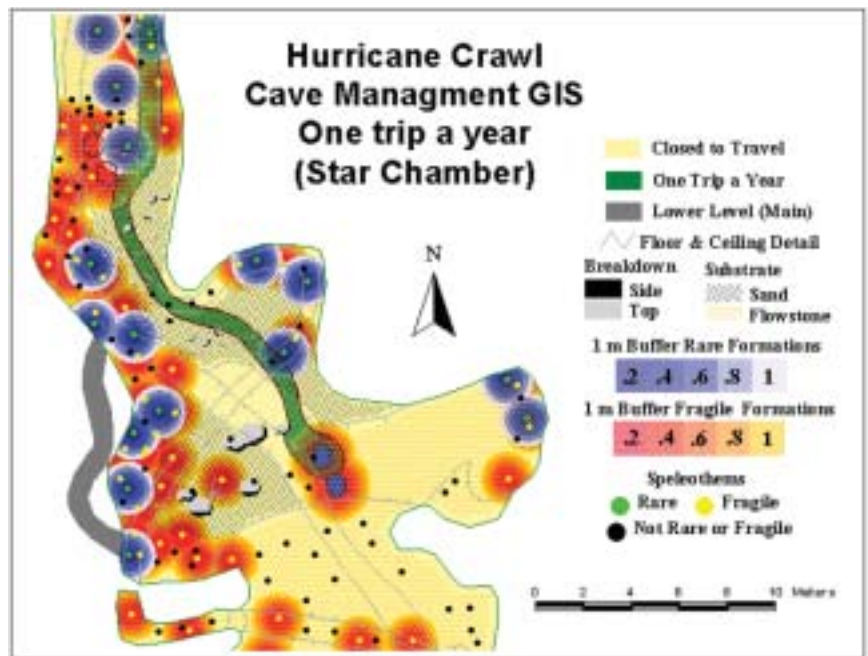
Stan Allison from Carlsbad Caverns provides a report on a project at Glacier Bay National Park. During the summer of 2000, Glacier Bay National Park Archeologist, Wayne Howell, Kim Ney and Nate Borson discovered a previously undocumented karst area. In a remote wilderness area of the park they found limestone pits, some actively taking water. Wayne recognized the significance of this discovery and contacted Ron Kerbo, National Cave and Karst Specialist, to request technical assistance in inventorying this karst resource. Ron contacted Stan Allison, Cave Technician at Carlsbad Caverns National Park and Kevin Allred an accomplished Alaskan cave explorer and cartographer.

During the course of an eight-day trip, 21 caves were explored, surveyed and photo-documented. Entrance locations were recorded using differentially-corrected GPS. The total surveyed length for the 21 caves is 2,011 feet. Almost all of the caves were vertical pits as shown by the 1,379 feet of total vertical survey. The deepest cave discovered was a single pit 245 feet deep. The longest cave was discovered on the last day and was surveyed for 281 feet. This trip documented a previously unknown karst area and revealed the potential for other caves and karst areas in Glacier Bay. Much work remains in this significant alpine karst area.

Sequoia & Kings Canyon National Parks

Joel Despain of Sequoia & Kings Canyon National Parks provided an update of an ongoing program supported by the Division to use Geographic Information Systems to review Cave Management Plans. GIS analysis and mapping is often used to look at karst systems as they relate to surface features. Employing a novel approach, Sequoia and Kings Canyon National Parks are using GIS to analyze the potential effectiveness of the Management Plan for Hurricane Crawl Cave. This cave has many delicate and unusual speleothems,

endemic animals and paleontological resources and is managed using narrowly defined trails and "closed" areas. This analysis will be used to revise the plan in the near future to insure that all key and fragile resources in the cave are protected by the cave's management plan. ◆



A map integrated in the Sequoia-Kings Canyon National Parks' GIS data base of the upper-level Star Chamber area of Hurricane Crawl Cave showing a segment of one-trip-per-year trail. Notice how the trail generally avoids rare and fragile features, such as filamental helictites, parachute shields, and folia.

The challenge to protect paleontological resources in the Park Service

by: H. Gregory McDonald, Paleontology Program Coordinator

Money, staff and time are all limitations that every NPS unit faces with regard to achieving the highest goals of preserving their resource for future generations and allowing for its enjoyment by the current generation. Recognizing these challenges, the Geologic Resources Division created a position and hired a Paleontology Program Coordinator in FY 2001 to work with parks to enhance their opportunities to care for their fossil resources. The goals of the program are broad and holistic and cover a variety of projects including basic inventory and documentation of the park's fossil resources, monitoring, scientific study, law enforcement, interpretation and education, and long-term care in park collections. Paleontology is rather unique among the geological disciplines in that it is the one program that often results in additions to park collections. As such it crosses disciplines and requires coordinating efforts with the NPS Museum Management Program to ensure that fossils placed in park collections or outside repositories receive appropriate preparation and curation. The ultimate goal of the program is to help all parks with fossil resources develop the capability to care for these resources at all levels.

Activities of the Division's paleontology program not only operate at the park level but also work to develop effective strategies at the Servicewide level. The goal is to enhance the capability of parks to care for their fossil resources. As a new program it was critical to assess park needs. In 2001, a survey was sent to 278 natural resource parks. There were 131 responses to the survey. The primary need identified by the majority of parks was for each park to establish a baseline of the types of fossils present and the geologic formations in which they are found through a survey. Other needs identified include the stabilization of fossils left in the ground, support for the collection and storage of fossils, and aid in developing interpretive tools and the facilitation of paleontological research in parks. The ongoing refinement of the strategic plan has required adjustments of GPRA goal 1a9A for paleontological resources and the eventual incorporation of this goal as part of the new broader Geological Resources goal under Features.

The Division began cooperative efforts with the GIS Division of the Intermountain Region to incorporate the standard paleontological locality into a park GIS and to develop a menu based program to record fossil localities that can be loaded into GPS units. These programs will be made available to all parks to aid resource managers to meet the 1a9A goal and to provide more standardized documentation of park fossil resources and improve management strategies at the park level.

During 2001, activities of the program included serving on the planning committee for the 6th Conference on Fossil

Resources held in Grand Junction, Colorado. This conference provided a forum for not only NPS staff, but also other land management agencies to meet with professional and amateur paleontologists to share ideas on the management of fossil resources on public lands. The Division's paleontology program also represented the NPS in a symposium on fossils on public lands and non-Federal repositories at the North American Paleontological Convention in Berkeley, California. In addition, the paleontology program served as one of the NPS members of the committee providing technical assistance on the Fossil Resource Protection Bill initiated by Congressman McGovern (D-MA).



Documenting fossils exposed on the surface at the Titanotheres Graveyard, Badlands National Park.

In 2001, the Division completed the initial stages in the development of web sites on paleontological resources in the NPS. This included not only the Division's web site, but also the first stages of developing a paleontology knowledge center in Synthesis. Both of these web sites will require original artwork and a cooperative effort with local artists to produce restorations of fossil animals and reconstructions of ancient landscapes.

As part of the Division's efforts to reach a wide audience, the paleontology program Coordinator helped with the following:

- ▶ The National Park Foundation Proud Partners Program and Time Magazine's production of an advertorial on fossils in parks.
- ▶ A video on dinosaurs in National Parks produced by Discovery Communications.
- ▶ The authoring of several articles including one on paleontology and caves for a USGS circular being prepared for the National Cave and Karst Research Institute.

In addition, since the inception of the paleontology program, we have received many requests to speak about fossils in parks. This has provided the program with the opportunity to reach a wide audience through these public lectures.

Future plans for the program include helping each park with fossil resources acquire necessary data and incorporate it into their resource management plans. An essential part of this

database is to include fossil information as a layer in the park's GIS. Equally important is to ensure that any fossils collected within the park, either as part of mitigation to the resource or as part of a research project, are properly documented, prepared and curated, either at the park or at an approved non-NPS repository. An urgent need exists to secure funding to ensure that all fossils from NPS units are properly curated for use in research, education and interpretation. The paleontology program is now planning to write a proposal for the establishment of a paleontology support center in order to assist parks with fossils but lacking a staff paleontologist. This support center will function along the same lines as the NPS archeological centers. The center would provide all types of support including survey, excavation, preparation and curation. ◆

The Geologic Resources Inventory

by: Bruce Heise and Tim Connors, Geologists

The Geologic Resource Inventory completed its fourth field season in 2001. Significant progress was made in various components of the inventory as data generated as part of the previous years' pilot studies begin to work its way back into park resource managers' hands. By the end of 2001, 237 parks had some component of the Inventory addressed.

The Geologic Resource Inventory is one of twelve data sets originally identified in the Inventory and Monitoring Program. It is cooperatively administered by the Geologic Resources Division and the Natural Resource Information Division. The Inventory is made up of four components:

- 1) A park specific bibliography of geologic literature and maps;
- 2) On-site evaluations of park geologic maps, resources, and issues;
- 3) A digital geologic map product with accompanying supporting information;
- 4) A summary report with basic information on the park's geology, geologic hazards, issues, and existing data and studies.

The intent of the Inventory is to provide each of the 272 natural resource parks with this information. Progress for each component is given below.

Geologic bibliographies

Geologic bibliographies, now titled "GRBib", were compiled and validated for an additional 167 parks in 2001, bringing the total to 235 parks. Keyword database searches are conducted on the American Geologic Institute's GEOREF, the USGS GEOINDEX, and park supplied Procite data. After compiling the bibliography, data validation issues are reviewed for duplicate citations, typographical errors, missing or inaccurate data, and the relevance to the park unit. Ultimately, GRBib will be incorporated into NatureBib (NRBIB), the online, Servicewide bibliographic database.

Scoping sessions

In 2001, Inventory scoping sessions were conducted in 22 parks, including two parks in Texas and New Mexico (Guadalupe Mountains, Carlsbad Caverns), the 12 parks in the National Capital Region, seven parks in Northern Arizona (Grand Canyon, Petrified Forest, Pipe Spring, Wupaki, Sunset Crater Volcano, Walnut Canyon, and Navajo), Delaware Water Gap in Pennsylvania and New Jersey, and the Ozark Scenic Riverways in Missouri. This brings the total parks scoped in the Inventory to 60. Scoping sessions bring together park staff and geologists from the USGS, state surveys, or academia with expertise in the region. Time is devoted to evaluating existing maps for quality and coverage,

digital map and report availability, and additional needed geologic mapping. Over 300 people, representing 5 federal agencies, 12 state geological surveys, 15 academic institutions, and 15 other entities, have participated in these meetings. While directed towards completing the inventory, the meetings serve the greater function of sharing knowledge with park staff on geology, geologic processes, and geologic resources.

Digital geologic maps

A digital geologic map is the keystone of the inventory. Of the 60 parks scoped to date, 26 have maps in paper or digital format. To date 16 park maps have been digitized and attributed and another 12 in progress (see sidebar). The basic map data may come from unpublished USGS or state maps, paper copies of published maps. More recent mapping is usually provided in digital format. In addition to standardized data definitions and structure, NPS resource managers also need user-friendly GIS applications that allow the digital geologic map products to "look and feel" like the original published paper maps. Applications (including the NPS-developed ArcView Data Browser, graphical cross section viewer and legend text display tools) are integrated with a standard geology-GIS model.

Geologic report

The first park report was completed in 2001, addressing the geology of Mesa Verde National Park. The report is intended for use as a resource management tool. Scoping has shown few, if any, parks have reports available to meet resource management needs. Preparing reports with a resource manager rather than a professional geologist or interpretive product in mind, is time consuming but is expected to yield a product that gets greater use in day-to-day park management decisions.

Planned inventory efforts for 2002

Inventory efforts in 2002 will be focused on completing ongoing mapping and digitizing. The remaining 37 park bibliographies will be compiled and validated. Geologic reports should be completed for the Colorado and Utah parks. The remaining bibliographies will be validated. Scoping will follow the I&M Monitoring Network approach, with efforts to complete scoping in the Northern Colorado Plateau and South Sierra Network parks. Most of the parks in the Northern Great Plains, North Coast and Cascades, and Rocky Mountain Networks will be completed as well. A dedicated effort to identify and locate all published maps for the 272 parks is planned, as well as an applicability review of a USGS furnished list of unpublished or partially completed geologic maps that cover park lands.

The geologic map enigma of the shoreline parks

Traditional geologic mapping addresses the bedrock and overlying unconsolidated surficial deposits. Along dynamic shorelines though, this approach provides limited information for park resource managers. To address this shortcoming in the Geologic Resources Inventory, a separate meeting will be held at Canaveral National Seashore in 2002 bringing

together park staff from the east and gulf coast shoreline parks with USGS, state, and academic experts on coastal geology. At this meeting, those physical features that can be identified and mapped will be targeted for future mapping efforts. Similar meetings for the Pacific coast shoreline parks and marine parks in the Pacific and Caribbean will be held in 2003. ◆

Geology outreach - Earth Science Week 2001

by: Jim Wood, Geologist and Melanie Ransmeier, SCEP

October 7th - 13th 2001 marked the fourth annual Earth Science Week. The National Park Service and the Division have participated in Earth Science Week since the first Earth Science Week in 1998. However, 2001 raised the bar regarding NPS participation. This year, Associate Director of Natural Resource Stewardship and Science, Mike Soukup, sent a letter to park superintendents supporting Earth Science Week and encouraging all parks to participate. The Division provided Earth Science Week information to every National Park area in an effort to broaden earth science awareness. The Division also provided over 1,000 copies of general interest earth science publications including: Sustaining our Soils and Society, Living with Karst A Fragile Foundation, and Evolution and the Fossil Record to the parks.

The Division participated in Earth Science Week by posting a web site for the event (www2.nature.nps.gov/grd/esw/). The site includes:

- ▶ Links to information about Air, Water, and Geology programs in the National Parks.
- ▶ Highlights of events planned for Earth Science Week in the National Parks.
- ▶ Online activities for teachers and students, including fun earth science puzzles for kids and an art contest.
- ▶ Interesting earth science related National Park Facts.

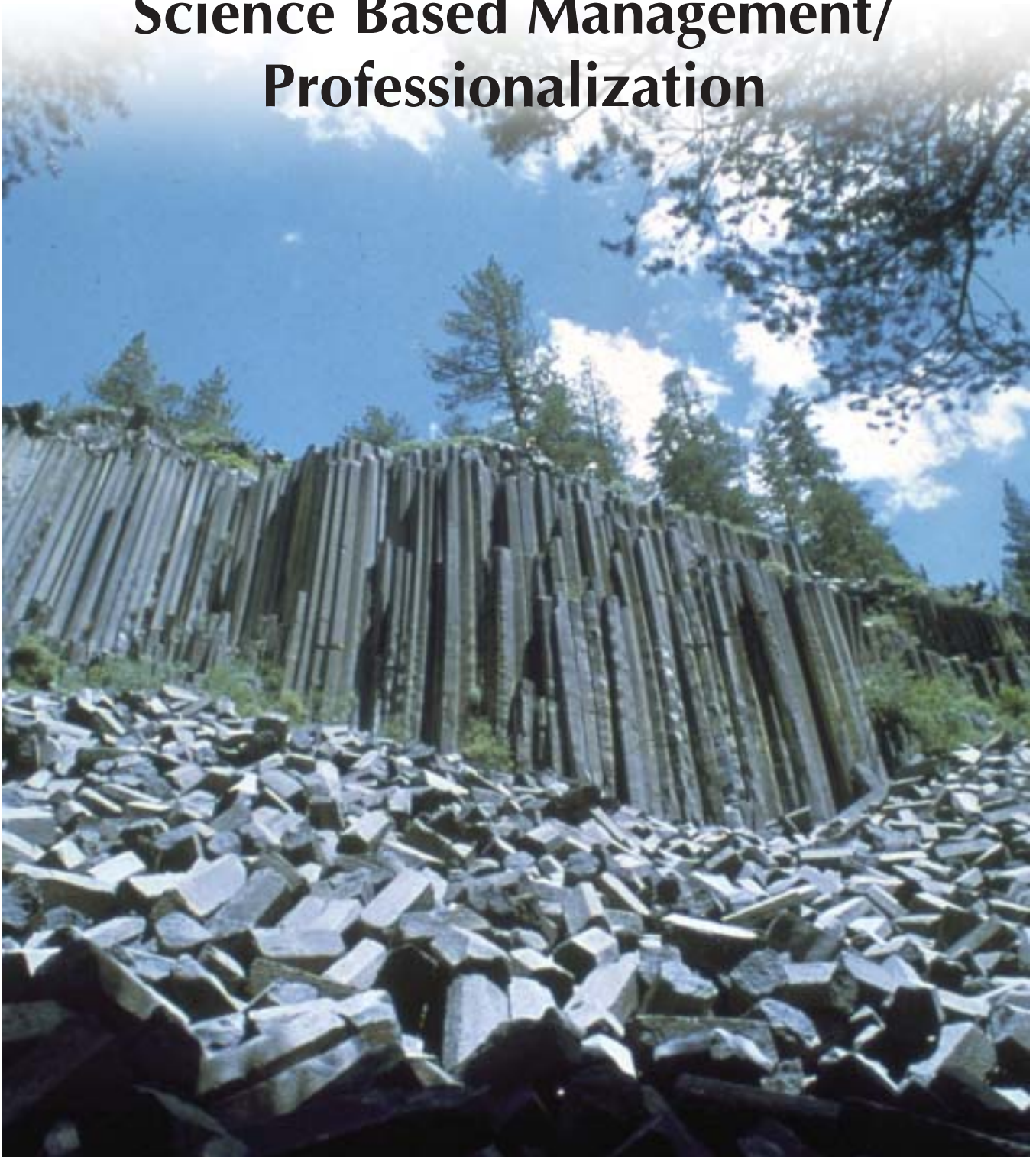
Division staff participated by giving "Adventure Geology" talks at a local REI store. Ronal C. Kerbo, cave specialist, gave a talk entitled, The Stone Wilderness: Visiting the Great Cave Areas of the World, and paleontologist Greg McDonald spoke on Learning about fossils in the National Parks.

Although some parks feature earth science education all year round, Earth Science Week provides a unique opportunity for all parks to showcase their regular science programs. During Earth Science Week, many parks choose to focus on earth systems education by guiding field trips, hosting speakers, putting together special exhibits, or coordinating activities for school groups. The National Park System offers an amazing opportunity to engage the public and raise awareness about the natural world - for information about next year's Earth Science Week, see www2.nature.nps.gov/grd/esw/. ◆



Earth Science Week in the National Parks information is posted on the Worldwide Web at [Http://www2.nature.nps.gov/grd/esw/](http://www2.nature.nps.gov/grd/esw/).

Science Based Management/ Professionalization



Devils Postpile National Monument, California

Days in the life of a mineral examiner in Denali National Park and Preserve

by: John Burghardt, Geologist and Certified Mineral Examiner

During the summer of 2001, one of the Division's mineral examiners participated on a team that mapped and devised a sampling plan for the Gold King placer mining claims, which were the subject of litigation at Denali National Park and Preserve. Additional team members included one examiner from the Bureau of Land Management (BLM), a private consultant, and several seasonal park staff.

The Gold King claim block, located for gold in 1962 and 1964, consists of 15 placer claims. These claims occupy approximately 266 acres along 3.7 miles of Glen Creek in the historic Kantishna Mining District of Denali. A placer claim can be as large as 20 acres, measuring up to 660 feet wide by 1320 feet along a stream channel, and is usually located ("staked," in common parlance) to appropriate surficial deposits of precious metals mixed in stream gravels. In contrast, a lode claim can be as large as 20.66 acres, measuring up to 600 feet wide by 1500 feet long, and is located to appropriate valuable minerals in bedrock.

There are currently 1,022 unpatented mining claims within 10 units of the National Park System. These claims were located on lands open to location prior to the lands being included in the National Park System. When new NPS units are established or when lands are added to existing NPS units, the involved lands are withdrawn from mineral entry. This means that new mining claims cannot be located on NPS lands. Pre-existing claims, such as the Gold King claims, have valid existing rights if the claimant can prove their validity. In brief, validity is the proven existence of a valuable mineral deposit from the time that the lands were withdrawn to the present, on a claim that has met all administrative requirements since the time it was located.

How, then, is this validity determined? That's where mineral examiners come in. It is their job, through the conduct of a

mineral examination, to assess mining claimants' assertions of discovery as defined under the General Mining Law of 1872 and associated case law. The NPS conducts mineral examinations whenever claimants submit plans of operations to mine. The NPS also conducts mineral exams where land title issues need resolution to protect park resources and values. The NPS has 8 mineral examiners: 3 in the Geologic Resources Division, 2 at Mojave National Preserve, and 3 in the Alaska Regional Office. Mineral examiners are usually geologists or mining engineers, often with experience in the mining industry, who are specially trained and certified by the BLM in exploration geology, mining engineering, metallurgy, mineral economics, and mining law.

