

**Geologic  
Resources  
Division**



**GRD**



**National Park Service**

◆ **1998 Annual Report** ◆

# Geologic Resources Division – 1998 Annual Report

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Inside Front Cover: Cedar Breaks National Monument. Photo by Don Wood

◆ 1998 ◆

# Annual Report

Geologic Resources Division



**Natural Resources Report NPS/NRGRD/NRR-99/02**

**July 1999**

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## Comments from Associate Director, Natural Resources Stewardship & Science

By Michael Soukup, Ph.D.

This Annual Report provides a summary of the accomplishments of the Geologic Resources Division (GRD) of the National Park Service (NPS) in 1998. The GRD was created in 1995 to be a strong component of the Natural Resource Program Center (with the Air, Water, Information Management, and Environmental Quality Divisions) in the last NPS restructuring. GRD's role is to provide Servicewide technical assistance and advice with respect to the preservation, protection, and management of the geologic resources of the National Park System. The division's staff is skilled in technical geology areas, education and interpretation, policy and regulatory analysis, mineral management, and training. Their geologic resource management assistance roles encompass abandoned mineral site and disturbed land restoration, cave and karst systems, geologic mapping, geologic processes and hazards, paleontology, and research coordination, as well as assisting parks in regulating internal and external mineral development. The Division's work plan is developed in response to an annual call to the field, as part of the Unified Natural Resources Call, to identify park needs and determine Servicewide priorities. In addition to national program responsibilities, the Division provides day-to-day support to parks, support offices, regional offices, and the Washington Office in addressing geologic resources concerns facing National Park Service. The Division is primarily located in Denver, Colorado

(303-969-2090), with a liaison office in Washington, D.C., and part-time offices within the U.S. Geological Survey in Denver and Reston, Virginia.

I am very pleased with the accomplishments of the Geologic Resources Division as reflected in this Annual Report. In its relatively short organizational life the Division has made significant progress in developing a wider range of skills, and a keen awareness and responsiveness to park's geology-related resource management needs. In addition to continuing to assist parks address mineral management concerns, program progress of particular note includes: the initiation of a Servicewide funding program for abandoned mineral site reclamation; development of an expanded NPS geology website; expansion of the Geologist-in-the-Parks program (including a recruitment website placing over 50 geologists in parks); an internationally recognized cave program; initiation of a paleontology program; and completion of the geologic mapping pilot project. These accomplishments are indicative of the professionalism and the ability of the Division to work cooperatively with management and staff of parks, support offices, regional offices, and WASO to effectively address geologic resource and minerals management issues of concern to NPS. The Division's progress and accomplishments would not have been possible without the continuing cooperation and support provided by all organizational levels of NPS. These collective efforts have created the environment necessary to begin to match the level of available technical expertise to the geologic resource management concerns faced by national parks in a changing landscape. ◆

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## Division Chief's Overview

By David B. Shaver

This is the first edition of a planned series of Geologic Resources Division annual reports. The Geologic Resources Division was created in 1995 as a result of the most recent NPS restructuring, which established National Program Support Centers where NPS management determined that such a center would most economically provide a critical mass of specialized expertise for Servicewide use. One of these Servicewide support centers is the Natural Resource Program Center, consisting of five divisions: Air Resources, Environmental Quality, Geologic Resources, Natural Resources Information, and Water Resources. In addition to minerals management, the new Geologic Resources Division was charged with functional responsibility for the earth sciences encompassing cave and karst systems, fossils, coastal processes, glaciers, landslides, soils, and other processes the form or act on geologic features.

1998 was an important growth year in the development of the Geologic Resources Division. Initially, when the division was created from the old NPS Mining and Minerals office with the addition of a cave specialist from the Southwest Region and an experienced geologist duty stationed in Washington, no new base funding was provided for the division's broadened functions and additional staff. In the FY-98 budget, the division

received two funding increases: one to establish an Abandoned Mineral Lands reclamation program, including Servicewide project funding; and a second to provide staff and support for a California desert mining office. These increases allowed the division to substantively move forward with program development in 1998, as well as carry out previous functions, as is well illustrated in this annual report.

Minerals management assistance to parks dealing with mining and oil and gas development proposals continued to be a significant workload for the Geologic Resources Division in 1998. While details of this program activity are provided later in this report, some of the highlights include:

- ▶ Assisting parks with the technical evaluation and processing of more than 20 proposed oil and gas development operations, including seismic exploration proposals encompassing over 200,000 acres of park lands.
- ▶ Establishing a mining management support office in Barstow, assisting parks with processing of proposed mining plans, and carrying out mining claim validity examinations.

- ▶ Working closely with the Departmental Solicitor's Office to clarify restricted rights of individuals to patent mining claims in parks, and to elaborate on NPS's ability to protect park resources from adverse effects of external development.
- ▶ Assisting parks to address adjacent mineral development proposals, including successful negotiations with a surface coal mine proponent adjacent to Natchez Trace, and technical and legal efforts that resulted in the withdrawal of lead prospecting permits near Ozark National Scenic Riverways.
- ▶ Providing technical assistance to the World Heritage Commission, through Regional Director Cook, in assessing the potential effects of the proposed Jabiluka uranium mine within an Australian National Park.

For the first time in 1998, the Geologic Resources Division managed the distribution to parks of Servicewide project funding for abandoned mineral lands (AML) reclamation projects. These funds were made available due to a specific budget increase. These funds will now be distributed annually to park projects on a competitive basis as part of the Natural Resources Unified Project Call. In an effort to build on the successful AML funding initiative, the division prepared and pursued an FY2000 budget proposal and justification for a Disturbed Lands Restoration funding program tied to Goal Ia1A of the NPS Strategic Plan.

The division's geology functions continued to develop in 1998, with significant advances in the cave program, the paleontology program, geology education, and geologic assistance to parks through field interns and external agency scientists. Highlights in the geology area include:

- ▶ The park geology website was greatly expanded in 1998, encompassing field notes for more than 130 NPS parks. The site was twice highlighted on the NPS ParkNet, received external recognition through the Eisenhower Award, and receives thousands of daily virtual visitors.

- ▶ The new cave and karst newsletter *INSIDE EARTH* was initiated in 1998 and is posted on the website for an international readership.
- ▶ A half-time paleontologist joined the division staff in a job sharing arrangement with Fossil Butte National Monument. 1998 accomplishments, which mark the beginnings of a Servicewide program, include compilation of thematic paleontological inventories, completion of several individual park surveys, and development of a prototype paleontological resource database.
- ▶ The Geologist-in-the-Parks program placed fifty-two geologists in 28 parks in 1998. Since its beginning in 1996, the program has grown dramatically each year, providing valuable geologic expertise to parks for education, interpretation, and resource management projects.
- ▶ The geologic inventory and mapping program took a major step forward with the completion of the Colorado pilot project. The effort helped to define park needs, clarify the geologic inventory objectives, and identify potential partners and cost-effective processes.

Many of the programs and accomplishments described above are explained in more detail later in this Annual Report. I hope you will find this report interesting and informative.

Consistent with the tradition of the other Natural Resource Program Center divisions, the Geologic Resources Division is dedicated to providing leadership, high quality technical and policy expertise, and scientific support to the parks and to NPS management on geologic resource management and mineral development concerns. The division staff is committed to these objectives, as is demonstrated by their dedication and hard work on a daily basis. I am proud of the division's accomplishments to date and look forward to continued program evolution in response to the needs of park resource management. ◆



## Washington Liaison Highlights

By Lindsay McClelland, Geologist

The Geologic Resources Division Washington liaison facilitates services to the Division and the field that can be most effectively provided at NPS headquarters or through links with other Washington-based offices. Examples include serving on inter-agency teams to develop consistent policies for cave/karst and fossil resource management, working with the Department's Office of the Solicitor on matters ranging from Freedom of Information Act requests to protection of parks from mining impacts, and preparing and distributing briefing statements on geology-related issues for NPS and Department officials. Although some of these issues may primarily affect a single park or group of parks, many have Servicewide impact.

Secretary Babbitt has instructed the U.S. Geological Survey to serve as the "science agency for the land-management agencies", an interdisciplinary role involving the four main USGS Divisions: Geologic, Water Resources, Biological Resources, and National Mapping. The Washington liaison is the primary NPS link to the USGS Geologic Division at their headquarters in Reston, VA, and to USGS eastern region geologic operations, facilitating cooperative high-priority scientific and interpretive projects in parks.

The USGS National Cooperative Geologic Mapping Program redirects about \$2 million of staff salaries/benefits and operating expenses annually towards geologic mapping in parks. Highlights in 1998 include geologic mapping in Great Smoky Mountains National Park that will help target work for the park's All Taxa Biodiversity Inventory, geologic mapping and associated hydrologic studies that will form the basis for assessing risks from proposed lead mining near Ozark National Scenic Riverways, completion of geologic maps for the entire length of the C & O Canal, and cooperative USGS/NPS interpretive work in several western parks, including Lake Mead and Golden Gate National Recreation Areas.

The USGS Coastal and Marine Program is involved in shoreline studies at several parks including a long-term effort to determine impacts and appropriate mitigative measures linked to coastal engineering near Assateague Island National Seashore, and studies of recent large landslide deposits from coastal dunes at Sleeping Bear Dune National Lakeshore. A national USGS/NPS shoreline workshop planned for September 1999 will assess park coastal issues and potential cooperative USGS efforts to address them.

A similar workshop to be held in FY 2000 with the USGS Volcano Hazards Program (VHP) will address volcanic and related hazards in parks. The VHP provides an integrated approach to volcano hazards, including basic research on volcanic processes, monitoring and eruption forecasting, work with land managers on planning and response issues, and public education. Ongoing VHP work in parks includes studies and monitoring of the volcanic/geothermal system at Yellowstone, assessments of hazards from edifice collapse and volcanic mudflows at Mt. Rainier, and monitoring of volcanoes in Alaskan and Hawaiian parks by USGS volcano observatories.