A mineral examination begins when the mineral examiner contacts the claimant to review all the information the claimant can provide concerning the claims. The examiner then reviews the administrative record to determine whether the claims were properly located and maintained in accordance with federal and local laws. Next, the examiner conducts a field exam, in which he or she maps the claims, selects appropriate sample sites, and collects samples. Sampling placer claims such as those in the Gold King claim block can be a costly venture, involving a large tracked

excavator with a 20-foot reach, a bulldozer, and a 30 cubic-yard-per-hour wash plant that separates gold from the stream gravels. The samples are analyzed, and the resulting data and all other information gleaned are synthesized in a mineral report. The mineral report either confirms or challenges the claimant's assertion of discovery.



Equipped in a full bug suit, the mineral examiner contemplates bedtime at 11pm on a beautiful July evening in Denali, Mounts McKinley and Foraker in the background.

A claimant on NPS lands may be allowed to mine valid claims subject to regulations found in the Code of Federal Regulations, Title 36, Part 9, Subpart A. However, where the impacts of such an operation on valid claims are incompatible with park resource protection, the federal government seeks to acquire the claims. Where claims are found to be invalid (in short, administratively deficient or not economically viable), as documented in a mineral report, the NPS asks the BLM to initiate a complaint to nullify the claims. If the claimant does not answer this complaint within 30 days the claims are permanently extinguished. When the claimant

disagrees with the government's finding of invalidity, a contest is brought before the Office of Hearings and Appeals (OHA), in which the mineral examiner serves as the government's expert witness. A decision from OHA can be appealed to the Interior Board of Land Appeals and beyond, even as far as the U.S. Supreme Court. By acquiring valid claims that conflict with park management objectives and requesting contest of invalid claims, the NPS fulfills its statutory mandate under the Organic Act to manage parks in a manner that leaves them "unimpaired for the enjoyment of future generations." (16 U.S.C. §1)

The foundation for the entire validity process is the field examination, which often takes place in less than desirable conditions. Mapping the Gold King claims in Denali during July 2001 involved walking over rough terrain through hordes of voracious mosquitoes, usually in a cool rain, while recording the geology and evidence of past mining. Retiring after a 10- to 12-hour field day, the group camped in the park's Glen Creek Camp. During its heyday in the late 1980s, Glen Creek Camp was comprised of numerous individual and communal tents supporting fieldwork for a court-mandated Environmental Impact Statement on the effects of mining on park resources. In the 1990s the camp served as a base for mineral exams, surveys, and reclamation projects. Today the camp is reduced to several isolated tents that see only occasional use. In 2001, one of the tents served as the office/kitchen where the team members reconstituted freeze-dried concoctions into something vaguely resembling and tasting like food. It was this setting in which coffee was sloshed on field notes and maps amidst discussions of what was seen that day and what would be accomplished the next. Team members eventually retired to their individual tents, attempting to sleep under Alaska's glaring midnight summer sun, awaking to sunrise at 4am, then rolling over in a vain attempt to fall back to sleep. One found that the best time to use the out-house was 4am, when lines were short and cool air temperatures suppressed the mosquitoes. The team arose at 7am to fix a nominal breakfast, left camp at 8am, and the routine repeated itself until the job was completed some 2 weeks later.

This routine seriously challenges the old adage that a bad day in the field is better than a good day in the office, but such is the life of a mineral examiner in Denali National Park. ◆

Gravel planning progress pays off in Alaska and Pacific West Parks

Two Pacific west park units are digging in to resolve the gritty issues associated with in-park gravel extraction for road construction and maintenance. For decades Denali National Park and Olympic National Park have been grappling with the conflicting need for maintenance or construction materials and the mandate to protect park resources. Both parks initiated gravel extraction planning efforts in 2001. These park-wide gravel plans will:

- ▶ calculate park-wide gravel needs;
- ▶ identify gravel sources in and out of the park;
- ▶ evaluate the impacts/conflicts associated with in-park extraction vs. importation;
- ▶ plan an importation/extraction / restoration scenario that best protects park resources while providing needed road and trail materials; and,
- ▶ integrate environmental compliance into the overall and site-specific project design.

Once complete, these plans will enable park maintenance staff to provide safe roads and trails with a minimum of resource conflicts for 10-20 years.



In-stream mining of sand and gravel along the Toklat River in Denali NP.

Geohazards and risk: Rock mechanics assessments

by: Philip Cloues, Mining Engineer

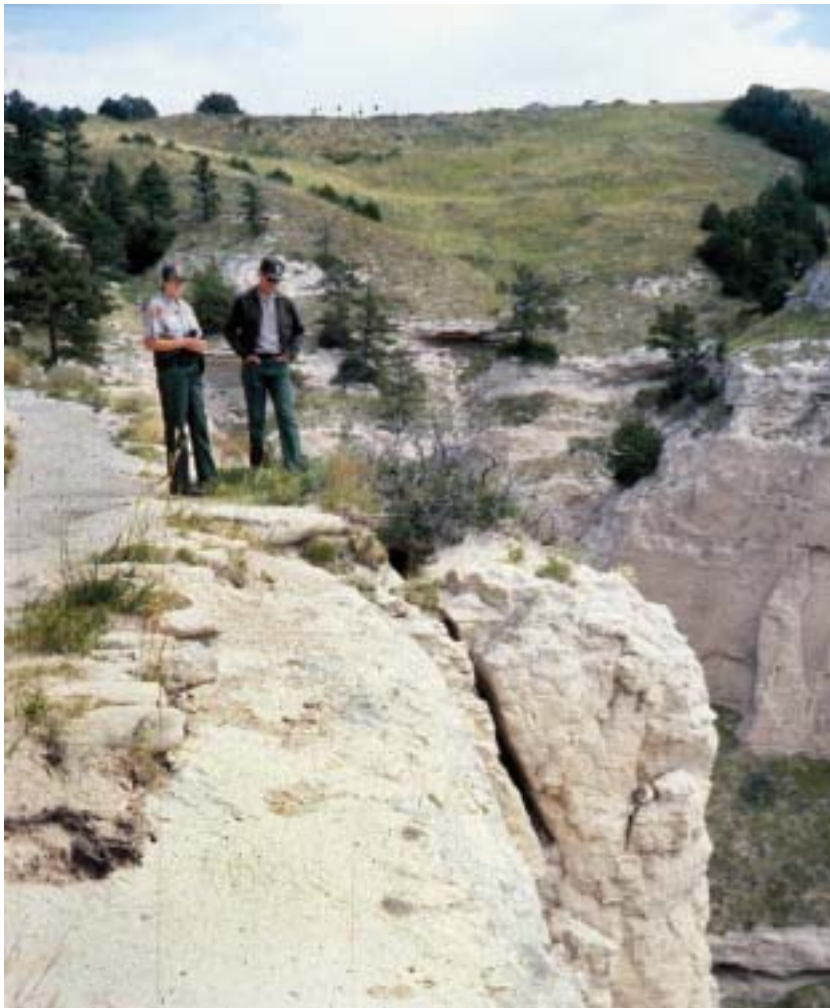
When a rock breaks loose, tumbles down a mountain slope or hillside, and comes to rest on a trail, a road, a building, or a person we ask ourselves the routine set of questions.

Why did it happen?

Will it happen again?

Could it have been prevented?

Occasionally, some alert person notices cracks or small rocks on a trail that indicate that a larger rockfall may be about to



Trailside cracks at Scotts Bluff National Monument, Nebraska provide evidence of ongoing natural bluff retreat and potential rockfall areas.

happen. If someone or something of value is in its path, then we call the problem rock a geohazard. Rockfalls are Mother Nature's way of using gravity to move rock features at high elevation to sea level. Gravity is assisted by water, freeze and thaw cycles, wind, rodents, roots, thermal changes, blasting, or seismic vibration from traffic or earthquakes. Rocks can

become unstable if the slope is altered by construction for road or trail development, power line supports, canals, ditches, or building sites. Three key elements to rock stability are geology, geology, and geology. Rock type, fracture patterns, bedding planes, joints, inclination, geometry, specific gravity, strength, and many other factors can contribute to rock failure.

When a potential rockfall threatens lives or physical assets, we have a problem. When these things are not threatened, we have erosion. Because of the random frequency of rockfalls, there is an element of risk or chance involved in the assessment of hazard analysis. Geologic processes of erosion may appear infrequent within our busy hectic schedules bounded by hours, days, and weeks. But geologic time is measured in millions of years and rockfalls that take place within a few years or decades are in fact a present day happening. Remember that gravity is always at work and its finished product is sand.

There are three possible solutions to geohazards involving rockfalls. Remove the hazard, remove the target, or engineer an artificial support for the problem rock. There is a fourth alternative, no action, but this essentially relegates the target to an unknowing game of Russian Roulette. While appearing simple in concept, the access, size of potential rockfall, location, risk of triggering the fall by tampering with the problem, cost, surrounding geology, and other factors may complicate the remediation. Good planning should take into consideration the potential for rockfalls and avoid building facilities or structures within their path. Trails and roads should be constructed outside the fall zone if possible. Engineering solutions (e.g., rock bolts, cable anchors, concrete support, rerouting water runoff, energy absorbing cable nets, etc.) must be carefully analyzed, designed, constructed, monitored, and maintained to be effective.

Education is also a good tool to alert visitors and staff to the potential of rock falls. One can learn to spot hazard areas and avoid remaining at rest within the area (i.e., WATCH FOR FALLING ROCKS). People can become the early warning system to report rocks on the trail or road. An inspection can then determine if the small rocks are precursors to a larger event and a remedial action can be planned and implemented. Monitoring and good

systematic record keeping can provide helpful information to long-term problems that appear to be random incidents but are in fact frequent and regular geologic incidents within the processes of erosion. Preventive maintenance and education can reduce the serious incidents, save lives, reduce injuries, and reduce costs. With geohazards, an ounce of prevention

can go a long way toward managing the problem rather than managing the destruction and clean-up action.

Parks can develop, through their loss management team, a contingency plan to respond to geohazard incidents. Education, monitoring, planning, and maintenance are tools to help manage a disaster before it happens. And, if an incident takes place, the preparedness should reduce the stress and facilitate the handling of the problem by better coordination of maintenance staff and equipment, rescue team, and local medical facilities. Planning prior to an incident in a period of calm makes handling an incident in the wake of stress and injuries a more manageable task and allows for a more professional response.

Rock mechanic engineering assessments of geohazards in 2001 took place at Harpers Ferry National Historic Park, Scotts Bluff National Monument, and Carlsbad Caverns National Park. Rock falls varied from a few tons to approximately 450 tons and potential rock fall included fractured rocks above roads, railroads, grass malls, surface trails, and underground trails. Rock types included sedimentary shale, mudstone, and limestone, as well as metamorphic schist and phyllite.

The Geologic Resources Division has expertise and contacts that can help in identifying potential problems and assisting with remedial recommendations and follow-up actions. In addition, *Management Policies 2001 (4.8.1.3 Geologic Hazards)* contains helpful information in dealing with such problems while considering the protection of natural processes. Each geologic hazard can be unique in its complexity but the policies will assist in a thorough analysis that should optimize the solution in a balanced manner. ◆

Contaminants Technical Advisory Group assists parks on oil and gas site cleanups

by: Jim C. Woods, Chief, Mineral Operations Branch

In 2001, the NPS Contaminants Technical Advisory Group (CTAG) continued to assist park managers on spill remediation issues at oil and gas production sites. Technical support largely included critiquing soil and groundwater contamination assessment plans, data analysis, evaluation of proposed remediation action plans, and regulatory enforcement advice.

During the year, CTAG technical specialists weighed-in on contaminant releases from two oil and gas well sites at Padre Island National Seashore and four well sites at Big Thicket National Preserve. Contaminating substances spilled at the producing wells in Padre Island included hydrocarbons and produced water high in chloride concentration. Localized soil and shallow groundwater contamination at the well sites in Big Thicket was discovered by the operator during decommissioning and reclamation of the sites. Substances of concern at these sites included heavy metals and chlorides. Technical advice provided by CTAG resulted in improved spill site characterization and environmental risk assessment, setting of appropriate cleanup goals based on pathways and receptors, proper reclamation of damaged park resources, and oil and gas operator compliance with applicable laws and regulations.

Oil and gas development often involves the use and generation of substances harmful to the natural environment (e.g., diesel fuel, drilling mud additives, produced brine, heavy metals, crude oil, naturally occurring radioactive material, solvents, surfactants, lubrication oils, tank bottom solid waste, etc.). Release of such substances into the environment during the conduct of drilling and production operations can result from equipment failure, improper maintenance of equipment, human error, poor storage and handling procedures, inadequate secondary containment design, and vandalism. Contaminant releases, if not properly contained and immediately cleaned up, threaten numerous resources, including surface and groundwater quality, wildlife, air quality, soils, vegetation, human health and safety, and cultural resources. Oil and gas operators are responsible for contaminating substance release prevention, containment, removal and site restoration.

Park managers in 12 units of the National Park System are faced with this potential on a daily basis. When a contaminant release occurs at an oil and gas operation, park managers often seek assistance and advice on resources at risk and the proper course of action in terms of regulatory compliance, sampling and analytical protocols to document the type and extent of contamination, spill containment and cleanup methods, and restoration goals. In the past, park managers would seek such assistance by placing several telephone calls to various NPS offices, including the Air Resources Division, Biological Resources Management Division, Environmental

Quality Division, Geologic Resources Division, Water Resources Division, and Regional hazardous waste management coordinators. This process was inefficient and at times resulted in conflicting advice.

In an effort to improve coordinated interdisciplinary support to parks, the above divisions in the Natural Resource Program Center and the Hazardous Waste Management and Pollution Prevention Team of the Facilities Management Division (FMD) established CTAG. The group's mission is to provide technical assistance to park managers on contaminating and hazardous substance issues in park units, including spill prevention; spill site assessment; risk assessment; data interpretation; remediation strategies and goals; interagency coordination; policy development and implementation; regulatory compliance; and enforcement remedies to ensure protection of park resources and values, and human health and safety. A primary goal of the group is to provide park managers with "one stop shopping" in terms of professional advice on contaminant issues.

Emergency technical assistance can be obtained from CTAG by contacting one of the following representatives: Tamara Blett (Air Resources Division), Greg Eckert (Biological Resources Management Division), Tamara Whittington (Environmental Quality Division), Carl Wang (Facilities Management Division), Jim Woods (Geologic Resources Division), and Roy Irwin (Water Resources Division). Park managers can compete for funding or request technical support on contaminant-related issues by submitting project proposals in response to the annual Servicewide Comprehensive Call and Natural Resources Technical Assistance call issued by the Associate Director, Natural Resources Stewardship and Science, WASO. ◆



CTAG and USGS contaminants specialists evaluate soil and shallow groundwater near an oil and gas well at Padre Island NS.

Survey of NPS paleontology needs and paleontology resource inventory initiative

by: Greg McDonald, Paleontology Program Coordinator

During 2001, a survey was sent to the 276 natural resource parks to identify the needs of individual parks and to help determine Servicewide initiatives for fossil resource management. The response to the survey was positive with 141 parks responding.

The survey was designed to identify priority needs of parks with respect to the management of paleontological resources. It covered needs in administration, resource protection, interpretation, collections, and research. The number one need identified by parks was to conduct a baseline inventory of their fossil resources. Half of the parks that responded to the survey (77) indicated they required technical assistance to document and evaluate the status of their fossil resources. Another 59 parks indicated that they would like to have a scoping meeting in order to identify their park's needs with regard to fossil resources while another 59 indicated they needed to initiate inventory and monitoring programs. Thirty-eight parks identified the facilitation of research and 32 parks indicated that they needed assistance in improving interpretation of their fossil resources. The issue of collection and storage of fossils was identified as a pressing need for 28 parks while 20 parks identified the actual protection of fossil sites as a priority. The stabilization of fossil localities was a high priority for 13 parks. Finally, 58 parks indicated that they needed assistance in writing PMIS statements to secure funding for projects related to fossil resources.

As a result of the survey, the Division's paleontology program has helped initiate projects at a number of parks. Part of the funding for these projects has been possible through cooperation with the Geoscientists in the Parks program which has supported individual projects at Glacier, Big South Fork, Pu'uuhonua o Honaunau, Grand Teton, and Joshua Tree. Additional paleontology surveys currently underway that are being funded through fee demo money include Big Bend, Santa Monica Mountains and Arches. Many of the projects are being done in partnership with paleontologists at museums and universities. ◆

Reflecting on the GIP program's successes and needs: A one year summary

by: Judy Geniac, GIP Program Manager



As a GIP at Florissant Fossil Beds, Rebecca Lincoln gathered a great deal of information to help determine the best way to preserve the park's petrified tree stumps.

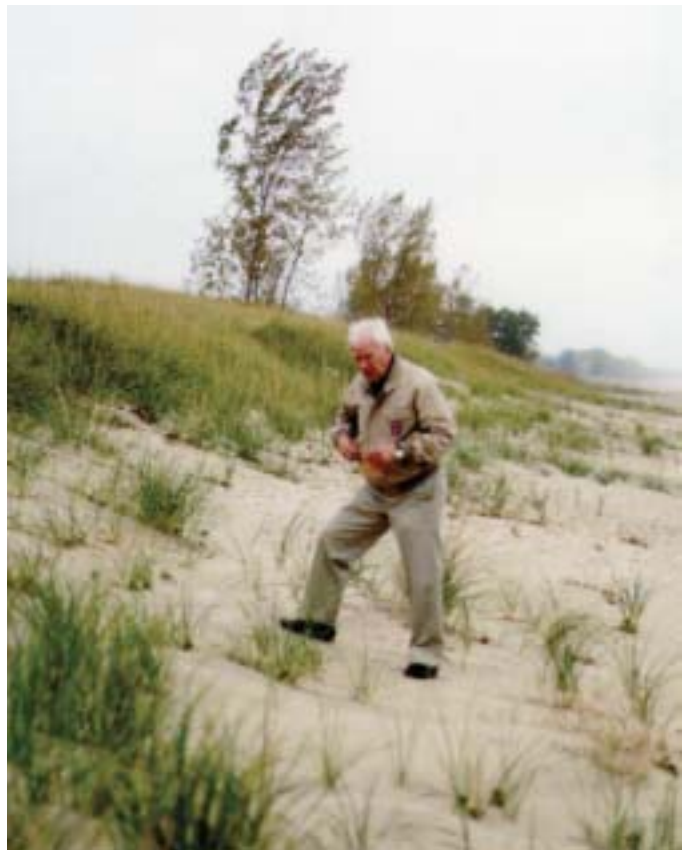
The Geologic Resources Division established the GeoScientists-in-the-Parks (originally, Geologist-in-the-Parks) Program in 1996, with the placement of 6 geologists. In 2001, the GeoScientists-in-the-Parks (GIP) Program placed 35 GIP participants in 32 parks and the program opened its doors to an even broader array of park proposals. These proposals ranged from helping provide geology expertise to providing assistance with other earth science issues, including water resources, air quality, GIS, and integrated science issues related to the inventory, monitoring, and health of ecosystems. The program continues to help parks find candidates to fill permanent and seasonal positions, but its main focus remains on filling park needs through supported volunteers and the associated partnership funding.

The number of participants in GIP does not reflect the number of other volunteers or interns gained by parks via the advertising assistance of the GIP Program. As more parks heard about the program, the number of proposals grew, as did funding needs. A mix of negative and positive events made for an interesting year. There was a drop in centralized NPS funding, a small gain in partnership funding, an increase in park proposals, and an increase in park funding. The Division had little funding to directly support GIPs and no funds to match funding offers this year. Despite this, the Geologic Society of America more than doubled the number of GIPs positions, from 10 to 25, supported via their GeoCorps America Program. The Association for Women Geoscientists continued its support of 2 GIP positions, with stated hopes of increasing the number being supported in the

future. While regional funds could not be provided this year, parks increased their backing by supplying a greater share of their very limited housing, working with universities to find local candidates, and providing funding support to the GIPs.

Park staff and managers are enthusiastically utilizing the expanding expertise the program provides. Parks continue to express gratitude for seeing the realization of products long overdue and the creation of new and innovative products for visitor use. The staffs and visitors are finding their physical natural resources and processes just as intriguing as the biotic, while finding that the two are inextricably linked and vital to sustainable ecosystems. Park staff still notes that they are hiring former GIPs into seasonal and permanent positions. The Program hopes to develop a means to track such future placements.

Working toward the future is an endless, stressful, and exciting task! The program is still growing and we hope to prevent any stunting of such growth. We laid the groundwork for a \$150,000 grant from the Newkirk Engler & May Foundation for the year 2002. While this is wonderful progress, there are enticing offers related to matching any possible future NPS funding. The funding possibilities are huge, but cannot be realized without the centralized matching. This gives the program, its participants, the parks, and the Service something to work toward. ◆



Bill Hood, a GIP at Indiana Dunes National Lakeshore, created a wonderful geology map of the park for staff training classes. It helps everyone to better understand the park's geomorphology. He also enjoyed giving interpretive programs to school groups, showing them the wonders of this geologic park.