The state geological surveys are also an important source of geological expertise for parks. The Division's Washington liaison serves as the primary NPS link to the Association of American State Geologists (AASG), representing state geological survey directors. Through a contract with the NPS Inventory and Monitoring Program, the AASG provided bibliographic data on park geology that will be a fundamental component of geological information provided to parks. The state geological surveys are key participants in the I & M geology pilot program, described elsewhere in this report, that began in Colorado in 1998, will expand to Utah in 1999, and to other states in succeeding years.

An increasing number of parks are of interest to scientists engaged in bioprospecting, the search for life forms that may be sources of components, such as enzymes and gene sequences, with commercial value in products including pharmaceuticals, catalysts, or industrial reagents. Scientists seek such components in, for example, microbes found in hot springs and caves, and a wide variety of fungi and plants. The source environments are often unusual or unique, and must also be biologically rich and protected from human impacts, a situation that is increasingly rare outside the national parks. Challenging scientific, legal, and policy issues arise from the need to manage bioprospecting activities in parks. Effective management requires parks to provide the highest level of protection for their resources, build understanding of ecosystems that have previously received only limited study, and obtain financial benefits when a valuable product is derived from a park organism. Although most environmental groups have been supportive of properly managed bioprospecting activities in parks, concerns about larger issues such as the patentability of components of natural organisms and of genetically altered organisms have spawned legal challenges to NPS bioprospecting programs. The Division has provided support on bioprospecting issues to parks, the NPS Directorate, and the Department through its Washington liaison. ◆

## Abandoned Mineral Lands Reclamation Program

By David L. Steensen, Geologist – AML Coordinator

The Geologic Resources Division oversees the NPS abandoned mineral land (AML) reclamation program, providing national-level coordination and technical guidance or field oversight to park projects on request. After over a decade of effort to develop the AML program, in 1998 a budget initiative provided NPS project funding for the reclamation of degraded lands and waters and the mitigation of safety problems at priority AML sites. The Division administers this Servicewide competitive project funding, and provides parks with technical assistance to develop project proposals and to carry out restoration projects.

**Project Funding** – The AML Program distributes project funds to parks based on park submitted proposals evaluated and ranked by an NPS panel of regional representatives. For the selected projects, Division staff review project work plans for technical adequacy and provide oversight in relation to cost accounting, accomplishments reporting, and the preparation of technical guidance.

**Technical Assistance** – The Division has in-house specialists in surface reclamation, underground mine safety mitigation, mining engineering, and petroleum engineering. Division staff works directly with parks to provide:

- assistance with inventory, site characterization, resource impact assessments, and identification of health and safety hazards;
- help developing mitigation designs and funding proposals, including geomorphic/geologic analyses, volumetric surveys, landform restoration designs, engineering or well-plugging specifications, contracts, and materials/equipment cost estimates;
- access to multidisciplinary expertise for natural systems restoration and conservation of critical habitat; and
- oversight of on-the-ground project implementation.

### AML Program Overview

The National Park System contains nearly 3,000 sites in 146 parks that are disturbed by previous mineral exploration and development. These sites include 11,000 underground openings, 51 abandoned oil and gas wells, and 33,000 acres of scarred surface area. These figures will increase as AML inventories are completed in the new California Desert parklands. Resource effects at AML sites include excessive erosion and sedimentation, exotic plant invasion, soil and water contamination, and public safety hazards. The NPS estimates that addressing its priority AML needs would require \$20 to \$40 million. Long-term reclamation costs to deal with all sites could be as high as \$165 million.

The NPS AML program has five objectives: (1) inventory all AML sites, (2) restore degraded natural resources, (3) eliminate safety hazards, (4) protect critical habitat, and (5) preserve and interpret culturally and historically significant resources. The Division's program directly addresses goals 1 to 4, and goal 5 is addressed by coordination with NPS cultural resources personnel. To assist in carrying out these objectives, the NPS has entered agreements with eight states and two federal agencies to conduct site characterizations and aid on-the-ground reclamation.

Prior to 1998, these efforts contributed to restoring 85 AML sites, closing 766 mine openings and plugging 34 oil and gas wells. These partnership agreements for cost sharing and access to technical expertise will continue to complement the new AML program funding.

### 1998 Program Activities

The NPS AML Program provided \$250,000 to parks for mine site reclamation, habitat conservation, and site characterization and planning for future work; this involved 21 separate projects at 17 parks throughout five Regions. The following table shows the 1998 projects:

Region	Park	Project Title	AML Funds
Alaska	Glacier Bay	Rainbow Mine Closure	\$2,050
	Denali	Slate Creek Restoration	\$7,500
	Wrangell-St. Elias	Orange Hill Site Cleanup	\$5,700
	Wrangell-St. Elias	Kennicott Mill Transformer Removal	\$2,650
	Wrangell-St. Elias	Mitigate Explosives: May Creek, Larson, Kennicott	\$1,900
	Wrangell-St. Elias	Bremner Mine Closure	\$1,250
Midwest	Buffalo River	Bat Gate Construction at Rush District & White Eagle District	\$20,000
Northeast	New River-Gauley River	Closure and restoration of Elverton Mine, South Nuttall Mine, and Kaymoor Tunnel	\$17,500
Inter-Mountain	Big Bend	Mariscal Mine – Assess Bat Gate Performance	\$1,400
	Canyonlands	Lathrop Canyon Bat Gates/Mine Closures	\$16,000
	El Malpais	Sandstone Quarry Reclamation	\$5,000
	Fort Bowie	Backfill Quillin Mine Shafts	\$5,000
	Grand Canyon	Initiate Last Chance Mine Closure (Compliance)	\$8,000
	Lake Meredith	Assess 30 Oil and Gas Wells	\$2,500
Pacific West	Whiskeytown	Closure & restoration of West End, Davis Gulch, Guardian Rock, Need Camp, and Unnamed #2, 3, 6, & 7 Sites	\$20,000
	Joshua Tree & Lake Mead	Obtain Polyurethane Foam (PUF) machine for shaft and adit closures	\$25,000
	Joshua Tree & Lake Mead	Close/Restore Mines	\$20,000
	Death Valley	Inventory & Compliance	\$18,400
	Great Basin	Inventory & Compliance	\$18,300
	Mojave	Inventory & Compliance	\$18,300

The following examples highlight the range of projects completed in 1998:

**Denali National Park & Preserve – Slate Creek Restoration:**  
*Excerpted from Ken Karle, Denali National Park*



Denali NP

*Limited access to the Slate Creek site required the park to transport lime and other supplies by helicopter. Lime was applied to acid generating spoil to increase pH at Denali National Park & Preserve.*

**Stream stabilization, acid mine drainage remediation, and revegetation of a 4-acre Antimony mine.** Problems on Slate Creek included both aquatic and upland disturbances associated with the mine, including low pH stream water (2.5-2.7), incised stream channels, and poor recovery of vegetation. This work included recontouring spoil piles to a stable configuration, application of lime to acid-producing spoil, constructing anoxic limestone drains (ALD) to accommodate concentrated runoff, and use of biotechnical methods to stabilize eroding stream banks. The park, Alaska Region, Geologic Resources Division, and Water Resources Division jointly funded this work. Monitoring results show that lime-treated soil had an increase of soil pH to between 5.0 and 5.5 and effluent through the ALD showed drainage pH increased to 6.0.



Denali NP

*Anoxic limestone drains were constructed to raise pH of mine spoil effluent. This photo shows the drains during construction.*

**El Malpais National Monument – Sandstone Quarry Reclamation:**

*Excerpted from Herschel Schulz, El Malpais NM*

**Final surface reclamation of a 5-acre sandstone quarry.** The visual scar of the quarry, poor vegetative recovery, and safety concerns of the quarry highwalls combined to place this site as a top reclamation priority for the park. Work actions included backfilling unsafe highwalls, salvaging fill materials to create a hydrologically functioning landscape, and placing salvaged cover material suitable for revegetation on the recontoured surface. In addition, the work also included the construction of a new road to a popular trailhead, obliteration of the old road, and grading at the quarry to facilitate development of an interpretive



*The use of heavy equipment enabled the establishment of a stable surface that conforms to the surrounding landscape at El Malpais NM.*

overlook of the reclaimed quarry and other park features. The 52<sup>nd</sup> and 387<sup>th</sup> Engineer Battalions, Army Reserves, performed most of the earthmoving work as a training exercise. Students of the New Mexico Highlands University salvaged plants from the site and assisted with revegetation work.

**Buffalo National River – Rush Mining District Closures:**

*Excerpted from Chuck Bitting, Buffalo National River*

**Installation of steel gates at underground mine openings at the Rush mining district to conserve critical bat habitat and eliminate unsafe conditions for 30,000 visitors annually.**

The historic Rush mining district is riddled with at least 70 abandoned prospects, adits, and shafts. Since 1983, the park has closed six of these unsafe mine openings. The entrances next on the priority list were the Monte Cristo #1, White Eagle #1, and the Lower McIntosh. All three mines are located next to roads or trails, which makes them susceptible to visitation, and are used by the bats. Therefore, rather than traditional backfill closures, steel “bat gates” were installed. Bat gates reduce human safety concerns, allow bats access to mines, and are designed to reduce the potential for bat depredation. ◆



*After establishment of final surface contours, topsoil was placed, and then graded, to provide the best possible conditions for revegetation at El Malpais.*



*Installation of a gate closure specifically designed to allow bat access while reducing safety concerns at Buffalo NR.*

Buffalo NR

## Safe Conduct of Bat Surveys in Abandoned Underground Mines

By John Burghardt, Geologist

With the current national emphasis on abandoned mine reclamation, the National Park Service and other agencies have become increasingly concerned with assessing and preserving critical wildlife habitat that many mines provide. Most often this concern focuses on bats, which are becoming more dependent on abandoned mines for habitat as recreational caving and deforestation diminish their natural habitat. Where significant habitat has been identified, special closures can usually be designed to exclude people and allow free passage of the bats. Where more restrictive closures such as backfilling are mandated, colonies can be excluded and relocated prior to closure.

External and internal surveys are both used to gain information on mine-dwelling bat species. External surveys can be conducted during seasons when bats are active from dusk to dawn. However, internal surveys are the only way to obtain reliable data on hibernating bats, and they yield much more information on roost characteristics and bat behavior during active seasons. Winter underground surveys are most useful, as hibernating bats can be identified, and uneaten insect parts, guano, and urine-stained walls attest to spring, summer, and fall use. Ideally, surveys are conducted in all four seasons of the year before a mine is closed, as various species will use different portions of a mine for varying purposes through the course of a year.

Wildlife biologists conducting underground surveys are subject to the same hazards for which the mines are being closed. Oxygen-deficient air, toxic gases, unstable rock, vertical drop-offs, abandoned

*At Fort Bowie NHS, the urine-stained roof and massive guano pile discovered in a winter survey of Quillin Mine indicates a large summer roost of bats. Biologists returned in the summer and identified a maternity colony (mothers and their nursing young) of 4,000 cave myotis (*Myotis velifer*).*



KON KEBBO

explosives, and hazardous waste are some of the hazards typically encountered. Abandoned underground mine specialists are therefore being linked with biologists to conduct underground habitat surveys. These specialists are equipped and experienced to deal with underground mine hazards, and assume responsibility for the training and safety of inexperienced members of underground survey teams.

In 1998, the NPS continued a collaborative effort initiated the previous year with several federal agencies to establish abandoned mine entry policies and safety training programs for employees who now find abandoned mine entry a routine part of their job. The Geologic Resources Division is considering language for a servicewide policy, and has conducted numerous safety sessions with the

general admonition to stay out of abandoned mines unless accompanied by a qualified safety specialist. The USFS has an official policy that requires a qualified mineral examiner to lead abandoned underground mine research groups. With the assistance of NPS and BLM mining specialists, USFS has developed a weeklong mine safety course that has been attended not only by wildlife biologists, but also specialists in cultural resources, hazardous materials, law enforcement, search and rescue, and minerals management. BLM is just developing its policy, and is considering offering a training course through their National Training Center. All three agencies are conferring on official criteria to certify individuals as “qualified” for leading underground surveys. These efforts will ensure that wildlife surveys and other important work in abandoned underground mines will be accomplished with maximum safety for all federal employees. ◆

## Deteriorating Geothermal Well Plugged in Lassen Volcanic National Park

By Mark Ziegenbein, Geologist



In 1994, Geologic Resources Division staff received calls from the U.S. Geological Survey and the California Division of Oil, Gas and Geothermal Resources warning that the well casing was deteriorating. The well could potentially fail. Catastrophic well failure could lead to decades of uncontrolled flow, public safety hazards and damage to park thermal features. Division staff then:

- ▶ Notified the park of the potential well failure,
- ▶ Assembled a multi-agency team to develop well plugging and site restoration plans,
- ▶ Provided the park with well plugging and restoration designs, including cost estimates,

Few people realize that energy and mineral extraction occurs in our national parks. When private mineral rights exist inside park boundaries, the park service often has limited authority to regulate extraction operations. This was the case in Lassen Volcanic National Park with regard to geothermal development.

Geothermal energy extraction relies on drilling a well to intersect natural steam at great depths. This steam is produced from water that is super-heated and under pressure from Magmatic heat sources. The steam is brought up the well and is used to drive turbines, generating electricity.

In 1962 and 1978, energy development companies drilled a 4000-foot deep geothermal exploration/production well on private land in Lassen Volcanic National Park. This activity raised public, agency and congressional concern for nearby park thermal features. Renewed development activity in 1979 prompted congress to condemn the private land and mineral rights to protect the park's sensitive geothermal features. In the declaration of taking, the park acquired the land and mineral rights at fair market value. The park also acquired the liability for plugging the well and reclaiming the site. Thereafter the well was not monitored or maintained for 15 years.

- ▶ Assisted regional staff in funding acquisition,
- ▶ Provided technical assistance writing contract specifications for the well plugging contract, and
- ▶ Arranged for on-site project oversight and inspection.

On October 10, 1997, a geothermal well contractor successfully plugged the well in a weeklong procedure. Four cement plugs were installed to prevent geothermal steam or fluids from contaminating non-thermal aquifers or venting to the surface. The Bureau of Land Management, Ukiah office, provided a geothermal engineer to supervise the procedure. Well pad and access road restoration was scheduled to take place in the summer of 1999. Thanks to the cooperative efforts of the NPS, The Bureau of Land Management, The U.S. Geological Survey, and the California Division of Oil, Gas and Geothermal Resources, this natural resource threat has been eliminated.

“Orphaned” wells (oil, gas, or geothermal) can pose threats such as groundwater and surface water contamination, toxic gas emissions, visual impacts, public safety hazards, and can kill plants and animals. If you are aware of such a well in or near a park unit please contact the Geologic Resources Division. ◆

## Disturbed Lands Restoration

By David L. Steensen, Geologist

### Program Activities

The Disturbed Lands Restoration specialists spent much of 1998 preparing for possible budget increases in FY2000. This included developing budget initiatives, briefing statements, and supporting information. Examples of specific budget initiatives include the NPS Natural Resource Initiative, Partnerships for America's Resources, USEPA Restoration Fund, and the Clean Water Action Plan. Division staff working in this program area also oversees two primary park-specific activities: Servicewide GPRa Goal Coordination and technical assistance.



*This debris flow originated at an abandoned logging road in Whiskeytown NRA during the 1997 New Year's storm. The road fill became saturated, "out of balance" with adjacent stable landforms, and consequently failed.*

*Servicewide Coordination - GPRa Goal 1a1A* — Parks report performance to NPS Goal 1a1A, which involves restoring parklands disturbed directly by land development. These are areas where past land uses have significantly altered the landscape that the park intends to restore. Examples of such land use include: abandoned structures, abandoned roads, abandoned mines, permitted mining activities, administrative use of sand and gravel, abandoned campgrounds, abandoned trails, and other abandoned sites or facilities targeted for restoration. Division staff involved with GPRa Goal Coordination provides technical guidance to central offices and parks.

*Technical Assistance* — The Geologic Resources Division has in-house specialists that provide expertise in restoration techniques related to physical conditions. Division staff work directly with parks to provide:

- ▶ assistance with disturbed area inventory, site characterization, resource impact assessments, issue identification;
- ▶ analysis of human health and safety hazards and development of mitigation designs;
- ▶ assistance with developing proposals for funding;
- ▶ geomorphic/geologic analyses, volumetric surveys, and development of materials/equipment and cost estimates;
- ▶ landform and stream channel restoration designs, engineering specifications, well-plugging specifications, and contract scopes-of-work;
- ▶ project oversight assistance; and

- ▶ facilitate access to expertise for natural systems restoration and conservation of critical habitat.

### Background

*Overview* — The National Park System contains nearly 315,000 acres throughout the National Park System have been disturbed by human activities. These disturbances include abandoned roads, dams, canals, railroads, grazed areas, campgrounds, mines, other abandoned sites, etc. Lands disturbed by human activity often cause unwanted and long-lasting problems that



*Downstream, the debris flow removed all riparian vegetation for a five-mile segment of a prime salmon-recovery stream.*

affect other resources or park facilities. For example, altered soils and landforms affect biological communities and habitats in negative ways. Exotic plant invasion, unsightly scars, abandoned or unmaintained road networks, and mine sites, among many others, cause problems for parks managing areas as wildlands. One-hundred ninety-five National Park System units report disturbed areas in need of restoration work.

*Goals* — In the Fall of 1996, the Geologic Resources Division convened a workshop to identify strategies for developing a Servicewide Disturbed Lands Restoration Program. The participants of this workshop identified the following goal for such a program: "to restore lands disturbed by development of infrastructure, removal of abandoned infrastructure, and resource extraction-related activities, and to prevent or limit disturbance sources."

*Program Needs* — The NPS estimates that to restore priority areas over the next 10 to 20 years would require \$65 million. Long-term reclamation costs could be as high as \$195 million. If budget initiatives mentioned above are successful, FY2000 funding would be the first directed specifically toward restoration. ◆



*The debris flow also destroyed three bridges within the park.*

## Geologist-in-the-Parks Program

By Diann Gese, Geologist

Started in 1996, the Geologist-in-the-Parks (GIP) Program facilitates the temporary placement of geoscience professionals in the parks. Geoscientists work with park staffs to help them understand and manage geologic resources.

Program goals include:

- ▶ Meet park's geologic needs,
- ▶ Encourage academic community to do geologic research in the national parks, and
- ▶ Make the geologic community aware of the need for geologic expertise in the national parks.

Division recruitment and funding placed 52 geologists in 28 park units in 1998. Thirty-six geologists were placed in 1997, and six were placed in 1996. GIPs completed 27 geologic interpretation, 18 resource management, and eight research projects in 1998. These projects very likely would not have been completed without the assistance of the GIP program.

**Torrey Nyborg** assisted Death Valley National Park with the



management of their fossil resources. He did field work in temperatures (120 degrees) that would have most of us running to our air-conditioned offices! But Torrey says that "I reminded myself that I was doing field work in an area of scientific

research that I have spent the last four years studying..." A Geological Society of America internship recipient, Torrey documented and inventoried a fossil trackway within the park. He produced a GPS map of the fossil localities, accurate photo points, and detailed descriptions of about 50 sites for future research.

The overwhelming success of this program is the result of forming partnerships and creative advertising of the park's geologic opportunities. The Division partners with individual park units, NPS regional offices, professional societies, academia, and other federal agencies. The Geological Society of America (GSA) provided funding (\$15,000) and administered six geologic internships in six park units. The Intermountain (\$4,200) and Alaska (\$9,600) Regional Offices provided funding for three geologic projects in each region.

**Erinn Drone** worked with the Shenandoah National Park education specialists to develop an Earth Science curriculum for high school teachers. She has a degree in environmental science and a minor in



geology. Erinn and the park staff identified and developed 45 different geology-oriented activities for local teachers to use on field trips through the park. This project enables educators to lead high-quality geology field trips through the park without park staff. Local teachers will be "field testing" Erinn's work this fall (1999).