Natural resources law & policy course for superintendents

by: Carol McCoy, Chief, Policy & Regulations Branch

Natural resources management depends not only on a solid understanding of scientific principles and the use of sound data in decision making but also a clear understanding of the Service's legal authorities. To help bolster park managers' understanding of the Service's authorities, the Albright Training Center offers a course entitled, *Natural Resources Protection Law and Policy Course for Superintendents*. Since the course's reintroduction in 1998, the Division has played a key role in helping the training center sponsor the course. The Division has done so because it views the course as an important opportunity for superintendents and aspiring superintendents to gain critical information about recent legal cases affecting natural resources management and advice on how to best assure that park decisions end up on the winning side of lawsuits.

The 24 to 32-hour course provides park managers with a fundamental understanding of their overarching legal and policy mandates to advance park protection and the ABCs of litigation. Special emphasis is placed on the statutory provisions of the NPS Organic Act, the body of case law pertaining to the management of park natural resources, and the importance of the administrative record. Class participants explore other resource protection statutes through a combination of presentations, case studies and small group discussions. Attorneys with the Department's Solicitor's Office provide extensive assistance in presenting legal material and in engaging in discussions with class participants. Overall, the course has been consistently well received.

In 2001 the Division and the Water Resources Division, both divisions within the Natural Resource Program Center, assumed a stepped-up role in organizing and hosting the course. This was due to the departure of Bob Karotko from the Albright Training Center to a management position in the National Capitol Region. Up until his departure, Bob had been the Natural Resource Training Manager for the center and the law course's exuberant "Master of Ceremonies".

Lots of work went into planning the course for 2001 from making changes in the course agenda to lining up dynamic speakers. With an eye towards avoiding the peak of the visitor season, the course date was set for the week of September 25 in Washington, D.C. at the Main Department of the Interior Building. On September 5, due to security concerns surrounding a meeting in Washington of representative nations of the International Monetary Fund of the World Bank the course was postponed to the spring of 2002. On the heels of this postponement came September 11th.

The course was eventually held in April 2002 in Washington, D.C. ◆

Fair market value for mineral rights: The action behind the scenes

by: Philip Cloues, Mining Engineer/Mineral Economist

In 2001, Division staff completed 5 technical mineral appraisal reviews for the Alaska Region in Wrangell St. Elias National Park and Preserve, 2 technical mineral appraisals for negotiations of a mineral right acquisition in Curecanti National Recreation Area in the Intermountain Region, and a technical review of an appraisal in the Midwest Region that was encumbered with a potential hazardous materials problem. Work behind the scenes continued at Olympic National Park's Shi Shi Beach private mineral rights inholding and is moving toward a potential court date to resolve a dispute on sand and gravel ownership at the park. Work also progressed on the purchase of 110,000-acres of private mineral rights in the East Extension Area of the Everglades National Park as well as movement on the acquisition of oil and gas rights in the Big Cyprus National Preserve which are both located in the Southeast Region.

To understand what is involved in a mineral appraisal, we must first become acquainted with the logistics of the process. The federal government is required under the 5th Amendment to the U.S. Constitution to pay just compensation for the taking of private property. Just compensation, as interpreted by the courts, means fair market value and this value can be found in the market arena. It basically boils down to that value in cash or its equivalent that a knowledgeable buyer and a knowledgeable seller, neither being under duress, will negotiate at arms length, given a reasonable time on the market, for a given commodity or property. One may look for comparable sales in the market place but comparability is subject to a range of interpretation from the conservative to the liberal point of view.

While the law demands that opinions be backed by a reasonable interpretation of the facts, local or national politics may pressure the parties to act outside the standards of appraisal to pay too much or too little. The subject appraisal may then become a marker of value that impacts future sales negotiations in a negative manner. If a land exchange is not based on the Uniform Appraisal Standards for Federal Land Acquisition, then the selected and offered lands proceed toward consummation under a false umbrella of validity. Such numbers can then come back to haunt the agency in any future negotiations for expansion plans or for purchases of private holdings of mineral rights inside parks.

The sanctioning of unsupported values that have not cleared the technical review hurdle for budgetary purposes may dampen future negotiations by hobbling the perception of fairness. Internal and external perceptions of fair play come from an open discussion of the issues, the facts, and the reasonable interpretation and significance of those facts. Checks and balances to maintain fairness can only work if permitted to function in the light of day. Differences of opinion can be elevated to a higher management level for

arbitration and consensus to place the project back on stable footing. A written confirmation of the decision will then provide a record for any future review of the action.

Behind the scenes of a mineral appraisal is a cast of stagehands busy with mineral potential reports, adjudication of legal rights, legal surveys, appraiser's qualification evaluation, report format, contracting for services, appraisal review, negotiations, and many other necessary actions. Each professional provides a unique set of skills that leads to a valid appraisal of fair market value and the desired goal of acquisition. Incomplete geologic information, lack of records, unsubstantiated assertions, misinterpretations, and other discrepancies all make mineral appraisal a difficult task. If reserves are proven, one is still faced with different scenarios of production, recoverability, quality, selling price, operating costs, capital costs, depreciation schedules, and a host of variables that have a direct bearing on hypothetical market value.

Fair market value determinations for mineral rights continue to progress and allow the acquisition of outstanding mineral rights to preserve the natural resources of parks threatened by unacceptable mineral development. The process is dependent on a qualified team of specialists working behind the scenes to ensure that compensation is fair to the seller as well as the purchaser, the American taxpayer. ◆

Inventory and monitoring of geothermal resources becomes a hot issue

by: Sid Covington, Geologist

In the Fall of 2001, the Division benefited from the assistance of Debbie Barr, with the Department of Energy Yucca Mountain Project, for a 60-day detail to address geothermal issues in the NPS. Debbie is in the Executive Potential Program for GS-13s to GS-15s. Debbie worked with both the Geologic and Water Resources Divisions to develop a program to address geothermal issues. The result was a report entitled "The Geothermal Steam Act and the National Park Service." Debbie used information from Division files, information from parks, regions, and other agencies as well as information from the private sector to develop this comprehensive overview. The following is a brief synopsis of the Report's Executive Summary.

At present the level of inventory and monitoring of the thermal features listed in the Geothermal Steam Act is inconsistent and insufficient to meet the requirements of the Act. Where some characterization work has been done there is not an adequate monitoring program in place. In most cases, there is not enough understanding of the features, and characterization is needed to begin a monitoring program. Some of the listed park units, such as Hawaii Volcanoes National Park and Haleakala National Park, already have adequate monitoring programs in place to meet the requirements of the Act. Parks such as Lassen Volcanic National Park and Yellowstone National Park have a greater understanding of the features, but an insufficient monitoring program. Other parks, such as Crater Lake National Park and Hot Springs National Park require further characterization to understand the geothermal system and an expanded monitoring program before any kind of recommendation can be made on impacts of geothermal development.

The issue of impacts of geothermal development on park resources is one that involves more than just the NPS. The U.S. Geological Survey also performs research in parks, along with the Bureau of Land Management, the leasing agency, and the U.S. Forest Service, which is the surface management agency adjacent to many parks. There are also potential interactions with the Department of Energy, which deals with energy issues.

The report recommends that the NPS create an Advisory Board to facilitate the interactions among the agencies, and to ensure that there is adequate communication among agency staffs. It suggests the NPS partner with the U.S. Geological Survey to facilitate research and monitoring of the thermal features listed in the Act.

The report also recommends that NPS should establish a central clearinghouse of information regarding geothermal issues. This could be in the form of a geothermal position at the Geologic or Water Resources Divisions, or within each of the NPS regions. This is important for establishing a uniform



The present level of inventory and monitoring of geothermal features is inconsistent and insufficient to meet legal requirements. In many cases, we lack sufficient understanding of the features to begin a monitoring Program.

and comprehensive approach as to how the NPS will meet the requirements of the Act. Alternatively, a technical oversight committee could be formed with individuals from the Geologic or Water Resources Divisions, the listed parks, and the U.S. States Geological Survey as members.

Background

The Geothermal Steam Act Amendments of 1988 (P. L. 100-443) identified 16 units of the National Park System as containing thermal features qualifying as significant and required the NPS to establish a research and monitoring program to collect and assess data on these features. The Act also required the NPS to make a recommendation on any lease applications for geothermal development in areas adjacent to the park units listed. Based upon scientific evidence, the Secretary determines if the geothermal development activities will have an adverse affect on the thermal feature. The research and monitoring program required in the Act provides the basis for the Secretary's determination.

The Act is the first step in protecting geothermal features within parks from an immediate threat. While there are 16 parks listed in the Act, there are other parks within the National Park System that contain geothermal features. And while development by the geothermal industry is one threat

to these features, there are others threats such as human impacts and development. By initiating an inventory and monitoring program of all the geothermal features within the National Park System, the NPS can initiate the protection of all of these resources.

With the new Energy Plan of the present Administration and it's emphasis on alternative forms of energy, it is anticipated there will be a resurgence of interest in geothermal energy development. It is incumbent on the NPS to be prepared to make recommendations regarding lease applications near the significant thermal features listed in the Act. ◆

Resource Protection



Grand Teton National Park, Wyoming

2001 Minerals management program highlights

by: Carol McCoy, Chief, Policy & Regulations Branch, and Jim C. Woods, Chief, Mineral Operations Branch

In 2001, the Geologic Resources Division continued to provide program support and technical assistance in the minerals management arena to parks and the Directorate. The support ranged from reviewing site specific proposals to mine in and adjacent to parks to working on mining related legal issues with the Department's Solicitor's Office. Because of the Administration's well-publicized policy thrust in 2001 to lessen the Nation's dependence on foreign oil, the Service witnessed heightened advocacy on the part of nonfederal oil and gas interests in parks for streamlined permitting procedures. To the extent that the NPS regulatory process could be made more efficient without compromising park protection, the NPS took steps in 2001 to improve that process.

The number of mineral extraction operations in the parks remains startling. At the close of 2001, the following operations existed in parks: 706 oil and gas wells in 14 parks, 249 oil and gas pipelines crossing 55 parks, 67 mining operations in 19 parks, and 487 NPS administrative sand and gravel extraction operations in 71 parks (see chart on next page). In addition, over 200 parks are encumbered with private mineral rights that could be developed in the future. Many parks, especially those in the west, must also contend with actual or potential mineral development adjacent to their boundaries.

Below is an overview of key functions and accomplishments of the Division in 2001. Some of the topics are covered in much greater detail in subsequent articles recapping 2001.

Plan of operations review

NPS regulations at 36 CFR Part 9 control mineral development associated with two different types of mineral rights in parks. Part 9A governs mining activities associated with mining claims located under the Mining Law of 1872 while Part 9B governs nonfederal oil and gas operations. Both sets of regulations require prospective operators to submit and obtain NPS approval of a plan of operations before they can commence exploration or development of their mineral rights. A plan of operations is essentially an operator's blueprint. It details how an operator plans to extract minerals from the park, mitigate impacts, and reclaim the area disturbed by the operation. Advance review of these plans enables the NPS to require up-front modifications to protect parks, including sending a prospective operator back to the drawing board if necessary.



Plugging of an oil and gas well at Lake Meredith NRA in May 2001.

During 2001 in response to park requests, Division staff reviewed 27 proposed plans for mineral development in parks, and assembled technical, environmental compliance and mitigation recommendations for park action. These reviews included one proposal for access across Death Valley National Park related to extracting minerals from 1872 Mining Law claims under the Service's Part 9A regulations. Requests for assistance to review proposed plans of operations under the Service's mining claim regulations are projected to continue in the near-term. While all parks are now closed to new claim location, a total of 19 parks contain 1749 mining claims. These mining claims encumber about 35,000 acres. Most of these claims are located in Mojave National Preserve in California and park units in Alaska.

Division staff evaluated 13 plans for nonfederal oil and gas operations in five parks, including Big South Fork National River and Recreation Area, Big Thicket National Preserve, Jean Lafitte National Historic Park and Preserve, Padre Island National Seashore, and Lake Meredith National Recreation Area. Division staff provided detailed technical and regulatory comments to the parks and advised them of informational deficiencies. In addition, Division staff evaluated supplemental mineral ownership information pertaining to 13 out of 29

proposed nonfederal oil and gas plans at Big Cypress National Preserve. Most of these plans filed at Big Cypress over the last four years lacked complete ownership records or proof of a right to explore and develop the subsurface oil and gas rights in the park.

Finally, in response to a request from Cape Krusenstern National Monument in Alaska, Division staff evaluated an "Operating Plan" for the Delong Mountain Transportation System (e.g., Red Dog Mine haul road) through the park. The Red Dog Mine, operated by Teck Cominco, is the largest zinc producer in the world. Teck Cominco annually trucks over 1.4 million tons of zinc and lead concentrates on the haul road through the park to a port facility at the Chukchi Sea where the material is loaded on ships. Twenty-four miles of the 54-mile haul road pass through the park in a transportation easement established by Congress. The Division compiled its technical comments along with those prepared by other Natural Resource Program Center divisions (e.g., Air Resources Division, Biological Resources Management Division, Environmental Quality Division, and Water Resources Division), Alaska Regional Office, Alaska Support Office, and park staff. The purpose of the comprehensive evaluation was to identify specific issues and deficiencies in the plan with respect to park resource protection for the superintendent's use in discussions with Teck Cominco on necessary revisions and updates to the plan. Primary issues

included air pollution abatement, spill prevention and cleanup, cultural resource protection, caribou population monitoring, and gravel pit restoration.

Park Service mining of sand and gravel

In 2001, the Division assisted Denali National Park and Preserve and Olympic National Park in complying with Servicewide policy direction governing the extraction of sand and gravel inside park boundaries for park administrative purposes. Under the Service's *2001 Management Policies*, parks must prepare a written analysis that evaluates alternative sources of raw materials used in building and maintaining structures, roads and trails in parks.

Denali and Olympic are engaged in the preparation of in-park gravel extraction plans and related NEPA compliance documents, consistent with the Service's *2001 Management Policies*, for proper planning and execution of mining activity for material materials to support park road construction and maintenance while ensuring protection of park resources and values. Division staff is supporting these planning efforts by providing technical assistance in the identification of potential gravel sources to meet long-term needs, preparation of detailed extraction and restoration plans for each site, and identification of impact mitigation techniques to protect park resources. Once completed, these comprehensive planning documents will provide excellent "blueprints" for mining of gravel in the parks while minimizing adverse impacts to resources.

Policy and regulatory support

Frequently, policy and regulatory questions arise in applying the Service's regulations to on the ground operations or in trying to contend with mining proposals where the NPS lacks tailored regulations as in the case for nonfederal minerals

other than oil and gas. New "what ifs" are common place and efforts to find regulatory handles for novel problems often prompt Division staff to re-examine existing, and sometimes tangential, regulatory regimes to find solutions. As noted above, the mere number of plan submittals at Big Cypress raised new policy questions for the Service. Because the litigation potential is high in the mineral arena, which implicates private property rights, the Division frequently works closely with staff attorneys in the Solicitor's Office both in Washington and the various regions. Below are some examples of policy and regulatory assistance provided to parks in 2001.

In addition to working closely with the Solicitor's Office on policy and regulatory issues at Big Cypress, the Division spearheaded efforts to streamline the implementation of 36 CFR §9.32(e), a regulatory provision that allows nonfederal oil and gas interests to tap their rights inside park boundaries using directional drilling techniques from a surface location outside a park. While the NPS had been looking at its options with respect to applying this provision, a prospective operator at Big Thicket National Preserve in Texas underscored the need for action. Through an ongoing dialogue with the Solicitor's Office, the NPS has now better defined its authority under this regulatory provision and, in turn, made adjustments in the documents it must prepare pursuant to the National Environmental Policy Act (NEPA).

The Division assisted staff at Big Thicket pursue an enforcement action against an operator who refused to comply with the 9B regulations. Continuing to object to the Service's authority to require a plan of operations, the operator filed a lawsuit challenging this authority. The case initially filed in state court was removed to federal court. The case is still pending.

Mineral Development Summary, July 2002

Region	Oil and Gas				Mining		NPS Administrative Sand and Gravel	
	Wells		Trans-Park Pipelines		Operations	Parks	Extraction Sites	Parks
	Operations	Parks	Operations	Parks				
Alaska	0	0	1	1	14	3	71	7
Intermountain	215	5	82	16	3	3	255	29
Midwest	127	3	52	9	8	4	27	12
National Capital	0	0	5	2	0	0	0	0
Northeast	10	20	34	13	4	2	12	3
Pacific West	0	0	20	5	30	6	112	18
Southeast	344	4	55	9	8	1	40	2
Totals	706	14	249	55	67	19	487	71

Efforts initiated in 1999 to secure a Solicitor's opinion on how to interpret unique language in the enabling statute creating the Tallgrass Prairie National Preserve came to fruition in 2001. In February the Regional Solicitor's office issued an opinion that contains helpful guidance to the park. Division staff had worked closely with the park in framing the request for a legal opinion and, through discussions with the Solicitor's office, ultimately helped secure the issued opinion.

In 2001, legal questions regarding ownership arose in connection with a proposal to extract sand and gravel at Shi Shi Beach, in a wilderness area at Olympic National Park in Washington. The project proponents asserted that they owned the sand and gravel yet failed to proffer proof of such ownership. The Division, in coordination with the Solicitor's Office, determined that the Federal Government, as the surface owner, owns those rights. Under state law, rights to sand and gravel typically run with the surface estate unless specific deed language exists to the contrary. The proposed plan was one of a series of plans the Service has reviewed to date from the mineral owners. While the mineral owners hold mineral rights to the beach, no sound evidence exists to date pointing to the presence of minerals in economic quantities in this area of the park.

In Alaska, Division staff provided assistance to staff at Cape Krusenstern National Monument and the Regional Office in interpreting the legal handles available to the Service to protect park resources from truck traffic along a transportation corridor through the park to the Red Dog Mine and a proposed landing strip associated with the mine. As noted above, the Red Dog Mine presents unique resource management challenges to the Service.

In 2001, the Division provided extensive assistance to Denali National Park and Preserve and the region in dealing with the possible need to redo a validity examine associated with a group of mining claims located under 1872 Mining Law. The claim block is currently the subject of litigation regarding its value. A validity exam is a well-established method derived from case law for determining whether any legal property rights underlie a claim.

Finally, in 2001, the Division responded to numerous requests for information from the Director's Office about the Service's regulatory and policy framework governing mineral development in parks, especially oil and gas development.

Minerals management planning

In 2001, the Division continued to provide extensive technical support to Alibates Flint Quarries National Monument, Big Cypress National Preserve, Lake Meredith National Recreation Area, and Padre Island National Seashore in their efforts to prepare programmatic Oil and Gas Management Plans and Environmental Impact Statements. All four noted parks have a combined total of 210 non-federal oil and gas wells within their boundaries, and we expect additional exploration and production activities to occur in these parks over the next decade.

The Oil and Gas Management Plans are designed to provide for the development of nonfederal oil and gas resources while eliminating or mitigating adverse impacts to park resources and values to the greatest extent possible. Each plan identifies sensitive resource areas, operating stipulations, legal and policy requirements, and impact mitigation measures for the park-specific environment. The intent of such plans to provide nonfederal oil and gas operators with a clear understanding of NPS requirements, expectations, and technologically feasible methods for the industry to achieve its goals while protecting park resources and values.

In 2001, the Final Oil and Gas Management Plan/EIS for Padre Island National Seashore was approved by the Regional Director, Intermountain Region. Oil and gas operators are now using the document to prepare plans of operations for oil and gas drilling operations in the park, and by all indications the document is serving them well in planning such operations in a manner consistent with park management goals and objectives. The Draft Oil and Gas Management Plan/EIS for Lake Meredith and Alibates Flint Quarries National Monument was released for public comment this year, with a target project completion date in August 2002.

Participation in external minerals permitting

In 2001, the Division assisted several parks effectively influence development proposals outside their boundaries. Since its inception, the Division has provided expertise to parks in raising park protection concerns associated with external development proposals. To do so, Division staff have educated themselves as to the regulatory framework of other agencies and undertaken detailed technical and compliance reviews of proposed mineral projects. At the federal level, a key avenue for reviewing and providing comments on external mining projects has been the National Environmental Policy Act. Because most states lack comparable statutes, participating in state forums to influence decision-making is much more challenging. See the article on page 31 highlighting the threat of energy development near parks, particularly coalbed methane development in the west.

Mineral appraisal review

In 2001, Division staff continued to provide technical support to regional Lands Offices by reviewing mineral appraisals for NPS acquisition of private mineral rights in parks. Division staff evaluated 11 mineral appraisals for technical adequacy in terms of documenting compliance with the requirements specified in the Uniform Appraisal Standards for Federal Land Acquisition to support a fair market value determination. See the article on page 19 that discusses the "action behind the scenes" in determining the fair market value for mineral rights acquisition. ◆

Shi Shi beach: A case study underscoring the importance of verifying mineral ownership

by: Ed Kassman, Regulatory Specialist

In 2001, the Division provided key assistance to Olympic National Park and the Regional Solicitor's office in addressing a mineral exploration proposal at a remote wilderness beach. The Division has worked closely with the park on this matter since the early 1990s. Last year marked a significant turning point in this case as the holder of the mineral interest ripened a pivotal issue in the case - who owns the rights to the sand and gravel?

Nestled in the remote northwest corner of the Olympic Peninsula, a place as far west as one can travel in the lower 48, lies Shi Shi beach. Located wholly within park designated wilderness, Shi Shi has been called one of the top ten wilderness beaches in the United States. This coastline provides habitat to a variety of endangered species including the bald eagle, spotted owl, sea otter, and northern sea lion. The northern section of the Olympic National Marine Sanctuary runs along Shi Shi beach. The Sanctuary contains the world's most diverse kelp communities, and is home to some of the largest colonies of seabirds in the continental United States.

Beginning in 1976, Congress authorized the expansion of Olympic National Park to include land along the Pacific coastline within the park. However, when the United States purchased the land within this area, approximately 30,000 acres, it did not purchase the mineral rights. The mineral rights remained in the hands of a various private entities. In the early 1990s, the holder of the mineral rights at Shi Shi beach approached the park, expressing interest in selling its rights to the United States, and has submitted exploration proposals. Since that time, the Division, in concert with the Regional Solicitor's office, has provided key assistance to the park in addressing the legal and policy aspects of this exploration proposal. The NPS's response to the mineral owners illustrates the important role that law and policy plays in protecting park resources and values.

Origin of the split estate at Shi Shi beach

In 1928, the region around Shi Shi Beach was not a place necessarily sought for its solitude and wilderness values. Prior to 1928, organized timber operations associated with the World War I project began to harvest very select specimens of Sitka spruce found in this area of the Olympic Peninsula for warplanes and lightweight structural materials. A.W. Hammond, a mineral developer from Pacific County, owned the fee land at Shi Shi beach. Recognizing the increasing demand for timber harvest, he decided to sell off the surface interest in 1928 to the Washington Pulp and Paper Company. Via this conveyance, however, Mr. Hammond reserved certain minerals, specifically: ". . . all oils, gases, coal, ores, minerals and

fossils of every name, and which may be in or upon said lands . . ." Although he never sought to develop this mineral interest during his lifetime, Mr. Hammond retained it as part of his estate, eventually passing it down to his daughter Ruth. When Ruth died, her will directed that this interest be held in trust and the proceeds from the sale or development of the mineral interest would go to her three grandsons, Arthur, Scott, and Craig Watson. The Ruth Hammond Wyatt Trust is presently vested with the mineral interest at Shi Shi Beach.

In 1993, a contractor hired by the Trust approached the park with plans to conduct mineral exploration activities at Shi Shi Beach. The Trust intends to sell the mineral interest to the United States, and has requested authorization to explore in order to establish a value.

Evaluating the exploration proposal

On receiving an operator's proposal to exercise mineral rights in park units, section 8.7 of NPS Management Policies directs the NPS to first determine whether the operator has clearly demonstrated that it holds the mineral right. If it does not, the NPS owes no legal obligation to the mineral owner to consider its planned activities and will not permit mining activities in park units. Upon examination of the Trust's exploration plan, the NPS immediately flagged two issues regarding ownership: 1) noticeable gaps in the chain of title, and 2) the Trust proposed to explore for minerals that they did not apparently own - sand and gravel.

Regarding the gaps in the chain of title, the park requested that the Trust provide proof of ownership in order to verify that the Trust was vested with the mineral interest, and that there were no third parties who might claim an interest in the mineral reservation. The Trust could not initially provide such information. It, therefore, filed an action in state court to resolve ownership of this mineral interest. When this judicial proceeding was completed, and the court established that the Trust did own the mineral reservation, the NPS accepted this as conclusive evidence of ownership.

This issue of sand and gravel ownership has become more adversarial. When the NPS reviewed the deed, it noticed that language did not specifically reserve the sand and gravel. The deed to the mineral reservation states that the mineral reservation includes "all oils, gases, coal, ores, minerals and fossils of every name, and which may be in or upon said lands . . ." Despite the absence of phrase "sand and gravel," the deed does contain the language "minerals . . . of every name," which, if read broadly, could be construed to include sand and gravel. Given this ambiguity, applicable law was examined to determine whether courts have interpreted the phrase "minerals of every name," and how the courts would likely determine the issue of whether sand and gravel would be vested in a mineral interest under that phrase. Because the interest was severed in 1928 through a private conveyance, and not

by operation of a federal statute, the determination of what vested in the mineral estate and what vested in the surface estate, is a question of Washington state law.

The Washington state supreme court has addressed the question of whether sand and gravel is included in a mineral reservation under the phrase "minerals of every name" and has held that it is an issue primarily of intent of the parties when the interest was severed. That is, in 1928, did A.W. Hammond and the Washington Pulp and Paper Company intend for sand and gravel to remain with the surface interest or the mineral interest? To determine intent the courts will allow the parties to present evidence that analyzes the language of the grant itself and will also allow evidence demonstrating the circumstances surrounding the grant. Through these inquiries, the court will then attempt to discern the intent of the parties.

The review of both the language of the grant itself and the circumstances surrounding the severance in 1928, indicates that the sand and gravel remained with the surface owner - the Washington Pulp and Paper Company - when the estate was severed. For example, the timber company would not have wanted to give up most, if not all of, the substance that comprises the surface estate. To do so would substantially undermine the practical value of the timber, either as a resource the company itself would exploit, or as a leasable interest. Further, timber companies typically retain the sand and gravel to build provisional roads to harvest their resource. It would be unreasonable to conclude that the Washington Pulp and Paper Company would give away the sand and gravel, only to buy it back from the mineral owner in the future to build these roads.

The Trust provided the NPS with no evidence that A.W. Hammond intended to retain the sand and gravel as part of the mineral interest. The evidence they did provide only substantiated the fact that Mr. Hammond was a businessman, primarily in the business of mining in Pacific County. These general claims of his business preferences did not demonstrate that he intended to reserve the sand and gravel as part of the mineral interest in 1928.

Since the Trust could not provide evidence to substantiate its claim to the sand and gravel, the NPS, in accordance with NPS Management policies, denied the Trust's sand and gravel exploration plan. The Trust appealed the denial to the Superintendent, who on June 19, 2001, upheld this decision. The Trust then appealed to the Regional Director, who on February 8, 2002, upheld the Superintendent. The ball is now in the Trust's court to file an action in Federal District Court if it chooses to further challenge the NPS determination.

Law and policy as a tool to protect park resources

In the context of mineral proposals in park units, we typically think of protecting park resources and values through stipulations and mitigation measures attached as conditions of approval to an operator's plan of operation.

In this instance, however, the resources at Shi Shi beach have been protected thus far through the conscientious application of law and policy. This case underscores the importance of examining each aspect of an operator's proposal and ensuring that the operator is playing by the rules. ◆

Special thanks to the Solicitor's Office

As many of the articles in this Annual Report indicate, the Division often seeks out and relies heavily on assistance from the Solicitor's Office on issues spanning both geology and minerals management. In 2001 as in previous years, the division received invaluable advice from attorneys with the Washington Solicitor's Office and various Regional Solicitor's Offices. Topics ranged from advice on enhancing the stewardship of fossil resources on park lands to the interpretation and application of regulations governing the development of nonfederal oil and gas rights in parks. For the tireless legal assistance provided in 2001, the division extends a special thank you to the following individuals: Barry Roth, Rob Eaton, Bill Back, Kim Fondren, KC Becker, Larry Bradfish, John Harrington and Debra Hecox.

Enforcement action in the oil patch: Case study of Premium at Big Thicket

by: Ed Kassman, Regulatory Specialist

The Big Thicket National Preserve, with assistance from the Division, the Field Solicitor, and the U.S. Attorney's office, has exercised its enforcement authority to force a recalcitrant oil and gas operator into compliance with NPS regulations governing the exercise of nonfederal oil and gas rights. This enforcement authority has been used rarely in the past, as most operators comply with NPS regulatory authority. In this instance, however, one operator is seeking to challenge the validity of the NPS regulations, and the enforcement action could lead to a precedent setting case on the validity of the NPS's regulatory scheme.

Congress established Big Thicket National Preserve on October 11, 1974. 16 U.S.C. §698. When it did so, Congress recognized that much of the oil and gas rights lying beneath the Preserve would remain in private hands. To protect the federal surface interest, Congress authorized the promulgation of regulations governing the exercise of nonfederal (both private and state) oil and gas rights. 16 U.S.C. §698c(b)(2).

In 1979, pursuant to the Congressionally delegated authority under section 3 of the NPS Organic Act, 16 U.S.C. §3, and several park enabling statutes, including Big Thicket's, the NPS promulgated regulations at Title 36 Code of Federal Regulations, Part 9, Subpart B. These regulations, commonly known as the "9B," govern the exercise of nonfederal oil and gas operations in park units, and are "designed to insure that activities undertaken pursuant to these rights are conducted in a manner consistent with the purposes for which the National Park System and each unit thereof were created, to prevent or minimize damage to the environment and other resource values, and to insure to the extent feasible that all units of the National Park System are left unimpaired for the enjoyment of future generations." 36 CFR §9.30. The heart of the 9B regulations is the requirement that operators submit a plan of operation, and file a suitable performance bond to ensure compliance with the plan. The NPS analyzes an operator's proposed plan to ensure compliance with the regulations and protection of park resources and values. In nearly every instance since 1979, the NPS has authorized operations on federal surface.

A few months prior to Congress establishing Big Thicket National Preserve, Atlantic Ritchfield Company (ARCO), which held the mineral rights in a portion of the preserve's Jack Gore Baygall unit, leased its rights to an oil and gas developer. Two wells were completed on the lease. One oil and gas well (Well #1-A) was completed on July 21, 1976. Another existing well (Well #3) was converted to a saltwater disposal well a little over a year later, on September 28, 1977. This lease transferred through a number

of entities and was eventually acquired by Premium Exploration Company on or about September 1, 1998. Premium is the present holder and operator of the lease interest.

Since the time Premium acquired the rights to the ARCO lease, the NPS requested that Premium submit a plan of operations and file a suitable performance bond per the 9B regulations. Premium refused the NPS's requests. On December 12, 2000, the Preserve Superintendent suspended Premium's operations and closed Premium's site to all oil and gas related activities. On January 13, 2001, Premium's President sent a letter to the NPS stating, in part that "[Premium's] operations are exempt and outside the scope of the 36 CFR 9B regulations you cite as authority; and we do not have to obtain approval from the National Park Service to operate."

Contrary to Premium's belief, its operations are subject to the 9B regulations. The regulations do provide for an exemption from the plan of operations and bonding requirement for those operations that either predate promulgation of the regulations (1979) or establishment of the park unit (Big Thicket - 1974). However, an operation loses this exempt status if an operator is issued any new permit after those dates. The ARCO lease was initially exempt from the 9B when the regulations were promulgated in 1979, since the lease predated promulgation of the 9B regulations. When Premium acquired the ARCO lease it, by requirement of state law, had to obtain a new operating permit from the State of Texas. With the issuance of that new permit, Premium lost exempt status and was required to comply with 9B.

Despite this fact, on or about April 25, 2001, Premium filed a petition in court for a preliminary injunction to prevent the NPS from applying the 9B regulations to Premium's operation. In its petition, Premium claimed, among other things, that the Preserve "has practically eliminated oil and gas operations by making the regulatory scheme so onerous, so expensive, time consuming and difficult that it is practically impossible to comply with." In fact, since the regulations were promulgated in 1979, the NPS has approved well over 100 plans of operations Servicewide. In the Preserve, the NPS has approved over 20 operations since 1979 and has never denied a plan of operations. In the 22 years since the 9B's were promulgated, no operator has ever filed a lawsuit claiming that the NPS has denied it the right to explore for and develop oil and gas resources. These facts alone undermine Premium's sweeping statement that the NPS regulations are "practically impossible to comply with."

The 9B regulations are a valid exercise of authority delegated by Congress through the NPS Organic Act and the park enabling statutes. The power of Congress to delegate such authority is well-settled law, and the regulations are well within the scope of that authority. In 1994, the mineral interest owners beneath Padre Island National

Seashore in Texas, Dunn McCampbell Royalty Interest, Inc., filed suit in federal district court challenging the validity of the 9B regulations. Although the case was dismissed against the mineral owners on procedural grounds, the court found that the NPS acted properly in promulgating the 9B regulations.

Through the initial stages of litigation, the court has order Premium to post a bond and comply with certain measures that will protect park resources and values. To date, Premium has not fully complied with the court's order and now faces penalties for contempt of court. If the case does go to the merits, the NPS is confident that it will prevail and it will be a case that will provide direct support for the NPS's management of nonfederal oil and gas operations. ◆

Fossils in the NPS: The big picture

The National Park Service has a long tradition of protecting fossil resources. This tradition started in 1906 in Arizona with the establishment of Petrified Forest National Monument to protect fossil logs from commercial harvesting to be used as grit in sandpaper. Later, in 1915 Dinosaur National Monument was created to protect the world famous Carnegie Dinosaur Quarry. While the NPS currently has 8 units specifically created because of their unique fossil resources, in actuality there are now 150 parks that because of their geology and geographic location contain fossils. In some cases fossils are not specifically mentioned in the legislation creating the park, but are still viewed as an integral part of the park's resources due to their close ties to the geology of the park. The fossil reef at Guadalupe Mountains National Park is one example. In other cases the presence of fossils in a park may be viewed as totally incidental and secondary to the reasons for the establishment of the park. Whether viewed as a primary or secondary park resource, when viewed in totality, the variety of fossils, whether from plants, invertebrates, vertebrates or as traces such as tracks, that are found within the national park system, provide a rich tapestry that documents the history of life on this planet from the Pre-Cambrian to the Holocene. As such, fossils within the NPS should be viewed not just within the context of the park's "mission" but rather from a bigger picture of how the existence of that park can contribute towards the preservation of those fossil resources for use by the scientific community and interpretation and education of the public.

Dredging and disposal in park waters - A policy issue that surfaced in 2001

by: Rebecca Beavers, Coastal Geologist and Julia Brunner, Policy Specialist

During 2001, the Division's coastal team examined mechanisms for decreasing the damage to park resources and values caused by dredging and disposal activities in coastal parks. In some cases, the Division concluded that the costs of dredging outweighed the benefits. At Dry Tortugas National Park, for example, a channel dredged during construction of Fort Jefferson continued to fill with sediment and finally closed in December 2000 (See before and after channel closure images). Division staff evaluated this site in 2001 and recommended that the park allow the channel to remain closed rather than fighting natural processes through an intensive dredging operation complicated by the remoteness of the location.

Park coastlines and waterways are dredged for a variety of reasons. The U.S. Army Corps of Engineers dredges waterways in and adjacent to parks for navigation purposes. Park units dredge their waterways to improve water quality, preserve access to waterfront structures such as piers, boat ramps, and culverts, and maintain navigation channels. Dredging may be necessary in many cases, but it is expensive, interferes with natural sediment processes, stirs up contaminants, kills wildlife, and destroys wildlife habitat. In some cases, dredged material is removed from the littoral system, thereby hastening erosion. The disposal of dredged material can also bury beach-dwelling invertebrates, thereby reducing food sources for shorebirds, and diminish suitable sea turtle nesting areas. On the other hand, some disposal activities such as the creation of spoil islands may shelter the adjacent shoreline from erosive waves and currents and may result in habitat that provides vital bird rookeries.

Dredging and disposal operations conducted in parks by non-NPS parties such as the Corps of Engineers can be complicated to manage. Although these operations usually involve Corps dredging and/or disposing of the dredged materials on lands and waters owned by the NPS, the Service to date has not fully supervised or, in some cases, even known about these operations until their completion. Compliance with the National Environmental Policy Act (NEPA) and NPS standards has also been lacking. Concerned by the unsupervised and unmitigated damage to park resources and values, several parks such as Cape Hatteras National Seashore, Jean Lafitte National Historical Park & Preserve, and Padre Island National Seashore, have begun to question the status quo.

Working closely with interested parks and the Solicitor's Office, the Division is currently developing the arguments that would support the Service's assertion of increased involvement in the planning and execution of Corps dredging and disposal operations in park units. The NPS is also working as a cooperating agency with the Corps in the development of NEPA documentation for the Corps' proposed

dredging and disposal operations at Cape Hatteras National Seashore during 2002. While many differences of opinion between the Corps and the NPS remain unresolved, we can already see that our efforts to become more involved in dredging operations within parks will result in greater protection of park coastal resources. ◆



National Park before it closed because of natural sediment movement.



An analysis of management alternatives resulted in a decision to leave the sand isthmus in place.

The new energy boom - How do we protect NPS resources and values?

by: Kerry W. Moss, Environmental Protection Specialist

The NPS is no stranger to mineral and energy exploration and development. Oil and gas development occurs in 15 units, with active and potential coal, geothermal, coalbed methane, and oil and gas development adjacent to 53 units. Further, at least 22 NPS units contain significant geothermal resources. With statistics like this, it's no wonder that 2001 saw a drastic increase in energy development proposals that carry with them the potential to affect park units - particularly in the west. In light of this issue, the Division, along with parks and regional offices, have stepped up efforts to more effectively communicate NPS concerns on external operations to other Federal, state, and local agencies.

2001 may best be described as a year of energy uncertainty. From rolling blackouts in California to \$3.00 per gallon gasoline in the Midwest, to sky-high fuel oil prices in the east, energy availability and the price we would have to pay for it became a nationwide concern. Whether our enhanced emphasis on energy problems stem from an actual energy "shortage," or we are responding our heavy dependence on foreign energy sources, the public and government officials reacted in much the same way; we need more energy, we need it now, and we want it cheap.

Many western states, along with the Bureau of Land Management, are working to "streamline" the permitting process for energy development permitting on public and private lands. This action, along with periodic spikes in energy prices, has resulted in a flurry of permit requests by industry. The Division has responded to this increased activity by assisting parks and regional offices with technical and policy assistance by weighing-in on external permitting decisions and their corresponding environmental documents that result from energy development proposals adjacent to parks. We have discovered that early involvement with external agencies in the planning and permitting process will often result in a satisfactory outcome for protecting NPS resources and values.

In 2001, one of the more sought after energy commodities in the west was (and still is) coalbed methane. The production of coalbed methane, although fairly cheap to produce and clean burning, carries with it potentially adverse environmental consequences. Problems associated with extracting methane from coal seams include large amounts of produced water (often high in salts and sulfur), and associated infrastructure including roads, pipelines, electric transmission lines, and large compressors to move the product. Methane wells are also often drilled on the minimum spacing allowable by the permitting agency resulting in a very visible impact upon the landscape. Coalbed methane wells often produce product for 20 years or more resulting in a long-term impact upon the land.

Along with coalbed methane, energy companies are moving forward with traditional oil and gas wells nationwide and coal mining is once again on the upswing, particularly with the cleaner-burning western coal. The Department of Energy is encouraging industry to take a second look at geothermal development, and large-scale wind and solar farms are on the increase.

With any energy production, even clean burning coalbed methane, and non-polluting wind generators and large arrays of solar collectors, impacts on the environment are inevitable. The National Park Service often strives to influence external land management agencies that do not operate under the same conservation mission as the NPS in an effort to better protect park resources and values. Cooperative efforts between the NPS and adjacent land managers have improved with the NPS being invited into the planning and permitting process early. As we have confirmed in 2001, seeking involvement with local, state, and other Federal agencies, even as early as the land use planning stages, pays benefits when the ever-increasing pressures of energy development come to call on the NPS doorstep. ◆

New Grand Staircase-Escalante National Monument takes gravel-planning lessons from the Division

by: Mark Ziegenbein, Geologist

In September of 1996, President Clinton established the Grand Staircase-Escalante National Monument. The Monument is administered by the Bureau of Land Management for the purpose of protecting the natural and cultural resources within its boundaries. Prior to the establishment of the Monument, land users and the BLM operated sand, rock, clay and gravel (material) extraction sites to support construction and maintenance projects. Because of the similarity in mission between the newly created Monument and units of the National Park Service, the BLM contacted the Division to explore management options employed by the Service in similar situations. The BLM is not required to administer the Monument in accordance with NPS regulations or policies. However, NPS policies may provide a template from which the BLM may establish their own management policies. At section 9.1.3.3, the 2001 NPS Management Policies state in part:

"Material ... sources on NPS lands ... will be extracted and used only:

- ▶ *By the NPS or its agents or contractors;*
- ▶ *For in-park administrative uses;*
- ▶ *After compliance with NEPA, including written findings that extraction and use of in-park borrow materials does not, or will not, impair park resources or values, and is the park's most reasonable alternative based on economic, environmental, or ecological considerations; and*
- ▶ *After compliance with other applicable federal, state, and local requirements.*

In addition:

- ▶ *Parks should use existing pits, quarries, or sources, or create new pits, quarries, or sources in the park only after developing and implementing a park-wide borrow management plan that addresses the cumulative effects of borrow site*

extraction, restoration, and importation.