### Who are GIPs?

A Geologist-in-the-Park is any qualified geologist. They are undergraduate and graduate geology students, geoscience teachers, college professors on sabbatical leave, professionals, and retired geologists. A GIP is anyone who is willing to share their time and expertise to interpret, preserve and/or protect the geologic resources within our national park units. GIPs in 1998 included 27 undergraduate and graduate geology students, one geology professor on sabbatical leave, 18 professionals, and six retired geologists. Many students gain their first geology-related work experience through the GIP program. The parks provide an outstanding opportunity for them to use their college training in the real world and gain valuable work experience.

**Jack Rogers** was able to earn college credits for his work this summer at Petrified Forest National Park. After retiring from the army, Jack is pursuing a second career as a paleontologist. He assisted with the park's geologic research and air quality monitoring, prepared fossil samples, and measured stratigraphic sections. Jack also assisted Dr. Adrian Hunt, Mesa Technical College, with fieldwork that focused on searching for evidence of early dinosaur fossils. The highlight of an outstanding summer was discovering "only the fourth known Late Triassic dinosaur locality in the park." Jack is starting graduate school this year and hopes to do more paleontological work in other parks in the future.





The National Park Service and the public have benefited tremendously from the thousands of hours that GIP participants have given to the parks this past year. A few are seasoned professionals, but most are students or retired professionals who

receive only park housing and/or a small stipend. The Division plans to expand the GIP program to continue working with individual parks to reduce their backlog of geologic projects and manage our geologic resources more effectively. ◆

### **Parks participating in the GIP Program in 1998**

- ▶ Arches National National Park: geologic interpretation.
- ▶ Badlands National Park: geologic interpretation, resource management, and research.
- ▶ Blue Ridge Parkway: geologic interpretation.
- ▶ Craters of the Moon National Monument: management of geologic resources.
- ▶ Denali National Park: management of geologic resources.
- ▶ Death Valley National Park: management of geologic resources.
- ▶ Florissant Fossil Beds National Monument: geologic interpretation, resource management, and research.
- ▶ Fossil Butte National Monument: geologic interpretation, resource management, and research.
- ▶ George Washington Memorial Parkway: geologic interpretation of Roosevelt Island.
- ▶ Hagerman Fossil Beds National Monument: geologic research.
- ▶ Haleakala National Park: geologic interpretation.
- ▶ Jewel Cave National Monument: management of geologic resources.
- ▶ Joshua Tree National Park: management of geologic resources.
- ▶ Klondike Gold Rush National Historic Park: geologic interpretation.
- ▶ Lake Clark National Park: geologic interpretation.
- ▶ Lake Roosevelt National Recreation Area: geologic interpretation.
- ▶ Mesa Verde National Park: geologic research.
- ▶ Mount Rainier National Park: geologic interpretation.
- ▶ Navajo National Monument: geologic interpretation.
- ▶ North Cascades National Park: geologic interpretation.
- ▶ Oregon Caves National Monument: geologic interpretation.
- ▶ Ozark National Scenic Riverways: management of geologic resources.
- ▶ Petrified Forest: geologic research and interpretation.
- ▶ Sequoia/Kings Canyon National Park: management of geologic resources.
- ▶ Shenandoah National Park: geologic interpretation
- ▶ Sunset Crater Volcano National Monument: geologic interpretation.
- ▶ White Sands National Monument: geologic interpretation.
- ▶ Voyageurs National Park: geologic research.

## Geology Education and Interpretation

By Jim F. Wood, Education and Outreach Specialist



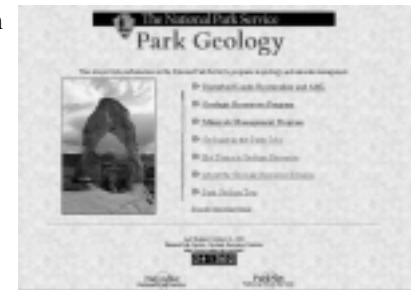
The Division became involved in information transfer and interpretation in order to improve the protection of park resources by providing access to geologic information and expertise. In 1996, a Park interpreter working on a temporary assignment for the Division conducted a telephone survey of Parks' chiefs of interpretation and asked them to identify their needs and the obstacles to geology interpretation. Parks indicated that their geology programs needed improvement and that they would benefit from access to geologists, training and funding support. The GRD has attempted to remove the obstacles to geologic interpretation by locating new sources for funding, recruiting geology experts to work with parks, and making geologic information more accessible. In 1998, the Geologic Resources Division worked within NPS and the geology community to garner support for geology interpretation in parks. The timing of this effort has coincided with an expanding realization throughout the geoscience and interpretation/education professions of the critical role that the understanding of earth systems has in environmental problem solving, park management, and sustainable ecosystem management. (May, Cathleen L., 1998, *Geoecology: Emerging direction or buzz word*: GSA Today, v. 8, n. 7, p. 12 - 13).

NPS cooperative agreements with geoscience organizations and museums have been developed to support park geology interpretation. A new agreement was signed in 1998 with the New Mexico Museum of Natural History and Science. Museum staff has since been involved in comprehensive interpretive planning at Capulin Volcano National Monument and providing technical review for NPS webpages. On-going cooperative agreements with U.S. Geological Survey, Geological Society of America, and Denver Museum of Natural History have also provided interpretive support to parks.

Over the past year the Geologist-in-the-Parks program has provided 27 interns and volunteers to park's interpretive programs. Geology interns performed a wide range of duties

and projects in the parks including writing site bulletins and exhibit text; leading walks, talks, and field trips; developing earth science education programs and leading school groups; updating interpretive research and collections; and working the front desk.

In 1998, a greatly expanded park geology website was launched to provide thematic information for parks staff and visitors, as well as for the broader audience on the Internet. The Park Geology website is located at <http://www2.nature.nps.gov/grd> and features geology fieldnotes for more than 130 park units. Several parks have worked with a USGS geology education specialist in the western region to develop full-featured geology education sites for their parks. Collaborative efforts in geology education are part of the cooperative agreement with U.S. Geological Survey and have resulted in the development and posting of web based introductory geology resources to benefit all parks.



Under the recommendation of the geology advisory group, the Division initiated a project to research and write an Administrative History of Geology in the National Park Service. NPS historian Harlan Unrau prepared a scoping document for a comprehensive historical study of the role of geology and geologists in the establishment, development, and operation of national parks and the NPS as well as our relationship to the USGS. The administrative history could be an important tool for building awareness and providing background for future geologic management decisions. The scoping report will outline the themes and information sources that will be the focus of research.



## Geologic Resource Science Partnerships

By Bruce Heise, Geologist

Due to the broad scope of geology concerns across the Service and limited NPS staffing, the Geologic Resources Division commits significant effort toward establishing and maintaining productive working relationships with other earth science organizations to support park resource management. In 1998, through these relationships, the Division was able to provide many parks with a variety of expertise in the fields of geology and paleontology. Described below are examples of partnerships with the U.S. Geological Survey, the Geological Society of America, Georgia College, the National Association for Black Geologists and Geophysicists, Denver University, the Colorado Geologic Survey, and the Colorado School of Mines, and the many benefits to parks from these activities.

### The U.S. Geological Survey

The Division has worked to establish NPS liaison offices in each of the three U. S. Geological Survey (USGS) regional offices. In 1998, Division staff spent one day a week in the Reston and Denver USGS offices and Judy Rocchio, NPS Western Region, worked at the Menlo Park USGS office. Operating through these NPS liaisons, the USGS provided important technical support to parks on matters relating to geologic research, management, and interpretation.

*Geologic Resources Inventory Pilot Project* — In 1998 the Division, in cooperation with the Natural Resource Information Division, initiated the geologic resources inventory as part of the Servicewide inventory effort mandated by the 1997 NPS Strategic Plan. Main elements of the pilot project include an on-site meeting at each park with NPS staff and external experts on park geology and the preparation of a digital geologic map and report. USGS participation in these phases of the project was critical. USGS staff accompanied Division staff to Mesa Verde NP, Black Canyon of the Gunnison and Curencanti National Monument, Dinosaur National Monument, Rocky Mountain National Park, and Colorado National Monument. At Colorado National Monument the effort paid dividends immediately when the Survey geologist working in the park identified charcoal horizons in the valley fill. C14 dating of these horizons provided a 750-year indication of the fire history of the park. An on-site workshop was conducted, attended by specialists in fire ecology, fire protection, pinon pines, soils, and paleo-climatology. This was a direct park management application of information obtained through geologic mapping. A full description of the pilot project is provided in the following article. The groundwork for a similar inventory project for parks in Utah has already been established with substantial USGS support and participation.

*Geologic mapping in and around Yellowstone* — The world's first national park continues to act as a magnet for USGS scientists. The Division facilitated two mapping related projects for the park. A technical assistance request from the park identified mapping adjacent to the northwest corner of the park as a critical need for groundwater studies planned by the multi-agency Yellowstone Compact. The Division worked with the Survey to focus the effort

and provide language for the funding proposal.

A USGS digital version of the Yellowstone geologic map was a commodity long sought by the geoscience community. Through the Division's facilitation, a meeting was held with participants representing the park, two Survey offices, three state Surveys, and two universities. Problems associated with the transfer of the digital data were resolved and the map was released as a USGS Open File Report.

*Planning for future conferences* — Numerous park technical assistance requests led the Division to organize two different workshops to be held in 1999. At Death Valley, park staff have long desired a single geologic map covering the entire park. To assist, the Division brought the subject to the attention of USGS geologists involved with mapping in or near the park. Working with the USGS scientists and park staff, the Division coordinated planning for a "Status of Geologic Research and Mapping in Death Valley National Park" workshop scheduled for April 1999. The workshop will last three days and involve experts on the park in a series of geology presentations, meetings and field trips. The USGS will fund 50% of the workshop costs, the Division and park will contribute 30%, and the Department of Energy the remaining 20%.

A second major workshop is being planned in response to numerous park requests for technical assistance on coastal related issues. In partnership with the USGS Marine and Coastal Geology Program and the Geologic Society of America, the Division is planning to present a "Geology of Coastal Ecosystems" workshop in the fall of 1999. Details of the workshop are given in the following Geological Society of America section.

The Division liaisons worked with USGS scientist to provide specific assistance at numerous parks. Several examples are listed below.