As a result of an interagency technical assistance request in 2001, Division staff traveled to southern Utah to meet with BLM staff and to visit 15 extraction sites in the BLM's new Monument. The Division provided guidance to Monument staff on regional material planning techniques, environmental compliance, and mine planning/restoration recommendations. Division staff, accompanied by BLM staff visited the Monument to inventory of the number, location, size and condition of extraction sites, and to develop management options or conceptual restoration measures for each site.

The Division then compiled the results in a report that provides recommendations for an overall sand, rock and gravel planning effort and also provides an inventory of the 15 extraction sites in the Monument. The report also provides specific extraction and restoration prescriptions or alternatives for each site in the Monument.

General recommendations

The Monument should develop a Monument-wide, gravel use planning and environmental compliance document to concisely display the following:

- 1) The sand, rock, clay and gravel needs in the Monument;
- 2) The locations where these materials are present and/or are being extracted (both in and outside of the Monument);
- 3) The environmental impacts and financial costs associated with material extraction at these sites;
- 4) Alternatives to current material uses, alternatives to current extraction site locations and alternative methods of extraction/reclamation.

The Monument subsequently closed and reclaimed a number of their extraction sites and is in the process of following-up on the Division recommendations. ◆



Grand Staircase-Escalante National Monument

Oil and gas management planning update

During 2001 and 2002 the Division provided substantial support to the Intermountain and Southeast Regions and park staffs to prepare oil and gas management plans and associated environmental impact statements. The Division assisted in preparing plans for Padre Island, Big Thicket, Lake Meredith / Alibates Flint Quarries, and Big Cypress. The purpose of these plans are to guide the long term management of nonfederal oil and gas development while ensuring the protection of park resources, values, and public health and safety.

The Record of Decision for the Padre Island plan / EIS was signed in August 2000 and the oil and gas management plan was distributed to oil and gas operators in the park in March 2001. The final plan has successfully been used by BNP Petroleum to facilitate the development of several drilling proposals in the park.

The Big Thicket plan/draft EIS is currently being revised by park staff. According to park management, public review of the plan / DEIS should occur sometime during fiscal year 2003.

Lake Meredith received seven comment letters on their oil and gas management plan / draft EIS. Responses to the substantive comments and revisions to the final plan were prepared by Linda Dansby, Intermountain Regional Minerals Coordinator. The final EIS was released for a 30-day "No Action" period on August 9, 2002. Once the 30-day review is complete, the Record of Decision on the EIS will be signed and a final plan will be prepared for use by park staff and oil and gas operators.

The Division participated in an alternatives refinement and impact assessment meeting in November 2001 for the Big Cypress oil and gas management planning effort. Development of the plan was halted in 2002 when the U.S. Department of the Interior and the Collier family entered into an agreement in principle to acquire the undeveloped Collier mineral estate within the Preserve. With the acquisition of the majority of the mineral tracts in the Preserve, future oil and gas development would be restricted to the existing two oil and gas fields, rather than being dispersed throughout the Preserve. This would eliminate the need for a parkwide comprehensive oil and gas management plan to guide future oil and gas development. All future drilling activities in the Preserve would be bound by resource protection measures required under existing oil and gas operating permits.

Restoration



Redwood National and State Parks, California

Disturbed lands restoration & abandoned mineral lands reclamation programs

by: David L. Steensen, Geologist - Restoration Program Coordinator

The National Park System contains over 575,000 acres in 195 park units that are disturbed by previous human activities and are targeted for restoration work. These disturbances include abandoned mines, roads, dams, canals, railroads, grazed areas, campgrounds, and other abandoned sites. Lands disturbed by human activity often cause unwanted and long-lasting problems that affect other park resources and facilities. For example, altered soils and landforms may affect biological communities and habitats in negative ways. Erosion and sedimentation problems, exotic plant invasion, and unsightly scars, among many others, produce problems for parks attempting to manage areas as natural habitat.

Restoration work includes actions to accelerate natural recovery processes at disturbed areas. Such work usually addresses the biological and the physical components of the area to establish stable landscapes that are capable of supporting the natural ecosystem mosaic and fostering self-perpetuating native plant communities.

In addition to surface degradation and restoration issues, many of the 3,200 abandoned mine sites (found in 132 parks), which include 10,000 underground openings or surface quarries, have moderate to severe safety hazards. Unstable structures, falling hazards, explosives, and poor air quality (trapped gases) are serious issues where visitors or staff can access unsafe openings.

Annual program

The Division manages two Servicewide funds focused on supporting ecological restoration projects in parks. The Natural Resource Preservation Program - Disturbed Lands funds are a sub-element of the program and are oriented toward all abandoned developments and agricultural areas. The Abandoned Mineral Lands Reclamation funds are oriented specifically toward the cleanup of lands and waters, and the elimination of safety concerns, at abandoned mineral developments. In addition, the Division's technical staff provides the cornerstone of our activities in parks by providing coordination, oversight, and guidance in land restoration issues. At the park level, the Division coordinates three primary park-specific activities: project funding, technical assistance, and Servicewide information transfer.

Project funding

Parks submit proposals to the various Natural Resources funding categories, including NRPP-DL and GRD-AML, via the Servicewide Coordinated Call. The NRPP-DL category provides \$850,000 annually in project funds. The GRD-AML category provided \$231,000 in project funds in FY2001. The Division distributes project funds based primarily on the ranking of the competitive proposals. Division staff reviews

project work plans for technical adequacy and provides oversight in relation to cost accounting, accomplishments reporting, and the preparation of technical guidance.



Many parks contain dams left over from previous land uses, such as the one shown above at Florissant NM.



Heavy equipment, similar to that used to construct the dam, is used to reestablish naturally functioning landforms.



Landforms, similar to the original, reconnect stream channels and associated wetland, riparian, and aquatic resources.

2001 Project activities

The Disturbed Lands Restoration Program provided \$850,000 to parks for restoration of disturbed areas. There were 12 separate projects throughout six regions. The following table shows the NRPP-DL projects funded in FY2001:

Region	Park	Project Title	NRPP-DLR Funds
Alaska	Denali	Restoration of the Caribou Creek Watershed	\$82,000
	Denali	Remove Hazardous Conditions in the Kantishna Mining District	\$79,000
Intermountain	Florissant Fossil Beds	Removal and Restoration of Earthen Dams	\$98,000
	Palo Alto	Restore Resaca Wetlands and Associated Wet Prairie Habitats	\$66,200
Midwest	Buffalo River	Stream Corridor Restoration within Boxley Valley Historic Use Zone	\$64,000
Northeast	Fire Island	Plug and Abandon Flowing Wells	\$58,800
Pacific West	Channel Islands	Protection of Endemic Island Oak and Rehabilitation of Actively Eroding Areas on Santa Rosa Island	\$46,200
	Great Basin	Disturbed Lands Restoration at Bonita Mine	\$72,300
	Golden Gate	Lower Easkoot Creek Habitat Restoration Project	\$77,500
Southeast	Big Cypress	Disturbed Lands Restoration at the Headwaters of Turner River	\$50,000
	Jean Lafitte	Backfill Dead-End Canals to Restore Marsh to Mitigate Impacts of Past Oil and Gas Exploration - Phase 1	\$50,000
	Mammoth Cave	Plug Improperly Abandoned Oil and Gas Wells	\$106,000
Total NRPP-DLR Project Funds			\$850,000

The Abandoned Mine Lands Reclamation Program provided \$231,150 to parks for reclamation of abandoned mines and the elimination of health and safety concerns. There were 9 separate projects throughout five regions. The following table shows the AML projects funded in FY2001:

Region	Park	Project Title	1999 AML Program Funds
Alaska	Wrangell-St. Elias	Kennecott Mine Opening Survey, Safing Design, and Closure	\$ 25,000
	Wrangell-St. Elias	Abandoned Mineral Exploration Camp Clean-up and Reclamation	\$ 14,700
Intermountain	Petroglyph	Reclaim 3 Abandoned Cinder Quarries	\$ 5,000
	Saguaro	Design and Install Bat-Accessible Gate at Wildhorse Mine	\$ 19,850
Midwest	Buffalo River	Construct Mine Gates: Rush Historic District	\$ 35,000
Northeast	New River Gorge	Reclaim 5-Acre Brooklyn Coal Refuse Pile	\$ 45,000
Pacific West	Great Basin	Reclamation of Lexington/Ponderosa Mine	\$ 24,300
	Lake Mead	AML Site Reclamation and Wildlife Protection	\$ 39,300
	Joshua Tree	Make Safe and Preserve Resource Values at Three Mine Sites	\$ 23,000
Total AML Project Funds			\$231,150

The Disturbed Lands program also provided \$121,500 to parks for disturbed area restoration using 20% Fee Demonstration Funds (originally funded in FY2000). This involved 5 separate projects at 4 parks. The following table shows the projects funded in FY2001:

Region	Park	Project Title	Fee Demo-DLR Funds
Intermountain	Hubbell Trading Post	Pueblo Wash Riparian Restoration	19,800
	Florissant Fossil Beds	Dam Removal	32,000
	Glacier	Restoration at Logan Pass	22,500
Pacific West	Pinnacles	Entrance Meadow Restoration	28,200
	Pinnacles	Rehabilitate Climber Access Routes at Bear Gulch	19,000
Total 20% Fee Demonstration-DLR Project Funds			121,500

Technical assistance

The Division has specialists in surface reclamation, fluvial geomorphology, slope stability, and soil science. With this expertise, Division staff work cooperatively with Natural Resource Program Center staff in other Divisions, and outside specialists to provide parks with:

- ▶ assistance with disturbed land inventories, site characterizations, resource impact assessments, and issue identification;
- ▶ analysis of human health and safety hazards and development of mitigation designs;
- ▶ assistance with developing proposals for funding;
- ▶ geomorphic and geologic analyses, volumetric surveys, development of materials and equipment, and cost estimates;
- ▶ landform restoration designs, engineering specifications, well-plugging specifications, and contract scopes-of-work;
- ▶ project oversight assistance; and,
- ▶ facilitation of access to multidisciplinary expertise for natural systems restoration and conservation of critical habitat.

Service-wide coordination

In accordance with the Government Performance and Results Act (GRPA), parks report performance to Service-wide GPRA Goal Ia1A, which involves restoring parklands disturbed by land use. Division staff involved with GPRA Goal Coordination provides technical guidance to central offices and parks.

The Division also facilitates cooperation with park or regional staff and among staff from the other Natural Resource Program Center divisions for disturbed lands restoration activities through the establishment of the NRPC Restoration Technical Advisory Group. Examples include the establishment of working groups to prepare or update restoration language for the *NPS Management Policies* and restoration guidance for *Reference Manual - 77*.

Program needs

The NPS estimates that to restore priority areas over the next 5 years would require \$65 million. Long-term restoration costs could be as high as \$650 million. There have been no funding increases for NRPP-DL since FY2000. In the case of GRD-AML, where there is an estimated \$40 million backlog, there have been no funding increases since FY1998. Despite the static, dedicated funding at the National level, parks have successfully competed for funding from other sources to keep the momentum behind restoration work in the National Park System. ◆



A bat gate installation at Saguaro National Park.

Division spearheads NRPC restoration group

The Division organized the Restoration Technical Advisory Group (RTAG), which brings together restoration specialists throughout the NRPC. The NRPC-RTAG provides the NPS with interdisciplinary expertise in ecosystem restoration, including disturbed lands, exotic species, and aquatic habitat restoration issues. RTAG manages restoration projects funded by Service-wide sources, provides restoration technical assistance to parks, develops and interprets restoration policy and guidance, and provides other related services to the NPS. Divisions represented in this group are the Biological Resource Management, Environmental Quality, Natural Resource Information, Geologic Resources, and Water Resources Divisions.

First steps towards dam removal, Lassen Volcanic National Park

by: Mark Ziegenbein, Geologist

In 1932 the Sifford family, owners of the Drakesbad Guest Ranch, constructed Dream Lake Dam in what is now Lassen Volcanic National Park. The purpose of the dam was to provide recreational opportunities for guests at the ranch, which it has for the past 70 years. Ranch records indicate that the dam washed out on two previous occasions: the winter of 1938, and the winter of 1952. On both occasions the ranch owners reconstructed the dam by filling the breached areas with uncompacted fill material of unknown composition.

In January of 2000, GRD staff identified the Dream Lake Dam as an unmaintained and failing structure in the report "Disturbed Land Inventory and Recommendations - Lassen Volcanic National Park." The report recommended removal of the dam under controlled conditions and restoration of the original stream channel.

In the spring of 2001, a family of beavers moved into the area and repeatedly blocked the spillway, raising the water level in the lake by about 2 feet. Water is now flowing over the 300-foot long earthen dam. This situation could result in failure of the dam at peak flow and maximum reservoir depth threatening downstream resources and infrastructure.



Dream Lake

In the fall of 2001, Geologic Resources Division and Water Resources Division staff traveled to the park in response to a last-minute technical assistance request. Mark Ziegenbein (GRD geologist) and Gary Smiley (WRD hydrologist) conducted a site assessment that consisted of the following:

- Photo documentation of site features;
- Total Station survey of the dam, the borrow pit and surrounding topography;
- Bathymetric survey of the lake bottom;

- GPS survey of surface features around the dam;
- Visual assessment of soils, soil compaction, surface water flow and condition, erosional features / sediment contribution to surface waters, natural revegetation / revegetation potential; and
- on-site discussion of restoration options.

The report produced by the Geologic and Water Resources Divisions provided the park with step-by-step recommendations for mitigating the dam failure hazard, dam removal and stream/wetland/riparian restoration. The removal and restoration process consists of six components: de-watering the reservoir, dam removal, sediment management, recontouring/revegetation of lakebed and dam site, stream restoration, and follow-up monitoring. The park will complete environmental compliance for the project over the winter of 2001-2002 and restoration work is expected to begin in the spring of 2002. ◆

Geomorphology and human activities

by: David Steensen and Harold Pranger, Geomorphologists, Disturbed Lands Restoration Program

The Division is responding to an increasing number of requests for assistance that deal with geomorphological issues. In FY2001 alone, the Division received 47 requests for assistance with areas disturbed by human activities, areas such as facilities, roads, mines, and dams. In some cases, resource issues involved affects to natural systems and habitats, and in other cases the issues centered on processes affecting cultural resources. What then, is the relation between these features - created by human activities - and geomorphology?

Geomorphology is the study of *landforms* and the *processes* responsible for their evolution. We are all familiar with landforms: hillslopes, valleys, channels, fans, terraces, floodplains, beaches, etc. A complex interaction between these landforms and climate, soil formation, and biological activity provides the setting for a myriad of habitats. Aquatic, riparian, wetland, lacustrine, marine, forest, grassland, and montane habitats, etc. are all landform dependent.



Roads divert surface flow and cause accelerated erosion, even in arid environments such as Saguaro NP.

Landforms are the result of many natural processes. Mostly, we are familiar with exogenic processes (those acting from outside): rain, snow, wind, and their effects (e.g., floods). Less familiar to many are endogenic processes (those acting from within): tectonics, volcanic activity, seismicity, and their effects (e.g., earthquakes). Landforms change when processes operate with sufficient magnitude; the rate of change in a

landform is dependent on how frequently such processes operate.

The rate of change of a landform is linked to our concept of stability. Many often consider landforms unstable when they change (e.g., a stream channel that erodes during a flood). However, all landforms are susceptible to change and actually are in a state of dynamic equilibrium with the processes acting upon them. A geomorphologist considers a landform unstable when a disturbance causes more geomorphic change than one would expect from a landform in dynamic equilibrium.

Many human activities affect landforms and/or processes. We alter landforms to build roads, structures, and for agricultural uses. When the landform is changed to the point of instability, we often see the effects in accelerated erosion, sedimentation, mass failure, etc. This acceleration can lead to degradation of associated resource values, such as habitats or cultural resources.

The common types of assistance that the Division provided to parks in 2001 were inventories, assessments, and recommendations for potential corrective actions for roads, mines, dams, various facilities, and impacts to cultural resources. Brief descriptions of these projects and their common effects follow. Some examples are more thoroughly described elsewhere in this publication as separate articles.

Roads

Roads and their effects are likely the greatest single issue associated with landform alterations in the parks. Roads divert runoff away from natural hydrologic patterns, may cause significant erosion and slope stability problems, and are unsightly scars. As an example of Division assistance, we helped Buffalo River develop a strategy to inventory and set treatment options and priorities on over 107 miles of abandoned park roads. In another example, we assisted staff at Capulin Volcano, Intermountain Region, and the Denver Service Center in a cooperative effort with the Federal Highways Administration to correct severe gully erosion along the Volcano Road. The Division also assisted Dinosaur, Washita Battlefield, Lake Meredith, Channel Islands, Pinnacles, Golden Gate, Sleeping Bear Dunes, and Big South Fork with similar road-related projects.

Mines

Over 130 parks have abandoned mineral sites, including hard rock, sand and gravel, and oil and gas exploration sites and developments. Many sites with highwalls, shafts, and pits create serious human safety concerns. In addition, mines cause serious landscape problems. At many mines, the natural landforms are completely obliterated, causing severe erosion and exotic plant problems. Correcting problems at mines often requires creative and/or expensive solutions. Some underground mines, however, provide habitat for Threatened or Endangered bat species. In addition to providing \$231,200 to parks for abandoned mine cleanup, safety, and reclamation work, the Division also assisted Joshua Tree, Saguaro, Great

Smoky Mountains, Glen Canyon, New River Gorge, and Sleeping Bear Dunes by providing assessments and design specifications for project development.

Dams

Dams are found throughout the National Park System. Most dams are relatively small structures originally intended to impound water for stock or local water supplies (Hoover, Glen Canyon, Hetch Hetchy, are a few notable exceptions). To date, the Division's efforts have focused on those small structures that are no longer needed for their intended purpose and affect the function of the stream corridor. The Division assisted Golden Gate and, in cooperation with Water Resources staff, at Florissant Fossil Beds to assess and identify potential corrective actions associated with abandoned and failing impoundment structures. Those dams that pose a health and safety risk to downstream facilities or visitors are addressed by the NPS Dam Safety program (Charles Karpowicz, 202-565-1249).

Facilities and slope-stability issues

When altered to build structures, entire slopes may become unstable and fail as landslides. The Division assisted Glacier with an unstable slope near a water tank, and Golden Gate with assessing the geotechnical report at a learning/housing complex located on a large earthflow.

Cultural resources

While naturally occurring, landforming processes can significantly degrade cultural resources. The Division provided assistance to: (1) Effigy Mounds to evaluate and establish a monitoring program to assess the effects of sedimentation on burial mounds located in the Mississippi River floodplain; (2) El Morro to assess techniques to slow the erosion rate of historic inscriptions that are etched into soft rock faces; (3) a cooperative effort at Zion to restore natural processes in the North Fork Virgin River by removing a culturally significant levee; (4) Sleeping Bear to develop a plan to remove an historic canoe livery on a heavily used stream channel; and (5) New River to evaluate the effects of severe flooding on the historic headquarters building.

Many of the projects in which the Division provided assistance are submitted for funding through NRPP-Resource Management, NRPP-Disturbed Lands, GRD-Abandoned Mineral Lands, other Natural Resources Servicewide funding categories, Line Item Construction, or other fund sources (e.g., regional, Fee Demo, etc.). In addition to the park assistance described above, the Division also provides design specifications, cost estimates, project oversight, technical guidance, and recommendations for outside scientific expertise. ◆

Flood damage assessment at New River Gorge National River

by: Hal Pranger, Geologist

From July 23-30, 2001 the Division helped New River Gorge National River prepare an emergency damage assessment of two major floods. Rainstorms hit the park on July 8 and 26 and caused severe damage. The park needed an accurate, justifiable and quick cost estimate to present to congress for emergency funds.

Mr. Erv Gasser, Natural Resource Specialist, Columbia Cascades Support Office, organized a Resources Assessment Team that functioned like a Burned Area Emergency Response team. Three members of the Resource Assessment Team assessed the hydrologic and geologic damage to the park. Earl Ruby, a retired hydrologist, evaluated the storm precipitation information. Mike Sanders, geologist, Redwood National Park evaluated hillslopes and Hal Pranger, division geologist, evaluated stream channels.