- At Padre Island National Seashore, as part of producing a future oil and gas development scenario for the ongoing NPS Minerals Management Plan, the USGS Energy Team created a sophisticated algorithm for estimating remaining hydrocarbon reserves in the park. Division staff then used these numbers to model future oil industry operations and the ancillary impact on park resources.
- At Gila Cliff Dwellings National Monument, a USGS geologist who has spent much of his career working in the region proposed an interpretive display linking the area's geology with its early human habitation. The Division worked with him to determine a format for the display and to find funding to complete it.
- At Devils Tower National Monument, the Division was asked to review a request from Western Washington University to collect 100-150 core samples for a paleo-latitude study. Working with the USGS geochronology experts, Division staff reviewed past work done in the area and provided a range of possible alternatives to the proposal that would have a lesser impact.

► At White Sands National Monument, the Division met with park staff and USGS experts on aeolian processes to discuss park geologic research needs. The group developed a ranked list of eight topics for the park to incorporate in their resource management planning.

### The Geological Society of America

For the past several years, the Division has nurtured and maintained a successful partnership with the Geological Society of America (Society). Two projects, one continuing and the other new, were carried out during 1998. The popular Geologist-in-the-Parks program (GIP) was again jointly conducted among the Society, individual parks and regions, and the Division. Additionally, and in response to coastal park technical assistance requests, the Division partnered with the Society and the USGS to initiate a conference on coastal ecosystem processes that will be held in fall of 1999.

*Geologist-in-the-Parks Program* — Created in 1996, the Geologist-in-the-Parks (GIP) Program facilitates the temporary placement of geoscience professionals in the parks to assist park staffs in understanding and managing geologic resources. The program is described elsewhere in this publication. In 1998, the Geological Society of America provided funding and administered geologic internships in six park units. Most were students gaining their first geology-related work experience through the GIP program. The parks provide an outstanding opportunity for them to use their college training in the real world and gain valuable work experience. In exchange, the National Park Service and the public have benefited tremendously from the many hours that GIP participants have given to the parks. The Division plans to continue working with partners such as the Society to expand the GIP program to assist parks to reduce their backlog of geologic projects and manage park geologic resources more effectively.

Parks participating in the Geological Society sponsored GIP Program in 1998 were:

- Badlands National Park — geologic interpretation, resource management, and research.
- Denali National Park – management of geologic resources.
- Death Valley National Park — management of geologic resources.
- Lake Clark National Park — geologic interpretation.
- Petrified Forest — geologic research and interpretation.
- White Sands National Monument – geologic interpretation.

*Geology of Coastal Ecosystem Workshop* — Working cooperatively with the Society and the USGS, the Division commenced planning for a workshop to address integrating geology into ecosystem management in the coastal parks. The workshop is a result of coastal park requests for technical assistance through the annual Natural Resources Unified Call, concerns raised at the

1998 Shoreline Resource Managers Conference at Cape Cod, and the number of direct requests from parks to the USGS Marine and Coastal Geology Program for technical expertise. The workshop is intended to make connections between research science and resource management, to foster a better understanding of the role of geology in coastal ecosystem management, and to facilitate collaboration between coastal parks and external sources of expertise and knowledge. The workshop is scheduled for September 1999 and desired outcomes include:

- geoscientists will better understand park resource managers' needs and how to provide research products that are useful to managers,
- managers will learn about the kinds of geologic knowledge that can be usefully applied to coastal ecosystem management, and
- geoscientists and resource managers will become familiar with when, where, why, and how to contact each other to work toward shared goals.

*Geological Society of America's annual convention* — For the third year, the Division hosted an NPS booth at this large convention held in Toronto in 1998. The booth display and associated interaction provides exposure of NPS geology concerns to the more than 6000 attendees. Visitation is hard to measure precisely, but nearly an entire ream (500) of GIP information sheets disappeared, along with all available hand-outs on the abandoned mineral land program, caves, volunteering in parks, and a variety of publications and Division information. The booth saw steady traffic from the time the doors opened until the lights went out, and response was at times overwhelming. The nature of the contacts ranged from students seeking employment to detailed discussions on increasing the geologic presence in parks.

### Georgia College

Division staff assisted in the development of a Memorandum of Understanding (MOU) between the Service and Georgia College. Dr. Bill Wall has developed a field program for training paleontology students that has proven useful in research in numerous parks. Since 1985, Dr. Wall and students from Georgia College have assisted many NPS areas with paleontological inventories and other technical assistance. In 1998 the MOU was established to facilitate future paleontological field activities in the parks.

### National Association for Black Geologists and Geophysicists

The NABGG became a Geologist-in-the-Park (GIP) partner in 1998 with the establishment of a Cooperative Agreement between their organization and the Geologic Resources Division. Two geology undergraduate students are being recruited by NABGG to be interns at Sunset Crater Volcano National Monument the summer 1999 field season. The interns will interpret park geologic resources to park visitors and help design and

write text for site bulletins, exhibits, and signs. Dr. Wesley Ward, NABGG president and a U. S. Geological Survey geologist located at Flagstaff, will mentor both interns.

### University of Denver Law School

Tiering off of an umbrella agreement set up by the Intermountain Regional Office with the University of Denver, the Division worked out an arrangement with the university's Natural Resources & Environmental Law Program in 1998 to obtain student research assistance. While not full-fledged lawyers, the students are immersed in a legal curriculum focused on environmental issues and use their developing legal research skills to augment the Division's technical assistance capabilities. Many of the concerns that the Division deals with have a legal dimension ranging from interpreting statutory language to applying regulations and relevant case law. The research results of the students will be integrated into Division products that will be forwarded to the Solicitor's Office for review. To date the students have assisted Division policy and regulatory staff analyze federal tort liability associated with mining sites, federal and state pipeline regulations, and legal protocols governing the removal of abandoned property at abandoned mining sites. The arrangement has proven useful and will be continued in the future.

### Colorado Geologic Survey

As described earlier, the Division initiated a geologic resources inventory of NPS units in Colorado in 1998. The state geologic agency participated in the scoping meetings at Mesa Verde and Rocky Mountain National Parks and at Black Canyon of the Gunnison National Monument. Colorado Geologic Survey geologists provided helpful input, particularly on slope instability and facility hazards in these parks.

### Colorado School of Mines

Two projects were completed in 1998 under a cooperative agreement between the Colorado School of Mines (CSM) and the Division. The projects were part of an ongoing Minerals Management Plan initiative for NPS units in Texas. One was a senior project compiling an annotated bibliography of environmental impacts related to oil and gas operations. This extensive database was cataloged electronically and provided to all participants on the management plan team. The team also funded a master's thesis that compared operating costs inside parks with similar operations outside to determine if there was an operating differential and what generated it. Staff and operators in Big Cypress, Big Thicket, Lake Meredith, and Cuyahoga provided much of the data. Economic models generated from the data indicate the increased costs come not so much in enhanced environmental protection but from delays in permit approval. Copies of the thesis and the annotated bibliography are available through the Division. ◆

## Geology Speaker Series

By Bob Higgins, Chief, Science & Technical Services Branch

As part of the Division's effort to increase awareness of geology concerns within the Service, an informal geology speaker series was initiated in 1998. The purpose of these sessions was to offer Denver-based NPS employees a selection of geologic talks relevant to NPS issues. Local speakers are used primarily from the U.S. Geological Survey offices in Denver, Colorado. In 1998 the following talks were given:

1. Dr. Steven Fryberg (consulting geologist) – Sand dune systems and geologic processes, examples taken from White Sands and Great Sand Dunes National Monuments.
2. Dr. James Ratte, (USGS, retired) – The geology of the Southwest Mogollon Rim in and around the Gila Cliff Dwellings National Historic Site.
3. Dr. Erving Friedman (USGS, retired) – The geology of geysers and geyser basin systems throughout the world with an emphasis on Yellowstone National Park.
4. Dr. Ken Pierce (USGS) – The Yellowstone Hot Spot, the Greater Yellowstone Geo-ecosystem, and the Human Experience.
5. Dr. Bob Lillie (Oregon State University) – Parks and Plates: fun ways to explain plate tectonics, its relationship to parks, and why staff and visitors should care! ◆

## Geologic Resources Inventory: Colorado Pilot Project

By Bruce Heise, Geologist

The Natural Resource Program Center (NRPC) has completed the first phase of the Geologic Resource Inventory, the Colorado Pilot Project. The pilot project conducted jointly by the NPS Inventory and Monitoring (I&M) Program and the Geologic Resources Division (GRD), stems from the 1997 NPS Strategic Plan. In that plan, Goal Ib1, Natural Resource Inventories, recognized a digital geologic map as one of 12 essential data sets for parks. At an NRPC meeting in November 1997, a group of NPS, USGS, and state geologists identified a service-wide inventory of the National Park System's geological resources as a critical first step for managing, interpreting, and understanding these resources. The group determined that a geology inventory should consist of four main components:

- 1) a bibliography of geologic literature and maps,
- 2) an evaluation of park geologic resources and issues,
- 3) an assessment of geologic map coverage and production of digital map products, and
- 4) a compilation of a park specific geologic report summarizing basic geologic information, hazards, issues, existing data, and research relating to the park.

Parks in three states (Colorado, Utah, and North Carolina) were selected for a pilot inventory. Inventory workshops were planned for each park to assess the quality and extent of available geologic information. Because of the proximity to both the NRPC and the U. S. Geological Survey (USGS), Colorado parks were selected for the first workshops. Meeting methodology, current project status, and results from the Colorado scoping meetings are described below in **Table 1**.

### Methodology

Cooperative inventory teams (park teams) conducted the scoping workshops. Each meeting started with a half-day or day-long field trip led by a park, USGS, or other authority on the park's geology, providing an overview of the local geology as well as an opportunity for the inventory team to observe issues related to geologic resource management. The next phase was dedicated to reviewing the four inventory items listed previously along with any other relevant issues. Each workshop ended with a summary session to determine inventory needs and deliverables and to tentatively assign cooperator responsibilities. In several cases, a follow up meeting at the USGS offices in Denver will review existing map quality and coverage and plan for digital product production.

### Inventory Teams

Cooperative inventory teams conducted the scoping workshops. These park teams had mixed makeup, but always included park and NRPC staff. Park staff participation ranged from superintendents present for the entire workshop to a variety of resource management, GIS, interpretive, and maintenance personnel. In general, the geologic resource inventory concept was well received by the parks and other natural resource inventories were also discussed.

Participation by external geologic groups was quite varied. The USGS attended meetings at Rocky Mountain National Park (ROMO), Colorado National Monument (COLM), Mesa Verde National Park (MEVE, including Yucca House (YUHO) and Hovenweep (HOVE)), Black Canyon of the Gunnison National Monument (BLCA), Curecanti National Recreation Area (CURE), and Dinosaur National Monument (DINO) and expressed an interest in the meetings at Great Sand Dunes National Monument (GRSA) and Florissant Fossil Beds National Monument (FLFO). There was academic participation at COLM, ROMO, GRSA, BLCA/CURE, and FLFO. The Colorado Geological Survey staff attended meetings at MEVE, ROMO, and BLCA/CURE. Volunteer geologists, significant contributors to the parks' geologic understanding, participated at BLCA/CURE, COLM, MEVE, ROMO, GRSA, and DINO.

**Table 1**

Park Unit	Park Contact	Workshop	Geologic Map	Digitized Map	Geologic Report	Biblio.
Colorado NM	Steve Hickman	6/23-24/98	Incomplete	No	Incomplete	Yes
Mesa Verde NP	Alan Loy	7/14-15/98	Incomplete	No	Incomplete	Yes
Rocky Mountain NP	Craig Axtell	8-11-12/98	Yes	Incomplete	No	Yes
Dinosaur NM	Dan Chure	9/10-11/98	Yes	No	No	Yes
Black Canyon NM Curecanti NRA	Sarah Beetch	8/25-27/98	Yes Incomplete	Ongoing Incomplete	Incomplete Incomplete	Yes Yes
Florissant Fossil Beds NM	Herb Meyer	10/21/98	Incomplete	No	Incomplete	Yes
Great Sand Dunes NM	Andrew Valdez	8/20-21/98	Incomplete	No	Ongoing	Yes
Bent's Old Fort NHS	Dan Brown	10/19/98	Incomplete	No	No	Yes

### Pilot Project Findings and Recommendations

Preliminary findings of the pilot inventory suggest several applications for overall park resource management from an enhanced understanding of the parks' geology. Examples include the use of stratigraphic relationships and age dates to construct fire histories, to identify habitat for rare and endangered plant species, to identify areas with cultural resource and paleontological potential, and to locate potential hazards for park roads, facilities and visitors. Digital geologic maps will enhance the ability to develop precise hazard and resource models in conjunction with other digital data. Many of the techniques have service-wide applicability.

In addition to applications for geologic data, the increased communication and coordination among the cooperating agencies, academia, volunteers, and NPS staff pay dividends as well. For example, at MEVE, new geologic field mapping by Mary Griffiths was ready for compilation and digitizing (field mapping to update the existing 1950s planimetric map may have cost \$50,000 or more), and park GIS staff propose to digitize the geologic map in FY 1999. At BLCA/CURE, I&M has the opportunity to fund the completion of a high-quality geologic map digitizing project that was languishing. Cooperators from Western State College have completed a project proposal to finish two of four unmapped quadrangles on the north side of Curecanti. At GRSA, park staff will map an unmapped portion of the monument and compile a geologic report for the park. A major benefit of the scoping meetings has been to identify previously unknown work and cooperating partners and to take maximum advantage of existing work for the geologic inventory. At small park units, the park superintendents and chief rangers are often major cooperators in the workshops. Park staffs have expressed an interest in working with other natural resource inventories and the Natural Resource Program Center.

As a result of the Colorado Pilot Project, the inventory plan and budget have been revised to reflect mapping and digitizing project opportunities. One full-time student and two half-time student geologist positions have been filled at GRD and I&M to supply support for inventory projects. Digitizing projects have been identified and project proposals started for work at MEVE, BLCA/CURE, and at NRPC for the other units. With adequate funding, a significant amount of work toward completing the inventories for Colorado parks will occur in FY 1999.

Recommendations from the pilot project are to initiate and complete remaining inventory projects for Colorado parks and to continue the inventory workshops for Utah and North Carolina parks as planned. Digitizing standards and report formats must be finalized. GRD and I&M need to continue or add to FTE support for the project as feasible, and project coordinators must continue to evolve a systematic approach, solicit additional cooperator project support, and leverage project funding for maximum gain.

### Colorado Pilot Project Status

Scoping sessions for the Colorado parks are complete. Over a four-month period, some 70 different people were involved in 18 days of inventory meetings in the 11 Colorado parks. Based on results of the scoping meetings, Colorado parks have the geologic inventory needs listed in **Table 2**. Efficient protocols for planning and conducting the workshops were developed and implemented. A geologic bibliography has been compiled and verified for each unit. Complete geologic map coverage at acceptable scales is available for only three of the units. However, seven units have recently planned or completed field maps that will be compiled digitally. Digitizing projects are underway for three parks and planned for an additional seven during FY 1999. Reports describing the local geology are available for five park units, but new reports need to be compiled or existing reports reformatted to complete the inventory for all 11 park units. Several parks are using techniques for overall resource management based on knowledge discerned from maps that may have servicewide applicability. The workshops have been successful for evaluating each park's issues and resources, gaining program understanding and cooperation, and maximizing returns from existing projects and knowledge. ◆

**Table 2**

Park	Digital Maps	Geologic Reports	Other Inventory Related Needs
Colorado NM	USGS will produce a digital map in FY 2000	USGS Professional Paper due in FY 2000	
Mesa Verde NP (includes Yucca House & Hovenweep)	Seven (7½ min) quadrangle maps remain to be digitized by the park	Existing geologic report by Griffiths and proposed USGS Professional Paper by Fassett.	Fassett will map coal seams in 1999 as part of a USGS Professional Paper
Rocky Mountain NP	A digital map of the park exists and has been converted into a usable format	No report covering entire park	
Great Sand Dunes NM	Three 7½-min quadrangles need to be digitized by NRPC.	Park is compiling report.	
Black Canyon NM Curecanti NRA	Eleven maps remain to be digitized by the parks	Book by Hansen on BLCA is done; no report covers CURE.	Bartleson (Western State) will compile unpublished USGS maps north of CURE. Some in-fill mapping may be necessary.
Dinosaur NM	20 quadrangles will be digitized by NRPC	No report covering entire park	
Bent's Old Fort NHS	No plans for a digital map at this time	No report dedicated to park geology	
Florissant Fossil Beds NM	Park map will be digitized as part of BLCA/CURE digitizing project	Reports exist in published brochure, conference proceedings, and field trip guide	Minor infill mapping Evanoff (UC) is needed in the NW corner of the park.

## Cave and Karst Management

By Ron Kerbo, Cave Specialist

The National Park Service through the Geologic Resources Division has been coordinating Servicewide assessment of resources in cave and karst areas as mandated by the Federal



Cave Resources Protection Act for the last three years. This has been accomplished through the position of the National Cave Management Coordinator providing technical assistance and allocating small cave project funds. Highlights of the 1998 program accomplishments in the areas of cave conservation, protection, interpretation, and park program support are outlined below.

### INSIDE EARTH Newsletter and Cave Program Website

This year marked the launching of an Internet web-site for the cave and karst program and the first issues of *INSIDE EARTH, A Newsletter of the National Park Service Cave and Karst Programs*. The web-site and newsletters have been well received by both the national and the international speleological community. To date there have been almost 2,000 combined "hits" on the web-site's three issues of the newsletter. The first issue was specifically dedicated to communication. In part the first article stated: "Cordell Roy, former superintendent of Timpanogos Cave National Monument has pointed out that there is a lack of adequate communication between parks established for their outstanding speleological/karst resources. To properly manage, protect, interpret, conserve, and understand our cave and karst resources we need to exchange information on a wide variety of topics... What is needed within the NPS, which is responsible for the management and protection of thousands of caves, is a forum where information, expertise, program components and general information can be exchanged . . . here is the first issue of the newsletter, edited by the competent hand of Dale Pate, cave specialist at Carlsbad Caverns National Park. Dale is a former editor of the *Texas Caver* as well as a person very active in cave exploration, surveying, and conservation. Thanks to his persistence our forum has taken on a shape."

### Park Updates and Projects

*Hawaii Volcanoes National Park:* A draft action plan for the park caves was written during a January site visit to the area. A set of cave survey standards based on those in use at Carlsbad Caverns, Cumberland Gap and other parks were recommended for implementation by the cave specialist Bobby Camara. Several meetings were held with members of the Hawaii Speleological Survey (HSS), a group doing most of the cartographic surveys in the park. Follow-up with the park and the HSS will include assistance to incorporate a cave-mapping program called Compass with Arcview.

*Carlsbad Caverns National Park:* The program continued to fund research projects in the park. This research in the park continues to be on the forefront of cave science. Speleologist Victor Polyak recently released information that establishes ages on the formation of caves of the Guadalupe Mountains including Carlsbad Cavern and Lechuguilla Cave. In Carlsbad Cavern, these dates have been determined: Big Room – 3.9 to 4.0 million years old (myo), Bat Cave – 6.0 myo. In Lechuguilla Cave: Glacier Bay – 5.7 to 6.0 myo, Lake Lebarge area – 5.2 myo

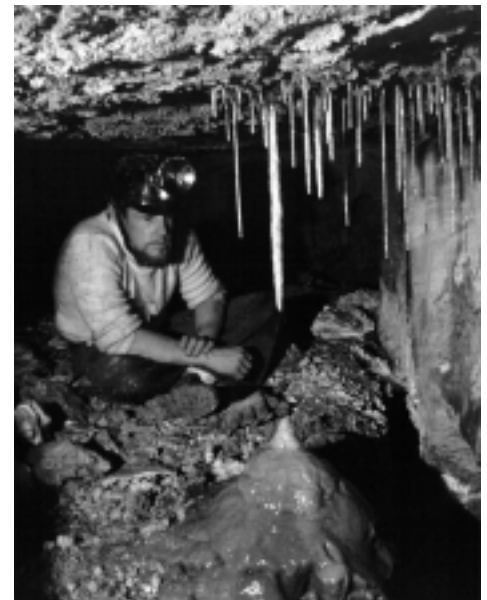
*El Malpais National Monument:* The cave program contributed \$1,000 to the 10<sup>th</sup> Anniversary Stewardship Symposium at El Malpais which was attended by a group of about 60 scientists, researchers, friends of the park, and speleologists. The symposium was a great success and will provide the focus for future research at the Monument and enhance the interpretive story with the visiting public. Of particular speleological note was the microbiological report on work conducted by researcher Diana Northup that has helped redefine how scientists look at evolution and the role of microbes in everything from how caves are formed to the minerals that are deposited in caves; and a cave stewardship workshop facilitated by the division.