Originally, the Team was assembled just to evaluate the damage from the July 8 storm, when four to six inches of rain fell over much of southern West Virginia in just four hours. The worst part of the July 8 storm hit the park, where 4.5 inches of rain fell at park headquarters and 11 inches fell only four miles away. A second slightly smaller storm hit on July 26 while the Resource Assessment Team was assessing damage from the first storm. The second storm complicated the Team's schedule, but fortunately there was little additional damage.



Flooding at New River Gorge National River's headquarters on July 9, 2001.

The damage caused by the July 2001 storms was due primarily to flooding, landslides and debris flows. Both floods inundated the basement and first floor of an historic building at park headquarters. Small landslides were common in undisturbed areas, but the large landslides all were directly related to reclaimed coal mines. Seven major debris flows on tributary streams damaged park infrastructure such as picnic areas, boat launches, roads, bridges, and private residences.

Section 4.1.5 Restoration of Natural Systems of the 2001 NPS Management Policies states that the NPS will allow landscapes disturbed by natural phenomena such as landslides and floods to recover naturally. Sections 4.6.4 Floodplains, 4.6.6 Watershed and Stream Processes, and 4.8.1 Protection of Geologic Processes state that natural processes should be preserved. The cause for flooding or large debris flows could not be directly linked to any particular man-made disturbances. As a result, the Resource Assessment Team specified no restoration in the affected channels.

The Team could not accurately estimate the relative size of the July 2001 storm, flood and debris flow events. However, several indicators suggest that the July 2001 events were not uncommon. In 1932 eight to 10 inches of rain fell on June 26, and an "even greater amount" fell on July 10. The 1932 storms caused extensive damage and loss of life. Another storm in the 1880s caused the highest flow on record on New River before dams were built. The 1880s storm also devastated the people and infrastructure of the area. The Team also observed large deposits of enormous boulders (up to 20 feet in diameter) at the mouths of tributary streams that indicate huge floods in the not-too-distant past. The urbanization of the upper watersheds on the plateau has increased runoff but to an unknown degree. The magnitude and frequency of storms, floods and debris flows is crucial for the park to be able to plan for future events.



Approximately 14-acre landslide associated with abandoned coal mine spoil near Elverton.

The Resource Assessment Team suggested several flood-related projects including a survey and restoration plan for fresh landslides and gullies directly linked to past mining activities. The Team also suggested that the park install automated streamflow-monitoring stations on two tributary streams and conduct a detailed flood and debris flow risk assessment. The total cost for all proposed items in the project was \$4.6 million. The Team completed its report on July 29 and presented the results to park personnel on July 30. ◆



Local resident of Thayer, WV, next to remains of her house destroyed by a boulder debris flow.

Collaboration



Acadia National Park, Maine

2001 Geologic Society of America annual convention

by: Bruce Heise, Geologist

The Geologic Society of America (GSA) is one of the world's preeminent geological organizations. Over 6,000 geologists representing academia, industry, and government routinely attend their annual convention. Since 1997 the Division has actively participated at the convention by presenting papers or posters, chairing sessions dedicated to park geology, and staffing a booth in the exhibition hall to promote geology in the parks. Over the years, the NPS presence has become an anticipated element of the convention.

At the 2001 Convention in Boston, Division staff contributed in numerous ways. A pre-convention field trip was conducted in partnership with the USGS at Cape Cod National Seashore for park and GRD staff. Two oral sessions were proposed and chaired by Division staff. The Coastal Geology of the National Parks session featured 18 talks by USGS and university scientists on coastal geologic issues confronting NPS coastal units. Several additional talks proposed for this session were hosted by other coastal sessions. The Geology in the National Parks; Research, Mapping, Education, and Interpretation session featured 18 talks by geoscientists on topics ranging from geologic mapping in Colorado to interpretive videos at Great Smoky Mountains. Both sessions were well attended. Division staff presented a paper in the Minerals session on low impact exploration methodologies of oil and gas operations conducted in NPS units.

The NPS booth in the Exhibition Hall is a perennial favorite and, responding to prior years' demand, was increased in size in 2001 to include two booths. Displays included geoscience activities, interpretation products, publications, and research underway in park units. Maps, handouts, information on nearby NPS units and a discussion area were available. In addition, Bryce Canyon staff displayed a poster of their ongoing Geo-detectives project, interpretive and education web pages and activities. The booth provides an opportunity to exchange information on park geology with students, professors, and professional geologists. It also serves as an effective recruiting tool for the Geoscientists-in-the-Parks program. An estimated 800 people visited the booth during its three day duration, generating numerous requests for additional information.

On the final night of the convention, the NPS hosted an open house on geology-related opportunities in the parks, including information on the Geoscientists-in-the-Parks program, the National Cave and Karst Research Institute, coastal geologic research, paleontologic studies, and the Geologic Resource Inventory. Ranger, academic and private sector geologists working in parks, along with all attending Division staff, participated by answering questions and presenting programs. The session was a success with nearly 50 people showing up to listen to and discuss specific geologic opportunities.

The 2002 GSA Annual Convention will be held in Denver, traditionally the largest draw of their convention sites. Expanded outreach programs for the booth and several sessions on park geology have been proposed. ◆

GSA field trip at Cape Cod National Seashore



Staff of Cape Cod National Seashore, the National Park Service's Geologic Resources Division, the U.S. Geological Survey, and Wood's Hole Oceanographic Institute participated in a field trip highlighting the geology of Cape Cod National Seashore on November 3, 2001. The trip was organized by Dr. Rebecca Beavers (GRD), Dr. Jim Allen (USGS), and Dr. Rob Thieler (USGS) to take advantage of the Boston location for the Geological Society of America meeting. This trip provided a unique discussion opportunity in the field and exposed several of the Colorado based Geologic Resources Division staff to coastal geology and seashore management concerns. This trip also provided the background and initial introductions for a follow-up Geoindicators Scoping Meeting conference call in 2002, the purpose of which was to bring together park staff, geoscientists, and other resource specialists to address the issue of human impacts on geologic processes at Cape Cod.

GeoScientists-in-the-Parks sponsored positions in 2001

Every year the NPS Geoscientists-in-the-Parks Program partners with organizations to fund and place physical science expertise in parks. The GIP program manager states, "Our partners are vital to the success of this program. They provide the lion's share of the funding and help us find outstanding candidates." In 2001, the Division partnered with the Geologic Society of America's GeoCorps Program and the Association for Women Geoscientists. Parks supplied most housing and supervision. The number and type of projects and services provided (see below) has greatly contributed to the goals of our parks, partners, and participants.

Park	Project
* All Parks	gather and distribute information regarding Earth Science Week to all parks; improve park website geology pages
* Multiple Parks (unknown #)	compile data on geologic type sections located in NPS units
* Multiple parks (170+)	creation of database to track paleo survey information to all parks; gathered and entered all data; assisted with website reviews; assisted with literature citation database.
Badlands	survey and curation
Big Bend	literature searches and field work to provide a number of detailed geologic site descriptions to apply to analysis of potential survey sites for t/e and exotic species
Big Bend	paleo site survey
Carlsbad Caverns	produce interpretive products for use in school sand visitor center
Capulin Volcano	disturbed lands restoration - trails
Denali	data collection and monitoring
Devils Tower	researching and creating activities and resources in support of school curriculum
Florissant Fossil Beds	inventory, monitoring, and curation
Fossil Butte	examine and summarize rates of fossil theft and associated issues
Fossil Butte	resource mgmt, protection, interpretation of fossil resources
George Washington Birthplace	shoreline erosion evaluation and recommendations
Grand Canyon	continued development of the park's geology training manual
Great Sand Dunes	revise park's research overview for visitors, general interp duties
Indiana Dunes	write geology curricula and training manuals
Haleakala	write geology curricula and develop educational materials, lead environmental programs
Lake Meredith & Alibates Flint Quarries	produce geology interpretive displays, educational materials, website pages
Lake Roosevelt	provide geology interpretive talks
Mammoth Cave	collect inventory, monitoring, and GPS data
Mount Rainier	produce a volcanic hazards curriculum, provide workshops
Morristown	establish and implement an erosion monitoring program to determine the rates of erosion and measure apparent trends within the park to protect archeological resources and address deer over-grazing
Navajo	provide synopsis of park geology, analyze soils, erosion, geologic hazards
Ozark	cave and spring inventorying and monitoring
Petrified Forest	inventory and monitor fossil resources
Point Reyes	map features of 1906 earthquake for interpretation purposes and watershed mgmt
Rocky Mountain	inventory and evaluate glacial and snow fields and summarize findings
Santa Monica Mountains	produce GIS geomorphic hazard susceptibility maps
Sunset Crater Volcano	collect lava samples (dating study), geochemical analysis, produce interp media and talks
Washita Battlefield	provide a literature summary and citation list of area geology for use in future planning documents; produce a park site bulletin on the park geology
Whiskeytown -Shasta-Trinity	map granitic debris flows to estimate timing of events
Wupatki	summarize literature & studies on volcanism, hydrology, and seismology, provide interpretive talks
Yellowstone	liaison btw geologists and Interp staff to produce updated park Resources and Issues Handbook
Zion	complete 3rd grade geology curriculum; coordinated development of interpretive waysides; guided walks; reference for other staff
Zion	via field work, GPS data, and GIS, map ancient lake shoreline; apply information to archeological studies

National Cave and Karst Research Institute-progress and activities

by: Zelda Chapman Bailey, Interim Director

The National Cave and Karst Research Institute was created by act of Congress in 1998 (Public Law 105-325) and placed under the leadership of the National Park Service. The Act stipulated that the Institute will be located in the vicinity of Carlsbad Caverns National Park in New Mexico (but not inside Park boundaries), and that the Institute cannot spend Federal funds without a match of non-Federal funds. The mission of the Institute is to facilitate speleological science, to enhance public education, and to promote environmentally sound cave and karst management. The goals of the Institute, derived from the text of the 1998 Act, are to:

- ▶ Further the science of speleology through coordination and facilitation of research.
- ▶ Provide a point-of-contact for dealing with cave and karst issues by providing analysis and synthesis of speleological information and serving as a repository of information.
- ▶ Foster partnerships and cooperation in cave and karst research, education, and management programs.
- ▶ Promote and conduct cave and karst educational programs.
- ▶ Promote national and international cooperation in protecting the environment for the benefit of caves and karst landforms and systems.
- ▶ Develop and promote environmentally sound and sustainable cave and karst management practices, and provide information for applying these practices.

Progress and current status

The Interim Director for the Institute reported in July 2000 for a two-year period to move forward with NPS efforts to establish the Institute. Key duties include defining the scope of operation, designing an organizational structure and staffing plan, forming partnerships, finding funding sources and a physical facility, and defining research needs. Considerable progress has been made in all these areas during 2001 toward making the Institute operational.

The Institute will not conduct research internally but rather will guide, focus, and encourage research through grants and partnerships. A primary function of the Institute will be to accumulate and organize data and information to make it accessible to investigators and for the Institute staff to use for synthesis of information on regional and national scales. The Institute will coordinate with partners to encourage focused research and studies in caves and



Inspection of Calabash Cave (lava tube cave) in Hawaii Volcanoes NP.

karst systems so that a more coherent and unified body of knowledge can emerge. The Institute will work toward accumulating funding that can be distributed through a grant program that focuses on national issues in cave and karst research and education.

The Institute will require about 12 employees to fully accomplish the goals. These positions include the Director, Science Coordinator, Education Coordinator, and Information Coordinator, and support staff under their direction. Voluntary

advisory boards made up of representatives from a range of disciplines and organizations will play an important role in guiding the science and educational undertakings of the Institute.

The City of Carlsbad and the New Mexico Institute of Mining and Technology (NMT) are the founding partners for the Institute, and additional partnerships with all types of cave and karst interest groups, agencies, and organizations are critical to the long-term success of the Institute. Support from a wide range of public and private groups will enhance the Institute's ability to create a national and international focus on research, education, and information dissemination for better understanding and management of cave and karst resources. Communication is important in forming these partnerships, and the Interim Director made numerous presentations at professional and special meetings to encourage dialogue on formation of the Institute, as well as meeting individually with many representatives of interest groups, organizations, and agencies. Nine articles or abstracts were published in venues such as *Environmental Geology* and *GSA Today* (Geological Society of America) to publicize the formation of the Institute to a wide audience. A web site was launched (www2.nature.nps.gov/nckri) to provide another avenue of communication.

The Institute received its first Federal appropriation for fiscal year 2002 in response to matching State funding appropriated to NMT in support of the Institute in their 2001-2002 fiscal year.

Temporary office space and clerical support will be provided for the Institute during initial staffing through a partnership agreement between the Institute and New Mexico State University in Carlsbad. The City of Carlsbad and NMT petitioned the State legislature for funds to construct a building in Carlsbad for the Institute to occupy.

The Institute currently is sponsoring and participating in some initial projects that will provide useful products and will help publicize the existence of the Institute. These projects require a small amount of funding, but primarily are being conducted with voluntary contributions of time and expertise by participants. The Institute is collaborating with:

- ▶ **Karst Waters Institute (KWI)** to produce a booklet tentatively titled *Protection of Cave and Karst areas on America's Protected Lands*. Associates of KWI, and staff of the NPS, Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (FWS), and U.S. Forest Service (USFS) are contributing written sections. The Institute and FWS provided funding for KWI to edit, publish, and distribute the booklet. The booklet, with an anticipated completion date of late 2002, can be used as a handbook for resource managers to comply with the requirements of the Cave Resources Protection Act, as a source of information for interpreters, and as a training resource.
- ▶ **U.S. Geological Survey (USGS)** to produce a USGS Circular (a magazine-style publication) tentatively titled *The Nation's Cave and Karst Resources: Science and Management*. In addition to the Institute and USGS, BLM, FWS, USFS, and the Environmental Protection Agency are writing sections of the report. Authors will contribute their writing time, the Interim Director will edit and compile the publication, and USGS will cover the cost of preparation, printing, and distribution in late 2002.
- ▶ **USGS** to organize a program to produce an improved national karst map and an associated web-based network of karst information. Federal and State agencies, the speleological community, and academia have repeatedly expressed the need for an accurate and detailed national karst map to better understand the distribution of soluble rocks in the United States. Maps at a variety of scales are needed to educate the public and legislators about karst issues, to provide a basis for cave and karst research, and to aid Federal, State, and local land managers in managing karst resources. The Institute is coordinating the united efforts of a number of groups in this program of national scope and will host a web-based network of karst information used to build the national map. USGS will work with State Geological Surveys and other groups to establish standards and consistent digital products, and will facilitate the digital compilation and production of the national karst map. ◆

The NPS partnership with the Association of American State Geologists

Providing geologic maps for 272 parks is an enormous undertaking, one that would not be possible without partnering with other geologic organizations. While much park mapping has been, and continues to be, done by the U.S. Geological Survey, state geologic surveys are significant contributors as well. The Association of American State Geologists is the umbrella organization for state geologists from all 50 states. They routinely invite NPS participation in their annual meetings to discuss joint state/NPS geologic issues. With a three-year track record of partnering with state agencies for the Geologic Resources Inventory, including funding support for mapping, NPS involvement continues to be well received. State geological surveys expressing an interest in the Inventory include:

- ▶ **North Dakota** - is mapping most of Theodore Roosevelt NP and would like to work cooperatively with the Inventory to complete it.
- ▶ **Arizona** - has produced joint NPS/ Association of American State Geologists publications on the geology of some Arizona parks used as interpretive aids. They are interested in completing the series for all NPS units in the state.
- ▶ **New Mexico** - state director was sufficiently impressed by the Utah volume on the Geology of Utah parks that his state will do a similar publication. The Geologic Resources Inventory will provide funding support.
- ▶ **South Dakota** - is very interested in cave and karst areas as well as Geologic Resources Inventory scoping in Black Hills parks in 2002 as part of their effort to complete geologic mapping of the area. They would like to partner with the Inventory to complete the project in a timely fashion.
- ▶ **Missouri** - is interested in participating in ongoing USGS mapping along the Ozark National Scenic Riverways.
- ▶ **Washington** - has expressed a high interest in proposed 2002 scoping of NPS units in the state. They have already published a series of interpretive brochures on Washington NPS units and have digital geologic map coverage of the entire state at 1:100,000.

For the Inventory to provide its mandated maps and reports to the parks continued partnering with the state surveys will be essential.

Speleological volunteers aid the NPS

by: Ron Kerbo, National Cave Management Coordinator

During 2000-2001, a number of parks reported that numerous volunteer projects were on-going in the parks. These projects ranged from cave inventory and survey to cave restoration field camps. Participants included members of the National Speleological Society (NSS), the Cave Research Foundation and local grottos (clubs) of the NSS. Each year thousands of hours are contributed to the Service's efforts to protect, conserve, manage and interpret caves throughout the system. The Service's programs in caves would not be possible without these generous volunteers of the speleological community.

Highlights reported from the field include:

Mammoth Cave National Park

The NSS conducted another successful restoration camp. Top priority for the camp was the removal of a rotting boardwalk in River Styx. Volunteers dismantled sixty-one feet of the heavily timbered walkway and also removed several hundred feet of electrical cable. A total of three dump truck loads of materials were removed from the cave.

Wind Cave National Park

A park volunteer recently completed a database of all the volunteer cave surveyors that have worked in Wind Cave in preparation for a special edition 100-mile Wind Cave map. This map is expected to be published in 2003, during the 100-year park anniversary. As expected, former National Speleological Society President John Scheltens was the most



A volunteer cleans up old spilled candle wax drippings along a tour route in Wind Cave.

prolific surveyor in Wind Cave, with 154 survey trips. Out of the 822 people that have surveyed in Wind Cave to date, 435 only went on a single survey trip. A total of 83 cavers have gone on more than 10 trips, 40 have gone on more than 20 trips, and 10 cavers have gone on more than 50 trips.

Carlsbad Caverns National Park

During a "lint camp," twenty-one volunteers removed approximately 25 pounds of lint from various portions of Carlsbad Cavern. This dedicated group donated 535 hours to rid Carlsbad Cavern of this unsightly and damaging material.



Volunteers assist researchers by conducting a visual survey of cave biota in Room Draculum, Wind Cave National Park.

Craters of the Moon National Monument

The Boise based Gem State Grotto of the NSS removed a twenty-year old culvert-type gate in Arco Tunnel. Grotto members were instrumental in the design and construction of a new bat gate that was installed in 1999 as a replacement for the culvert gate.

Sequoia and Kings Canyon National Parks

During the Crystal Cave restoration project more than 30 people worked on various projects such as removing no-longer used wire from an old surface trail, cleaning rimstone with a wet vac, and hose cleaning rimstone and flowstone. ◆

National Park Service/United States Geological Survey partnership advances park resource management

by: Lindsay McClelland, Geologist

Scientific information from the U. S. Geological Survey (USGS) is an integral component of understanding, managing, and protecting park resources. USGS geologists work with scientists from other disciplines to link geologic framework and processes with ecosystem functions in a variety of environments. In 2001, this successful partnership led to several important advances in park resource management as summarized below.

Of the 43 potentially active volcanoes monitored by the USGS Volcano Hazards Program, 22 are in units of the National Park System. The USGS Hawaiian Volcano Observatory worked with Hawaii Volcanoes National Park and Hawaii County to identify a safe, road-accessible site for the public to view lava flowing from Kilauea's east rift. Since the eruption began in 1983, lava flows have destroyed almost 200 structures (including a park visitor center), covered 13 km of highway with lava, and added 207 hectares to Kilauea's southern shore. The active vent releases between 1,000 and 2,000 metric tons of sulfur dioxide gas per day, producing significant volcanic air pollution on the Island of Hawaii and in the park. In addition to their detailed monitoring of Kilauea's volcanic system, USGS volcanologists are documenting its history of explosive eruptions, including several in the 16th-18th centuries, most recently in 1790 when many Hawaiian warriors were killed.

The Yellowstone region encompasses the largest active magmatic system in North America, centered on an enormous caldera that is characterized by major seismicity, deformation, and thermal activity, and infrequent but very large and destructive eruptions. In May, 2001, a Memorandum of Understanding among the NPS, USGS, and University of Utah established the Yellowstone Volcano Observatory, to provide a stable long-term basis for ongoing monitoring, hazard-assessment, and research activities, and to communicate more effectively the results of these efforts to responsible authorities and to the public. More information about the Observatory is available at its new tri-agency website <http://volcanoes.usgs.gov/yvo/>.