*Grand Canyon National Park:* With support from the program, noted speleologist and co-author of *Cave Minerals of the World*, Carol Hill started a study of the minerals of the caves of the Grand Canyon. Hill's work is focused on determining the roll of various ore bodies present in the canyon's geologic strata on the speleogenesis of the caves.

*Sequoia and Kings Canyon National Parks:* The national cave program contributed funding through the Geologists-in-Parks program to continue the ongoing cave inventory and assessment project in the park. Thanks to this funding the park cave resources office was able to keep an assistant cave specialist on staff to conduct backcountry cave inventory fieldwork. This enable the park cave specialists to produce a series of award winning cave maps documenting Crystal Cave, the second longest cave in the park at 2.94 miles.

### Meetings and Other Projects

*Cave Management Guidelines:* Mike Wiles, Jewell Cave cave resource specialist, assisted with the rewrite of the Cave Management Section of the old NPS-77. Thanks to Mike's assistance, the cave section was the first of the geology section rewrites to be submitted to for





final editing before going out to the parks for review and comment. The cave section has undergone substantial revision and the drafts have been through several reviews by field cave specialists.

*Interagency Cave Management Agreement:* An interagency agreement for cave management has been written in cooperation with BLM cave specialist, Jim Goodbar. The agreement provides for cooperative management of cave and karst resources among the USGS, BLM, USFS, USFW, and NPS. Since the passage of the Federal Cave Resources Protection Act in 1988, until now there has been no effort made to assure cooperation among the major agencies involved in managing and conducting or supporting research in the caves on federal lands.



*Interagency Cave Resources Workshop:* An interagency cave resources workshop that included participants from four agencies, NPS, BLM, USFWS, USFS and a representative of the Cave Research Foundation, was held in Denver. The two-and-a-half day interagency meeting was the first of its kind. Accomplishments of the meeting included agreeing to:

- ▶ Add “karst” to the language describing cave resources management, since the majority of caves exist in karst and cave resources can be neither understood nor managed without understanding and managing the karst ecosystems of which they are an integral part.
- ▶ Establish an interagency cave and karst working group to cooperate on issues related to cave and karst resources management.
- ▶ Advance an Interagency Agreement for Cave and Karst Resources Management between BLM, USFW, NPS, and USFS.
- ▶ Create interagency guidelines for cave and karst resources management.
- ▶ Enhance cooperation and communication through the establishment of an Intranet system for use by federal employees engaged in cave and karst resources management.
- ▶ Develop a comprehensive resources list for cave and karst management.
- ▶ Compose a report on the status of federal cave and karst conservation and management.
- ▶ Summarize and update the significant caves list.
- ▶ Continue discussions about the National Cave and Karst Research Institute, which may have authorization before the end of this congressional session.
- ▶ Continue work of NPS, BLM, USFS and CRF on national cave cartographic survey standard.

*Consultation with USFS:* As a follow-up to previous consultation with the USFS on Papoose Cave, Idaho an action plan to set priorities for research needs in the cave was drafted by the

division. The plan was compiled with input from the cave resources staff at Carlsbad Caverns and the USFS national cave management specialist, Jerry Trout. As a side benefit to the Service, cave diving guidelines developed by Division staff for Papoose Cave are being adapted for use in Lilburn Cave by the

Sequoia- Kings Canyon cave specialist. Papoose Cave is a difficult and deep cave on the Salmon River District of the Nez Perce.

*The National Speleological Society Convention (NSS),* was held at the University of the South in Sewanee, Tennessee. 12 cave specialists from the NPS attended the Convention and participated in a variety of meetings and sessions. The cave program assisted with the travel for several of the NPS cave specialists

attending this very important annual meeting of speleologists and cave explorers. Bobby Camarra (HAVO) led a special session on current speleological work in Hawaii Volcanoes. Joel Despain and Greg Stock (SEKI) were recipients of the NSS Cartographic Medal Award for their maps of Crystal Cave. Mike Wiles (JECA), Rod Horrocks (GRBA) and Stan Allison (CAVE) all presented speleological papers covering work from South Dakota to Mexico. Many of the NPS specialists were speakers at special sessions ranging from the National Cave Management Symposium Steering Committee to sessions on research and exploration in Lechuguilla Cave (CAVE).

### Summary

The cave program for FY 1998 was focused on the following:

- ▶ service-wide small cave assessment projects
- ▶ technical assistance for cave resources management
- ▶ attendance at cave/karst professional meetings
- ▶ agency and federal wide meetings on cave/karst issues
- ▶ lectures/programs on Service-wide cave/karst issues
- ▶ development of cave/karst newsletter and web-site

The cave program’s \$30,000 project assistance funding was expended as follows: mineralogical project in GRCA caves, \$5,000; assistance to cave assessment at ELMA, \$1,000; assistance to cave assessment at SEKI, \$4,000; assistance to cave assessment at HAVO, \$2,500; assistance to cave related geologist-in-the parks program, \$2500; Interagency Cave and Karst Meeting, which resulted in draft of Interagency Agreement for Cave and Karst Management, \$4,850; travel by cave specialists to professional meetings and training at MACA, CAVE, GUMO, the National Cave Management Symposium and the National Speleological Society Convention, \$7,860; software for web-site, \$500; assistance to Pacific West Region cave NNL assessments and assistance to California Department of Natural Resources at Mitchell Caverns Natural Preserve, \$1790. ◆

## Paleontological Resources Management

By Vince Santucci, Paleontologist

The year was very active in paleontological (fossil) resources management. The ongoing inventory of park paleontological resources added fourteen parks to the list of parks with paleontological resources and several thematic inventory efforts are proceeding, along with development of a Servicewide database. Program publications, education, and outreach efforts were broadened particularly through the revitalization of the Park Paleontology newsletter and development of paleontological information on the Division Webpage. Also, the Geologist-in-Parks program included several interns involved in paleontology in numerous parks.

### Park Paleontology Surveys

Continuing efforts by the divisions paleontologist and Geologist-in-Park interns and volunteers surveying individual parks has expanded the list of parks that contain



noteworthy fossil resources by fourteen, bringing the Servicewide total to 120 parks. The parks surveyed and added in 1998 are: Blue Ridge Parkway, Chickamauga and Chattanooga National Military

Park, C&O Canal National Historic Park, Golden Gate National Recreation Area, Great Smoky Mountains National Park, Hovenweep National Monument, Mojave National Preserve, Mount Rainier National Park, Navajo National Monument, Oregon Caves National Monument, Ozark National Scenic Riverways, Rainbow Bridge National Monument, Springfield Armory National Historic Park, and Vicksburg National Military Park. Paleontological surveys have been discussed for Arches, Canyonlands, Bighorn Canyon, Chickamauga and Chattanooga (cave), Grand Canyon, Niobrara Wild & Scenic River, Petrified Forest, and Zion for 1999. Graphic images including survey logos, maps and illustrations have been created for various park paleontology surveys.

### Thematic Paleontological Resource Inventories

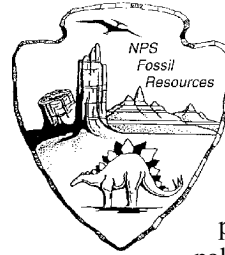
A compilation of NPS areas identified twenty-four parks as having fossil vertebrate tracks as a resource. This data was published in a professional journal (Santucci, Hunt & Lockley, 1998), and presented as a poster at the Society of Vertebrate Paleontology's annual meeting, and at the Fifth Conference on Fossil Resources. In 1998, division staff initiated a Servicewide inventory of paleobotanical specimens in consultation with paleobotanists from the Smithsonian Institution, the



Denver Museum of Natural History and Brigham Young University. Also, in a collaborative effort with the division cave specialist, an inventory of paleontological resources associated with NPS caves was initiated. Cave fossils generally occur in two categories: those contained in marine limestones that form the caves, and fossils of more recent (Pleistocene/Holocene) organisms that have either died in or been transported into caves.

### Servicewide Paleontology Database and Information Management

Division staff, in cooperation with the Inventory and Monitoring program, developed a prototype NPS paleontological resource database. The prototype is an ACCESS database and is designed to accommodate Servicewide paleontological resource management information. Although, the database is not specifically designed for park use, it can be adapted for park specific needs.



### Publications, Interpretation, and Education

Division staff completed several publications on management, interpretation, protection, and research related to NPS paleontological resources. The quarterly newsletter *Park Paleontology* was revitalized and published in 1998. The newsletter serves to communicate information related to fossil interpretation, protection, resource management, new discoveries, and current issues related to the world of paleontology and paleontological resources management. A Fact Sheet, *Paleontological Resources in National Park System Units*, was also prepared as part of the series produced by the Natural Resources Information Division. The newsletter and fact sheet are available on the Geologic Resources Division Intranet site.

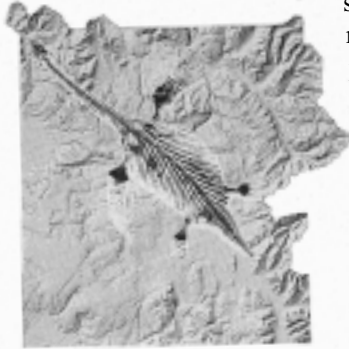
NPS Paleontological Research, Volume 3, was published as the first Geologic Resources Division Technical Report. This is the third research publication specifically dedicated to paleontological research in the national parks and contains 38 original articles representing 21 national parks, including the multi-park

research of the Morrison Paleoecosystem Study and an historical account of the forgotten Fossil Cycad National Monument. All of the NPS Paleontology Research Volumes have been posted on the Division Website.