The USGS, in cooperation with the NPS and the University of New Hampshire, produced a highly detailed map of the floor of Crater Lake. GIS analysis of the map data, and the resulting multiple views of the lake floor, won an ESRI, Inc. award in 2001. Monitoring began at another park volcano in 2001, when the Alaska Volcano Observatory established instrumentation on Mt. Wrangell, in Wrangell-St. Elias National Park.

The USGS landslide hazard program is working closely with staff of Yosemite National Park to monitor recent rockfalls and assess geologic hazards as they affect park facilities, such

as the continued temporary closing of part of Camp Curry in the aftermath of a series of rockfalls in 1999. In Shenandoah National Park, USGS landslide experts are examining the relationship of slope processes and landslide recurrence intervals to climate change, sampling charcoal and pollen from prehistoric landslides to determine the dates and climatic conditions when they occurred. USGS geologists and hydrologists assessed flooding and landslide damage at New River Gorge National River after heavy rains in July.

USGS geologic maps provide key information for protecting NPS water resources. USGS geologic mapping of 12 quadrangles around Ozark National Scenic Riverways, completed in 2001, is being used to develop a regional geologic framework with which hydrogeologists will assess the potential for proposed lead mining to contaminate karst aquifers that feed the area's world-class springs. USGS hydrologists are using chemical and isotopic data to analyze the mix of ages and sources of water emerging from the springs. Geologic map data are also being used, in cooperation with the park and the Missouri Department of Conservation, to assess geologic controls on vegetation distribution.

A new USGS 30x60-minute geologic map depicting the south rim of the Grand Canyon provides critical structural information for analysis of geologic controls on groundwater movement and spring discharge. USGS geologic mapping of Death Valley is also critical for management of scarce water, and is interpreted for the public on a USGS-NPS website.

Geological and geochemical information is also important in addressing biological resource issues. In the Everglades, the neurotoxin methylmercury is found in high concentrations in freshwater fish, posing a potential threat to humans and wildlife who consume fish. USGS research shows that sulfur is a key regulator of methylmercury distribution through biogeochemical processes in sediments. Isotope studies document that sulfur at up to 100 times background levels is entering the ecosystem in canal water draining agricultural areas, where it is used in sugar cane and vegetable production. The excess sulfur is believed to interact with mercury from airborne sources to produce the Everglades' abundant methylmercury.

USGS and university scientists continued a collaborative study to assess coral reef health in the Hawaiian Islands, monitoring oceanographic conditions, and assessing sediments beneath the reefs to better understand their evolution since the Ice Age. Elsewhere, USGS scientists have developed new technology that demonstrates that high levels of carbon dioxide in seawater promote dissolution of surrounding reef sediments, causing chemical changes that buffer the reef from dissolution.

USGS specialists are acquiring data for coastal vulnerability maps and associated GIS layers for a number of parks, assessing the impacts of the anticipated rise in global sea level. Similar technologies will be used to monitor change along the Great Lakes, where significant declines in lake levels are forecast for the next half-century.

Cooperation with the NPS in interpretation of geological information is an important component of a number of USGS projects in parks. USGS scientists provide geology training for interpreters in many parks, work with park management to help communicate issues such as geologic hazards to the public, develop geology displays and publications in cooperation with park staff, and help build website material that links with information on USGS websites. The USGS and the NPS Harpers Ferry Center cooperated in the production of a new video on the geology of the southern Appalachians, describing a billion years of geologic history and emphasizing its impact on the lives of people. The video and teachers' guide will be distributed to schools, libraries, and visitor centers in the region.

The NPS Geologic Resource Inventory relies heavily on its partnership with the USGS National Cooperative Geologic Mapping team to accomplish its goals. In 2001, Inventory scoping in association with the USGS was conducted in the National Capital Region parks, the Grand Canyon, the Flagstaff area parks, Petrified Forest, and the above mentioned Ozark Scenic Riverways. Direct funding from the Inventory went to support USGS work in Coronado, National Capital Region, Death Valley, Great Smoky Mountains, and Kings Mountain.

Previous Inventory funding used to support USGS geologic mapping in Colorado National Monument evolved into a national award winning poster of the Monument's geology and its control of the overlying biologic communities. GRD staff were invited by the USGS to participate in their annual Open House in Reston, VA, where the poster, and associated Inventory program, were presented to the Secretary of Interior. ◆

Park Assistance



Death Valley National Park, California

Division park assistance listing

Support Provided to Regions, Parks, and Other NPS Organizational Units.

Alaska Region

Cape Krusenstern National Monument

- ▶ Assisted park and region in determining whether the U.S. could grant an avigation easement across federal lands to mining company.
- ▶ Assisted park and region with interpreting various provisions of the 1985 Agreement between NANA Regional Corporation and the NPS regarding mining company's activities along the transportation corridor through the park to the Red Dog Mine.
- ▶ Reviewed and commented on charter for "policy team" regarding handling of mining company's activities along the transportation corridor through the park to the Red Dog Mine.

Denali National Park and Preserve

- ▶ Completed a technical review of the Howtay mineral appraisal and sent comments.
- ▶ Assisted in the development of a parkwide sand, rock and gravel plan.
- ▶ Helped the regional office and park work out with the Bureau of Land Management the tasks and the sharing of expenses associated with reconciling outstanding questions regarding the validity of the Gold King claims.
- ▶ In conjunction with Bureau of Land Management staff, re-mapped the Gold King claims and designed a re-sampling plan.
- ▶ Assisted in reviewing past placer claim validity reports for technical adequacy.
- ▶ Participated in NPS/BLM re-mapping of Gold King placer claims, and in developing sampling plan for future field examination pending failure of settlement in takings litigation.

Wrangell-St Elias National Park and Preserve

- ▶ Completed technical review of the Kennecott Mine donation mineral appraisal.
- ▶ Completed the Thorgaard Mineral Appraisal technical review.
- ▶ Completed the Eidemiller Mineral Appraisal technical review.

- ▶ Completed the Geohenda Mineral Appraisal technical review.
- ▶ Completed the Cosmopolitan Mineral Appraisal technical review.

Intermountain Region

Badlands National Park

- ▶ Participated in planning sessions for "Big Pig Dig."
- ▶ Helped park develop descriptions of relative impacts to paleontological resource for the EIS that is being prepared as part of the park's GMP revision.

Big Bend National Park

- ▶ Worked with park on review on development of proposed procedures for collection of dinosaur bones from wilderness area in park.
- ▶ Assisted the park with disturbed land restoration funding proposals.
- ▶ Provided on-site assistance to ongoing Disturbed Lands Restoration Project regarding accelerated soil erosion and ecological site identification for restoration activities

Bighorn Canyon National Recreation Area

- ▶ Developed restoration recommendations for abandoned ranching and mining roads.

Big Thicket National Preserve

- ▶ Reviewed and commented on the waiver application for Cobra Oil and Gas Corporation Quinn 2-84 well.
- ▶ Provided extensive assistance in responding to a prospective operator's request that the NPS streamline its policy and procedures governing operations that directional drill into parks to reach nonfederal oil and gas under 36 CFR §9.32(e).
- ▶ Assisted park to get recalcitrant operator (Premium) into compliance with NPS regulations.
- ▶ Assisted park and Field Solicitor with defensive litigation strategy in suit brought by recalcitrant operator (Premium) against the park.
- ▶ Assisted park to get a recalcitrant operator (Buford Curtis) into compliance with NPS regulations.
- ▶ Assisted park in reviewing Merit Energy's plan to plug and abandon its well.

Capulin Volcano National Monument

- ▶ Developed restoration standards for undesignated trails and related erosion.

Carlsbad Caverns National Park

- ▶ Completed a trip report for the site inspection of geohazards (fallen rock) within the cave and assisted maintenance department with geohazard assessment of potential rock fall areas along the access road to the visitor center.

Curecanti National Recreational Area

- ▶ Worked with park to arrange for preparation of dinosaur fossil.
- ▶ Provided mineral appraisal consultation and review of two third-party mineral appraisals for the Dickerson Pit buy-out analysis.
- ▶ Assisted the park with administration of the Gunnison Gravel mining operation.

- ▶ Developed restoration prescriptions and assisted with funding proposals for the Elk Creek Pumphouse and access road.

Dinosaur National Monument

- ▶ Provided information on the development of a parkwide sand, rock and gravel plan

El Malpais National Monument

- ▶ Evaluated the diversions and impoundments in the Aqua Fria Creek valley, their impact on cave resources and their restoration potential

El Morro National Monument

- ▶ Assessed the effects of runoff and erosion on the rock inscriptions around Inscription Rock

Florissant Fossil Beds National Monument

- ▶ Collaborated with park paleontologist to examine potential methods for stabilization of fossil redwood stumps.
- ▶ Developed restoration plans for seven impoundments and assisted the park in the removal and restoration of five of those impoundments.

Glacier National Park

- ▶ Evaluated landslide potential to an existing trail and access road.

Glen Canyon National Recreational Area

- ▶ Conducted scoping session on fossil resources.
- ▶ Provided guidance to the park, Intermountain Region, State of Utah, and Navajo Nation on closure and reclamation of Whirlwind uranium mine in the context of mixed land ownership issues and varying cleanup standards.
- ▶ Assisted park in preparing NEPA documents for closure of Blue Notch and White Canyon uranium mines.

Great Sand Dunes National Monument

- ▶ Worked with Fred Bunch to determine whether an assessment of future oil and gas resources should be prepared for the park by the USGS.
- ▶ Reviewed and commented on the CO State Land Board policy for mineral development on stewardship trust lands in the state.

Guadalupe Mountains National Park

- ▶ Conducted geology scoping session to identify needs for paleontological research and resource management.

Lake Meredith National Recreation Area

- ▶ Updated Alternatives and Environmental Consequences chapters for the park's Oil and Gas Management Plan / FEIS.
- ▶ Reviewed and commented on the plan of operations for Luxor Oil and Gas continuing operations of the #A-1R, and #A-2 wells and drilling of the McBride #8 well.
- ▶ Reviewed and commented on the environmental assessment for the continuing operation of Chesapeake Operating Inc. Lea 101, Lea 1R and Sneed 103 wells.

- ▶ Assisted in the preparation of a scoping package for Pioneer Natural Resources continuing operation of 49 gas wells and the re-entry of 26 wells.

- ▶ Assisted park with Duke Energy's plan to install a pipeline within its right of way to transport helium across the park.

Mesa Verde National Park

- ▶ Provided information to the park regarding the impacts of future oil and gas operations near the proposed cultural resources museum.

- ▶ Commented on draft EIS for coalbed methane development on the adjacent Southern Ute Indian Reservation.

Padre Island National Seashore

- ▶ Coordinated and participated in site visit by USGS staff to assess hydrocarbon contamination at 3 oil and gas sites in the

park. Provided technical review comments on the USGS report that summarized the findings of the site visit.

- ▶ Provided technical review and comment on the Oil and Gas Management Plan / FEIS and Record of Decision.
- ▶ Reviewed and commented on the plan of operations and environmental assessment for the BNP, Dunn Murdock #1 well.
- ▶ In response to a request from the Department of the Interior, developed a briefing statement explaining the status and management of nonfederal oil and gas rights in the park and prepared a comparison of NPS oil and gas requirements with those of other agencies.
- ▶ Prepared a briefing statement to explain the Dunn-McCampbell litigation at the park that challenged the Service's nonfederal oil and gas regulations in the mid-1990s.
- ▶ Worked with the park to get NPS concerns addressed in the dredge and disposal activities conducted by the U.S Army Corps of Engineers in and adjacent to the park.
- ▶ Conducted site visit to assess coastal processes and assisted with review of coastal management actions at Mustang Island State Park.
- ▶ Assisted park with getting recalcitrant operator (Vector) to clean up site contamination and into compliance with NPS regulations.
- ▶ Examined the park's enabling statute to determine whether state mineral lessee has right to occupy park land to conduct operations.

Petroglyph National Monument

- ▶ Prepared scope of work for reclamation plan for 3 cinder mines.

Pipe Spring National Monument

- ▶ Review and comment on engineering contract proposal for reconstruction of portal at collapsed spring entrance.

Rocky Mountain National Park

- ▶ Facilitate Rocky Mountain 2-day scoping meeting for Strategic Plan goal on "geologic processes."

Saguaro National Park

- ▶ Reviewed and commented on Wildhorse Mine bat gating proposal for a colony of 7,000 *Myotis velifer*, then provided onsite technical oversight during gate construction.
- ▶ Reviewed and commented on Draft Phase I and II Environmental Site Assessments for the Old Yuma Mine

tailings, and provided recommendations for closure and associated costs to be used in buy-out arbitration.

Sonoran Desert Network

- ▶ Participated in the Sonoran Desert Network 2-day vital signs scoping meeting and made a presentation on the application of geoinicators.

Washita Battlefield National Historic Site

- ▶ Developed restoration plan and design for 20th century railroad grade.

Wupatki National Monument

- ▶ Completed a restoration plan for 12 abandoned borrow pits.

Yellowstone National Park

- ▶ Provided park with comments on Gallatin NF 2001 New World Mining District work plan.
- ▶ Provided park with technical comments on draft EE/CA for moving the McLaren Tailings to a new location.
- ▶ Participated in the Greater Yellowstone Network web based "Delphi" vital signs monitoring process and identify geologic long-term monitoring needs.

Zion National Park

- ▶ Assisted the park in evaluating contractor's plans to restore North Fork Virgin River.
- ▶ Provided park with letter to BLM regarding NPS opposition to proposed lease sale of tracts for coalbed methane exploration and development adjacent to park.

Midwest Region

Regionwide

- ▶ Participated in the Mid-West Region vital signs 2-day workshop and made a presentation on the application of geoinicators to identify geologic monitoring needs.

Buffalo National River

- ▶ Developed mitigation strategy for sediment and storm water runoff from roads.

Effigy Mounds National Monument

- ▶ Assessed the effects of Mississippi River flooding and sedimentation on over 100 Native American burial mounds in the Sny Magill unit.

Keweenaw National Historic park

- ▶ Conducted a technical review of the appraisal of the mine facility property and its hazardous materials potential and need for a Level II Survey.
- ▶ Reviewed the Level I Hazardous Materials Survey for the subject property

Ozark National Scenic Riverways

- ▶ Facilitated Ozark Scenic Rivers scoping meeting for Strategic Plan goal on "geologic processes."

Sleeping Bear Dunes National Lakeshore

- ▶ Facilitated Sleeping Bear Dunes 2-day scoping meeting for Strategic Plan goal on "geologic processes."
- ▶ Conducted site visit to assess dredging impacts on adjacent shoreline.
- ▶ Surveyed and developed channel bank restoration plans for Platte River at the M-22 bridge.
- ▶ Surveyed and developed a restoration plan for one of the many Stanz Dump sand pits.
- ▶ Evaluated the success of restoration for three former gravel pits.

Scotts Bluff National Monument

- ▶ Provided field assessment of a serious rock slide, assisted the Superintendent with television interviews for the local news, provided a written analysis of the site investigation, and reviewed the park's Environmental Assessment for the blasting to remove the geohazard.

Tallgrass Prairie National Preserve

- ▶ Assisted the park in obtaining a favorable Regional Solicitor Opinion, which interpreted the park's enabling legislation and gave guidance as to its regulatory authority over nonfederal oil and gas operators.

National Capitol Region

Chesapeake and Ohio Canal National Historic Park

- ▶ Provided information to park staff on the abandoned mine shafts within the park.

Harpers Ferry National Historic Park

- ▶ Provide technical engineering review for Jefferson Rock Geohazards Contract proposal.

Northeast Region

Acadia National Park

Allegheny Portage Railroad NHS

- ▶ Reviewed and commented on acid mine drainage report.

Assateague Island NS

Cape Cod National Seashore

- ▶ Conducted site visit with Jim Allen (USGS) to assess coastal resources.
- ▶ Participated in Vital Signs Shoreline Position planning meeting.

Fire Island National Seashore

- ▶ Facilitate Fire Island 2-day scoping meeting for Strategic Plan goal on "geologic processes."
- ▶ Conducted site visit to assess coastal processes and Barrett Beach/Talisman area.

Friendship Hill National Historic Site

- ▶ Reviewed and provided comments on Ice pond Run Environmental Analysis Sludge Pond Project.

New River Gorge National River

- ▶ Provided stability analysis of landslides from July 2001 storm event.
- ▶ Participated in an emergency incident response team that evaluated the major flooding, erosion and landslide problems affecting the park from two July 2002 storm events.
- ▶ Provided field assistance for site characterization and engineering analysis of Brooklyn spoil pile stabilization project and historic incline tunnel at Kaymoor Mine complex.

Pacific West Region

Cabrillo National Monument

- ▶ Helped park address the issue of road erosion caused by coastal processes.

Channel Islands National Park

- ▶ Reviewed and commented on the DEIS for Delineation Drilling Activities in Federal Waters Offshore Santa Barbara County, California.
- ▶ Reviewed project agreement for GMP revision, and suggested the inclusion of paleontological resources in the document.
- ▶ Provided guidance on development of a sustainable management strategy for roads on Santa Rosa Island.

City of Rocks National Reserve

- ▶ Provided information on the development of a parkwide sand, rock and gravel plan.

Death Valley National Park

- ▶ Conducted inspection of Rainbow and Caliente talc mines in collaboration with Bat Conservation International and made appropriate closure recommendations.

Golden Gate National Recreation Area

- ▶ Reviewed and commented on Engineering/Geologic Report for Slide Ranch.
- ▶ Evaluated a total of nine disturbed lands sites in the Marin Headlands and in the Presidio and developed plans to restore or commented on those sites.

Joshua Tree National Park

- ▶ Conducted preliminary survey of Pinto Basin for fossil resources and helped arrange partnership with San Bernardino County Museum for further work.
- ▶ Developed a parkwide gravel pit restoration plan for 19 disturbed land sites.
- ▶ Conducted pre-closure inspections of 9 mine sites with 38 individual mine openings in collaboration with Bat Conservation International, and made appropriate closure recommendations for each.
- ▶ Provided guidance on disposal of abandoned explosives at El Sid Mine.

Klondike Gold Rush National Historical Park

- ▶ Provide Seattle Unit with information on placer mining impacts for educational kit.

Lassen Volcanic National Park

- ▶ Conducted topographic and bathymetric surveys and developed a dam removal and stream restoration plan for the Dream Lake Dam.

Mojave National Preserve

- ▶ Responded to San Francisco Regional Solicitor's Office request for assistance in interpreting NPS mining regulations.
- ▶ Assisted park staff in answering FOIA request and in denying premature reclamation proposal for Golden Quail pit, which is to be left open for evidence in future contest proceedings.

Nez Perce National Historic Site

- ▶ Prepared draft memo for the park to send to the BLM summarizing the law that prohibits leasing of federal minerals with unit of Nez Perce NHS.

Olympic National Park

- ▶ Developed a chronology of the administrative history of the efforts by mineral owners to develop their alleged mineral rights at Shi Shi Beach, a designated wilderness area in the park. The history spans 8 years.
- ▶ Prepared a draft response for the Superintendent's signature that upheld his decision to deny a proposed sand and gravel exploration plan at Shi Shi Beach for failure to demonstrate proof of ownership rights.
- ▶ Facilitated a 2-day scoping meeting for Strategic Plan goal on "geologic processes."
- ▶ Conducted site visit to assess coastal processes and evaluate Kalaloch Lodge erosion concerns and relocation plans.
- ▶ Developed a gravel extraction and bridge stabilization plan for the Finley Creek Bridge.

Oregon Cave National Monument

- ▶ Conducted scoping session to mitigate possible impact to cave resources including fossils on proposed wild cave tour.

Pinnacles National Monument

- ▶ Assisted the park in surveying upper Chalone Creek and developing the Old Pinnacles Road Restoration project.

Santa Monica Mountains National Recreation Area

- ▶ Sent land slide and rock mechanics information to park staff for Geologist in the Park project.

San Juan Island National Historical Park

- ▶ Participated in the Greater Yellowstone Network web based "Delphi" vital signs monitoring process and identify geologic long-term monitoring needs.

- ▶ Evaluated Cattle Point Road erosion and road relocation plans.

War in the Pacific National Historical Park

- ▶ Drafted a letter on behalf of the park explaining to a fiber optic cable company the NPS laws, regulations, and policies that would govern the company's right-of-way across park coral reefs.

Southeast Region

Big Cypress National Preserve

- ▶ Prepared a "Reasonably Foreseeable Development Scenario for the remaining hydrocarbons underlying Big Cypress National Preserve. Scenario based on USGS assessment of remaining oil and gas reserves underlying the Preserve.
- ▶ Prepared meeting materials and participated in the Alternatives Meeting for the Preserve's Oil and Gas Management Plan.
- ▶ Prepared Alternatives Chapter, and Legal and Policy requirements appendix for the Oil and Gas Management Plan / EIS.
- ▶ Assisted park with a variety of policy issues related to the Collier Resources Company's attempt to sell its mineral interest within the Preserve to the United States.

Big South Fork National Recreation Area

- ▶ Assessed landslide potential on coal spoil piles along scenic railway.
- ▶ Assisted park in reviewing operator's (Warren) plan.
- ▶ Advised park on legal issues associated with operator's plan to unitize existing field, which would have included federal minerals.

Cape Hatteras National Seashore

- ▶ Helped park voice its concerns with a proposal by the U.S. Army Corps of Engineers to construct two two-mile long jetties and implement a sand bypass system at Oregon Inlet, which is situated inside the park boundaries.
- ▶ Represented NPS at initial meeting and helped the park respond to a GAO audit of the proposed jetty project.
- ▶ Drafted a request for advice to the Southeast Regional Solicitor's Office.

- ▶ Worked with the U.S. Fish & Wildlife Service to involve the Council on Environmental Quality (CEQ) in the project.

- ▶ Drafted briefing papers and compiled background documents for the NPS Director and the Department of the Interior about the project, the inadequacy of the Corps' NEPA compliance, the CEQ referral, and the subsequent CEQ site visit.

- ▶ Drafted a briefing statement about the project for public distribution.

- ▶ Prepared a paper for the park describing NPS wetland policies, the impact of the jetty project on NPS wetlands, and the wetland mitigation costs unaccounted for the Corps.

- ▶ Developed follow-up documents for CEQ, in response to CEQ's request for clarification about several discrete issues of the jetty project.

- ▶ Drafted response letters on behalf of the park to local proponents of the jetty project.

- ▶ Helped the NPS act as a cooperating agency in the Corps' preparation of an environmental assessment for a proposed dredging project in the inlet.

Great Smoky Mountains National Park

- ▶ Prepared detailed closure recommendations and funding proposals for Eagle Creek and Sugar Fork copper mines.

Gulf Islands National Seashore

- ▶ Participated in meeting with US Army Corps of Engineers and coordinated a response from the park to a proposal to construct groins on adjacent lands.
- ▶ Conducted site visit to assess beach erosion concerns and mitigation actions planned at Fort Massachusetts.

Service-wide

Disturbed lands restoration and abandoned mineral lands programs

- ▶ Instructed federal employees in USDA Forest Service-sponsored Mine Safety Workshop, including NPS employees from Buffalo National River, Death Valley, Great Basin, Mojave, Whiskeytown, and Western Archeological Conservation Center.
- ▶ Convened Restoration Technical Advisory Group (RTAG) meetings to coordinate projects with overlapping divisional roles within the Natural Resource Program Center.

- ▶ Prepared Operations Formulation System (OFS) Funding Request for \$1,500,000 to be added to the Service's current Abandoned Mineral Lands budget of \$500,000.
- ▶ Attended National Association of Abandoned Mine Lands Programs Annual Conference, which is where GRD has made the most contacts to set up state cooperative agreements through which many NPS abandoned mine closures have been financed and contracted.
- ▶ Populated GRD website with often-requested articles, maps, and statistical data on the NPS Abandoned Mineral Lands Program.

Interagency coordination and collaboration

- ▶ Provided technical assistance to the Idaho State Office of the Bureau of Land Management on abandoned mine land technology.
- ▶ Sent bat gate engineering drawings to Montana Bureau of Land Management.
- ▶ Provided technical assistance to the Pima Indian Reservation abandoned mine land coordinator.
- ▶ Telecommunicated with Minerals Management Service staff on coal bed methane near Baggs, Wyoming.
- ▶ Participated on the Colorado Advisory Panel for Abandoned Mine Land Projects.
- ▶ Renewed cooperative agreement with Bat Conservation International for protection of significant bat habitat in abandoned mines and caves within the National Park System.
- ▶ NPS delegate to the Colorado Bat Working Group participated in preparing a Colorado Bat Conservation Plan.
- ▶ Gave radiation and on-site underground mine safety training to members of Colorado Division of Wildlife volunteers and personnel involved in conducting surface and subsurface mine surveys for bats.
- ▶ Renewed cooperative agreement with Utah Division of Oil, Gas, and Mining for assistance in closing abandoned mines in Utah NPS units.
- ▶ Attended BLM National Hardrock Minerals Conference.

Policy and regulatory assistance

- ▶ Completed sections for Natural Resource Reference Manual # 77 that provide information and guidance for managing cave and karst systems, disturbed land restoration projects, geologic resources, paleontological resources, and soils.

- ▶ Provided comments on draft Director's Order # 50c, Public Risk Management, and on draft Director's Order #13, Environmental Leadership Initiative.
- ▶ Provided informal technical comments on H.R. 2974, the "Paleontological Resources Preservation Act."
- ▶ Assisted Acting Director with question related to the applicability of the "Federal Advisory Committee Act" to the establishment of advisory committees for the Institute. Coordinated meeting with assistant regional Solicitor to discuss FACA issues.
- ▶ Co-coordinated the planning of the Natural Resources Protection Law and Policy Course for Superintendents with the Water Resources Division and the Albright Training Center.
- ▶ Arranged for a candidate in the Executive Management Training Program to examine and make recommendations on the Service's implementation of language in the Geothermal Steam Act Amendments of 1988
- ▶ Prepared draft legislative language that would enable the NPS to conduct transboundary studies and projects designed to enhance park protection.

Validity program

- ▶ Arranged for and participated in a meeting between managers from the Bureau of Land Management and the NPS to discuss the merits of allowing the NPS to recover the cost of conducting validity exams in parks under a BLM rulemaking.
- ▶ Participated in BLM Mineral Examiner Certification Panel, including 2 regular meetings, a meeting to rewrite the Mineral Examiners Handbook, and review of validity exams associated with takings litigation in Denali National Park.
- ▶ Updated 1988 version of NPS Procedures for Conducting Mineral Examinations and Writing Mineral Reports.

Other

- ▶ Participated in the Senior Engineering Design Trade Show judging at the Colorado School of Mines.
- ▶ Teach 29 interns at the British Primary School on using map scales as a math tool.
- ▶ Participated in Career Day at local elementary school and discussed science careers with the National Park Service.
- ▶ Taught Earth Science to 7 classes at Green Mountain High School ("Mining and the Environment: Tradeoffs for a Sustainable Society").

- ▶ Provided California Department of Conservation with abandoned mine lands information.
- ▶ Provided a slide show and demonstration of polyurethane foam to the Colorado School of Mines Denver Alumni Chapter.
- ▶ Consulted with the City Engineer (Downieville, CA) on the selected use of polyurethane foam for backfilling sewer pipes in areas of critical environmental concern.
- ▶ Consulted and provided technical information on polyurethane foam to close 800 mine shafts to the Department of Natural Resources, Emerald, Australia.
- ▶ Presented on NPS Bat Gating Program at the Mine Design, Operations & Closure Conference in Whitefish, MT.
- ▶ Attended acid mine drainage workshop hosted by U.S. Army Corps of Engineers in Butte, MT. ◆



Geologic Resources Division staff

Geologic Resources Division staff profiles

Lindy Allen - Division Secretary

Lindy joined the Division this year and is new to the NPS. As Division Secretary, she provides administrative support for the entire Division. She serves as the main contact for meeting planning, logistics and travel. Lindy holds a BA in Journalism and Political Science from Indiana University. Telephone: 303-969-2090; e-mail: lindy_allen@nps.gov

Zelda Chapman Bailey - Interim Director, National Cave and Karst Research Institute

Zelda's duties as the Interim Director of the National Cave and Karst Institute include moving forward with NPS efforts to establish the Institute by defining the purview and scope of operation, designing an organizational structure, forming partnerships, finding funding sources and a physical facility, and defining research needs. Her previous work experience includes various positions with the USGS, including Assistant District Chief for Operations in the Caribbean District, Associate District Chief for Hydrologic Studies in Colorado, and Acting District Chief for Colorado and Wyoming. Zelda has a degree in geology from Indiana University. Telephone: 303-969-2082; e-mail: zelda_bailey@nps.gov

Rebecca L. Beavers - Coastal Geologist

Rebecca is responsible for marine resource, coastal geomorphology, coastal processes, and resource management related issues. She has worked with the U.S. Geological Survey and the U.S. Army Corps of Engineers on a variety of coastal and nearshore research projects since 1993. Rebecca held a Research Assistant Professor and now adjunct faculty appointment at the University of North Carolina at Wilmington. She has worked with GRD since 2000. B.A. in Biology and Geology (Williams College), Ph.D. in Geology (Duke University). Telephone: 303-987-6945, e-mail: rebecca_beavers@nps.gov

Julia Brunner - Policy and Regulations Specialist

Julia works on regulatory and policy issues related to mining claims, nonfederal mineral operations, geologic resources (particularly geohazards and coastal issues), paleontological resources, mining-generated solid waste, wilderness, and disturbed land restoration. Before joining the Division, Julia clerked at a law firm and for the Idaho Supreme Court. Julia holds a B.A. in biology with an ecology emphasis from Dartmouth College and a J.D. from the University of California-Berkeley-Boalt School of Law. Telephone: 303-969-2012, e-mail: julia_f_brunner@nps.gov

John E. Burghardt - Geologist/Certified Mineral Examiner

John's duties are split evenly between coordinating the Mining Claim Validity Program and participating in the Abandoned Mine Lands segment of the Disturbed Land Restoration Program. John provides mine safety instruction to federal and state agencies and participates in bat conservation initiatives as they relate to bat habitat in abandoned mines. John represents the NPS on the Bureau of Land Management's National Mineral Examiner Certification Panel, and on the Colorado Advisory Board of the Western States Bat Working Group. He worked for 10 years as a miner, surveyor, and engineer for Amax, Inc. at Henderson Mine. He received a B.S. in geology from Colorado State University in December 1976. Telephone: 303-969-2099, e-mail: john_burghardt@nps.gov

Philip Cloues - Mining Engineer/Mineral Economist

Provides expertise for the Division in mining and exploration plan evaluation, environmental mitigation, regulation analysis for leaseable, locatable, and mineral material development, mineral appraisal, economic feasibility analysis, mineral royalties, equipment selection, mine restoration, and geohazard assessment. Phil worked for four years in the private sector, spent two years with the Peace Corps (Ministry of Mines in Venezuela), and 30 years with DOI (USGS/10, MMS/2, BLM/6, and NPS/12). MS Mineral Economics & EM Mining Engineering/Colorado School of Mines. Telephone: 303-969-2148, e-mail: phil_cloues@nps.gov

Tim Connors - Geologist

Tim's major duties include oversight of the Geologic Resources Inventory as well as general computer support, web page development, and providing Geographic Information Support (GIS) to the division. He has been with the NPS and GRD for three years. Tim's educational background includes an MS in Geology (1996, University of Toledo, Toledo Ohio) and a BS in Geology (1991, University of Toledo, Toledo Ohio). Telephone: 303-969-2093, e-mail: tim_connors@nps.gov

Sid Covington - Geologist/Certified Mineral Examiner

Sid is the Division contact for geothermal resources, aeolian processes and geologic input for park planning documents. He is also a Certified Mineral Examiner. Sid has worked for private industry as an exploration geologist, production geologist, and a Land Reclamation Superintendent. He was also an Assistant Professor of Geology and Mathematics at Colorado Mountain College. Sid's government service includes duties as a mineral examiner with the U.S. Forest Service, and a coal and petroleum geologist with the U.S. Geological Survey. Sid holds an M.S. degree in geology

from Florida State University. Telephone: 303-969-2154; e-mail: sid_covington@nps.gov

Diane Diedrichs - Program Analyst

Diane tracks the entire budget for the Division. She is responsible for obligating and transferring funds for each separate program. Diane began her career at the NPS 15 years ago, and has worked as the Program Analyst for the Division for 5 years. Telephone: 303-969-2070; e-mail: diane_diedrichs@nps.gov

Judy L. Geniac - Environmental Protection Specialist

Judy manages the Natural Resource Program Center's GeoScientist-in-the-Parks Program. She helps parks identify physical and associated ecological resource projects, the type and level of expertise needed, and funding sources and individuals to do the work. Previously, she worked for the U.S. Fish and Wildlife Service, Bureau of Land Management, Corps of Engineers, and other NPS offices: Everglades NP, Big Cypress NP&P, and Colorado NM, and the Water Resources Division via the Colorado State University. Judy has a B.A. in biology and masters credits in environmental management. Telephone: 303-969-2015; e-mail: judy_geniac@nps.gov

Deanna C. Greco - Geologist

Deanna works with the Division's Disturbed Lands Restoration Program where she serves as a servicewide technical expert on physical restoration and resource management, protection and mitigation. She has previously worked with the U.S. Army Corps of Engineers and the Bureau of Land Management. Deanna holds a degree in Geology from the University of Arkansas. Telephone: 303-969-2351; e-mail: deanna_greco@nps.gov

Bruce Heise - Geologist

Bruce is responsible for administering the Inventory and Monitoring Program's Geologic Resource Inventory. He coordinates partnerships between the NPS and a variety of earth science organizations and also serves as the NPS liaison with the USGS Central Region Geologic Division. Bruce's previous work experience includes two years experience with the USGS and ten years in the oil and gas industry. He holds a BS in Geology from the University of Massachusetts, MS in Geology from the University of Montana. Telephone: 303-969-2017; e-mail: bruce_hesie@nps.gov

Robert D. Higgins - Chief, Science & Technical Services Branch

Bob manages the Division's Science and Technical Services branch and is responsible for Servicewide geologic programs, supporting NPS geologic research, planning, resource protection, education, interpretation, I&M, and information transfer. He also serves as the Servicewide contact on geology and performance management. Bob has over 30 years experience in geologic resource management, including minerals exploration and leasing, crystallographic research, oil & gas exploration and reserves engineering, and earthquake research. He holds a BS in Geology from the University of Arizona and an MA in Engineering Administration from George Washington University. Telephone: 303-969-2018; e-mail: bob_higgins@nps.gov

Edward Otto Kassman, Jr. - Regulatory Specialist

Ed has been a policy and regulations specialist with the Division since 1993. He is the Division's point of contact for regulatory/policy issues related to the exercise of nonfederal oil and gas rights, federal mineral leasing, nonfederal mineral operations, external threats to park resources, and in-park administrative use of mineral materials. Ed holds a B.A. in history from the University of Colorado in Boulder and a J.D. from Suffolk University Law School. Telephone: 303-969-2146; e-mail: edward_kassman@nps.gov

Ronal C. Kerbo - National Cave Management Coordinator

Ron coordinates a Servicewide program to protect cave and karst resources, provides advice and consultation to the Washington office, Regions, and Parks in the development and implementation of cave related resource management programs. He has been a cave specialist for the NPS for 27 years, caving for over 40 years. Ron is an honorary life member and Fellow of the National Speleological Society, member of Cave Research Foundation, Honorary Director of the American Cave Conservation Association, and a former Director of the Karst Waters Institute. Telephone: 303-969-2097; e-mail: ron_kerbo@nps.gov

Carol McCoy - Chief, Policy and Regulations Branch

Carol manages the Policy and Regulations Branch. She is responsible for the development and application of NPS policies and regulations re: minerals management and geologic resources; training; litigation support; legislation; input on other agencies' regulations and policies; and assistance on policy matters that span the Natural Resource Program Center. Carol has worked for the federal government on regulatory and policy matters for 23 years: first with EPA then the NPS. Carol holds a B.A. in environmental studies from Brown University, a Masters Degree in public policy from the University of Michigan-Ann

Arbor, and a J.D. from Georgetown University Law Center. Telephone: 303-969-2096; e-mail: carol_mccoey@nps.gov

Kerry W. Moss - Environmental Protection Specialist

Kerry coordinates Division's external minerals function that focuses on elimination or mitigation of cross boundary impacts to NPS resources from adjacent minerals and energy exploration and development. Kerry specializes in hardrock, placer, and coal mine planning, permitting, environmental compliance and impact mitigation. His past work experience includes 3 years with the Jefferson County (CO) Sheriffs Department, 3 years with Conoco Oil, and 17 years with the NPS. Educational background in Criminal Justice and Environmental Planning. Telephone: 303-969-2634; e-mail: kerry_moss@nps.gov

Elizabeth S. Norby (Lisa) – Petroleum Geologist

Lisa's duties include oil and gas planning, technical evaluation of plans of operations, and recommendation of resource protection measures that can be implemented at oil and gas sites. She has worked in the NPS for 8 years as a petroleum geologist and previously as a natural resource specialist doing resource planning and NEPA compliance. She has also worked for 12 years as a Geophysicist and Geologist with Mobil Oil Corporation. Lisa holds a B.S. in geology (Ohio University), M.S. in geology (Idaho State University), and Masters in Environmental Planning and Management (University of Denver) Telephone: 303-969-2318; e-mail: lisa_norby@nps.gov

Patrick O'Dell - Petroleum Engineer

Pat is the point of contact for oil and gas development issues in and near parks. He is responsible for assessing impacts of oil and gas activity in and around parks, and developing measures to minimize or remove such impacts. Pat's prior work experience includes work in California and Alaska on environmental and safety compliance and 10 years with Marathon Oil Company working with well workover and production operations as well as field development planning, reserve determination, and property evaluation for purchase or sale. Pat has a BS in petroleum engineering from Montana College of Mineral Science and Technology (1982) and is a registered professional petroleum engineer. Telephone: 303-969-2013; e-mail: pat_o'dell@nps.gov

Harold (Hal) S. Pranger, Jr. - Geologist

Hal works as a geomorphologist, serving primarily as a technical expert on the restoration of disturbed lands such as deteriorating stream channels, gravel pits, ponds and roads. He also evaluates the impact of natural geologic processes on park natural resources, cultural resources, infrastructure and visitors. Previously, Hal worked three years as a geomorphologist for consulting firms in Colorado and Oregon, two years as a hydrologist for the state of Wyoming coal regulatory program, and nine years as a hydrologist for the U.S. Office of Surface Mining. Hal holds geology degrees from Colorado State University and Calvin College. Telephone: 303-987-6923; e-mail: hal_pranger@nps.gov

David B. Shaver - Chief, Geologic Resources Division

Dave is responsible for the Division's overall management and program direction. Has 25 years of federal policy, regulatory, and management experience beginning with U.S. Environmental Protection Agency in 1976. He came to the NPS Air Quality Division in 1979, and served as manager of the NPS minerals management office from 1983 to 1995, when the office function was broadened to geologic resources management. Dave has a B.S. in Economics (University of Minnesota), an M.S. in Environmental Science (University of Wisconsin), and a J.D. (Georgetown University Law Center). Telephone: 303-969-2094; e-mail: dave_shaver@nps.gov

David L. Steensen - Geologist

Dave is the Program Manager for the Servicewide Disturbed Lands Restoration and Abandoned Mineral Lands Reclamation programs. He serves as a technical consultant on issues relating to surficial geologic features and processes, including serving as Servicewide contact on restoration and performance management implementation. Dave has worked for the NPS for 15 years as a geologist (Redwood NP, GRD) and has over 17 years experience in geomorphology and landscape restoration and analysis. He holds M.S. (California State Univ., Humboldt) and B.S. (W. Washington Univ.) degrees in geology. Telephone: 303-969-2014; e-mail: dave_steensen@nps.gov

James F. Wood - Geologist

Jim is the Education Specialist for the Division. He coordinates NPS geologic educational goals with external partners and works with parks to develop educational programs, general interest geology publications, and Internet sites. Jim began his NPS career at Redwood National Park in 1986 and also worked at Yellowstone National Park and Mojave National Preserve. He holds a BS degree in Physical Science and an MA in Environmental Education (California State Univ., Humboldt). Telephone: 303-969-2149; e-mail: jim_f_wood@nps.gov

Jim C. Woods - Chief, Mineral Operations Branch

Jim manages the Division's Mineral Operations Branch and is responsible for the technical evaluation of proposed mineral development inside parks, on-site inspection of mineral operations, park minerals management planning, and development of NPS sand and gravel extraction plans. He also provides guidance documents for mineral operators in parks, and is a technical liaison on minerals development proposals external to parks. Jim has worked for the NPS for 23 years as a natural resource and minerals management specialist in parks (Padre Island NS and Big Thicket NP) and in the Division. Jim has a B.S. in marine biology (Texas A&I University at Corpus Christi). Telephone: 303-969-2635; e-mail: jim_c_woods@nps.gov

Mark Sandy Ziegenbein - Mining Geologist

Mark is the Division contact for in-park mining and sand and gravel extraction issues. He is also a Certified Mineral Examiner and assists parks with disturbed land inventory, restoration design and implementation. Mark has over 20 years of combined experience working on mining, environmental, and disturbed land restoration projects for Bechtel Inc., the Bureau of Land Management, Dames and Moore, Santa Fe Mining Inc. and the NPS. He holds Bachelor of Science degree in Geology (1978). Telephone: 303-969-2957; e-mail: mark_ziegenbein@nps.gov

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