**The Yellowstone Paleontological Survey** contains results of the comprehensive survey completed in 1998. This park management document addresses interpretation, resource management,



The Yellowstone  
Paleontological Survey



Vincent L. Santucci  
Yellowstone Center for Resources  
National Park Service  
Yellowstone National Park, Wyoming  
YCR-98-00-1  
1998

protection, and museum collections concerns, and contains a bibliography, fossil locality maps, and a paleo-species list. There are also recommendations on paleontological resource needs and suggested projects to support park planning. The report has generated considerable interest throughout the NPS and will serve as a model for similar surveys initiated or planned for other parks.

The program developed a number of Paleontological Resource Training presentations in Microsoft Power

Point for educating NPS staff. These programs include: Definition of a Fossil, Fossil Resource Protection, An Inventory of NPS Paleontological Resources, NPS Paleo Surveys, and Paleoecosystem Approach to Managing Fossils. Presentations were provided for Natural Resource Program Center staff in Denver, for staff training at Big Bend National Park, Death Valley National Park, Fossil Butte National Monument, and Guadalupe Mountains National Park, and to a number of community groups. A number of formal presentations were delivered at scientific conferences including Yellowstone's 125<sup>th</sup> Symposium, the Society of Vertebrate Paleontology Annual Meeting, and the Fifth Conference on Fossil Resources. For educational outreach, a paleontology "Parks as Classroom" proposal and prototype was developed. The concept involves a series of trading cards depicting the notable NPS units with paleontological resources, and containing an interpretive message, questions, and an Internet address for students to utilize as an activity to learn about the fossils and have fun.

### Geologists-in-the-Parks Program

The Division recruited seven interns at Fossil Butte National Monument providing them with a wide range of experiences including interpretation, curation, preparation, and field collection. Many of the interns were also involved in various paleontological surveys at Arches, Grand Teton, Timpanogos Cave, and other NPS areas. The interns assisted in the Park Paleontology newsletter, provided interpretive programs, assisted in compiling data for the Alaska national parks and the Cave-Paleo Survey, conducted research at Timpanogos Cave NM, assisted with the Fossil Butte curatorial backlog, co-authored a publication on Fossil Cycad NM, helped initiate the Death Valley Paleontological Survey; and compiled information on fossiliferous stratigraphic units preserved in NPS areas.

### Paleontological Research

Paleontological research continues in many NPS areas. Many presentations at the 1998 Society of Vertebrate Paleontology Conference and the Fifth Conference on Fossil Resources were directly related to research in the national parks. The Division received requests to review paleontological research proposals in Big Bend, Death Valley, and Yellowstone. A Memorandum of Understanding (MOU) was established between the Division and Georgia College to develop and facilitate field programs for training paleontology students in parks. Since 1985, Dr. Bill Wall and his Georgia College students have assisted many NPS areas with paleontological inventories and other technical assistance.

### NPS Park Paleontology Recognition Pins

The program created two recognition pins to acknowledge individuals making positive contributions in promoting management and protection of NPS paleontological resources. Both pins are modeled after the Park Paleontology newsletter logo. The first version of the pin is black and gold and is presented to individuals making noteworthy contributions to promote paleontology in the national parks. A solid gold version of the pin is presented to individuals making significant contributions to paleontology in the National Park Service. Listed below are the 1998 recipients of the gold Park Paleo pin.

The first recipient of the gold "Park Paleo" pin was **Rachel Benton**, paleontologist at Badlands National Park, for among many other accomplishments, coordinating two Fossil Resource Conferences. The second pin recipient was **Greg McDonald**, paleontologist at Hagerman Fossil Beds National Monument. During 1997, Greg obtained a \$50,000 grant from Cannon Corporation to conduct an excavation of the Hagerman Horse Quarry. The third pin recipient was **Diann Gese**, geologist in the Geologic Resources Division. Through her efforts with the Geologists-In-Parks Program, Diann successfully promoted paleontology by placing geology and paleontology student interns in NPS areas. The fourth pin recipient was **Lindsay McClelland**, the Washington-based geologist in the Geologic Resources Division. Lindsay has provided a strong voice in Washington to promote geology and paleontology in the parks. Among his many contributions to paleontology in the parks, Lindsay assisted in co-editing two NPS Paleontological Research publications. The fifth pin recipient was **Ted Fremd**, paleontologist at John Day Fossil Beds National Monument. Ted has successfully provided leadership in paleontological resource management and still functions as a viable researcher. The sixth pin recipient was **Torrey Nyborg**, paleo-intern at Death Valley National Park and at Fossil Butte National Monument. Torrey was recognized for his work in documenting fossil localities at Death Valley. ◆

## Minerals Management Program

By Carol McCoy, Chief, Policy & Regulations Branch

In 1998, 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. This role harkens back to 1983 when Director Dickenson assembled the Division's organizational predecessor to help parks manage private mineral development in parks and to effectively voice park protection concerns over mineral development on adjacent lands. Since that time the function of the group has expanded to encompass geologic resource management. Nonetheless, the original core function remains ever important and challenging as park managers contend with mining and petroleum operations in and adjacent to park boundaries.

The extent of mineral development in the parks is startling to most people, with 52 private mining operations in 18 parks, 597 nonfederal oil and gas operations in 10 parks, and 165 NPS sand and gravel pits in 35 parks. Also, it is a little known fact that most parks are encumbered with private mineral rights that could be developed in the future. In addition, many of the western parks and a dozen parks east of the Rockies must contend with mineral development adjacent to their boundaries.

Below is an overview of key functions and accomplishments of the Division in 1998. Some of the topics are covered in much greater detail in subsequent articles recapping 1998.

### Plan of Operations Review

NPS regulations control mineral development associated with two different types of mineral rights in parks. 36 CFR Part 9A governs all mining activities associated with mining claims located under the 1872 Mining Law 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 operation before they begin exploration or development activities. A plan of operations is essentially a mining blueprint that addresses impact mitigation and site reclamation. Review of these plans enables the NPS to identify potential effects to park resources and to require modifications to prevent adverse impacts.

In 1998, Division staff reviewed 25 proposed plans under the NPS regulations and assembled technical, environmental compliance, and mitigation recommendations for park action. Conducted in response to park requests, these reviews included two proposals to mine at Joshua Tree National Park and one at North Cascades National Park related to 1872 Mining Law claims. While all parks are now closed to new claim location, 20 parks contain 2400 pre-existing mining claims. Most of these claims are located in Mojave National Preserve in California and park units in Alaska. Division staff also reviewed 22 proposals to conduct oil and gas operations related to privately-owned minerals in parks. Most of the plans entailed proposals to

conduct 3-D seismic operations at the Big Cypress National Preserve in Florida. Division staff provided detailed technical and regulatory comments to the parks and advised them as to information deficiencies and patterns evident in multiple plan submissions. The Big Cypress plans raised significant policy and regulatory concerns requiring close consultation with park staff and representatives from the Solicitor's Office. For example, the extensive acreage involved prompted discussion on the need for an Environmental Impact Statement to evaluate associated resource impacts. The plans also lacked complete ownership records or proof of a right to characterize the subsurface oil and gas rights in the park.

### 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 of 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. Because the litigation potential is high in the mineral arena, since it involves private property rights, the Division frequently works closely with staff attorneys in the Solicitor's Office in Washington and the various regions.

While the NPS has specific regulations to control development on mining claims, the mining claim itself is a creature of the Mining Law of 1872. The Mining Law is encumbered by over 120 years of administrative case law that continues to evolve. As a result, the NPS must stay current with recent laws, Solicitor Opinions, and BLM procedures affecting the property right interests held by claimants. In 1998, the implications of three key Solicitor Opinions for mining claims management came to light revealing the Solicitor's interpretation of most park enabling statutes and §206 of the Alaska National Interest Lands Conservation Act that cut off claimants ability to obtain fee simple property rights through patents. Most withdrawal language reads, "lands are hereby withdrawn from all forms of appropriation under the public land laws, including location, entry and patent..." This was a significant revelation and one that reversed direction provided by the Solicitor's Office in the mid-1980s. Formalized guidance on this point will be forth-coming from the Solicitor's Office.

With the full support of the Superintendent of Ozark National Scenic Riverways in Missouri and the Director, the Division articulated legal and technical issues pertinent to protecting the park from adjacent lead prospecting and potential full-scale development and elevated them to the highest reaches of the Department. The Division advocated the NPS position that the Secretary had a central duty under the Organic Act to protect park resources from potential adverse decision under his control. Science data from the United States Geological Survey and others indicated that full-scale lead mining in the karstic environment, where the company sought permits, would likely pollute the superb water resources of the park. Since the Bureau of Land Management was the Federal Government's mineral

leasing agent, the ultimate decision to issue prospecting permits rested with the Department of the Interior. At the Division's urging, the Solicitor seized the opportunity to advance the reach of the Organic Act beyond park boundaries, which will likely be beneficial to other parks in the future.

In the policy arena, Division staff also provided the NPS Office of Policy with recommend revisions to the minerals management provisions contained in the NPS Management Policies.

### Validity Exams

Prior to approving mining operations in parks, the NPS must verify that a mining proponent possesses valid rights to mine. With respect to unpatented mining claims,<sup>1</sup> of which there are 1,581 in the National Park System, the means for confirming these rights is the performance of a validity examination.<sup>2</sup> A validity examination is a detailed geologic and economic analytical procedure supported by extensive case law. For a claim to be valid, in addition to satisfying all administrative filings, a mineral examiner must verify that a valuable mineral deposit was discovered at the time the claim was staked and still remains economically viable at the time of the exam. Failure to meet any one of these elements results in administrative action to declare the claim void. Thus, a validity examination is a powerful means for eliminating unsubstantiated mining claims from within park boundaries.

In 1998, the Division expanded the capability of the NPS to undertake validity exams by hiring two experienced mineral examiners to expedite evaluating mining claims in Mojave National Preserve, and Joshua Tree and Death Valley National Parks. The two examiners are duty-stationed at the Headquarters of Mojave National Preserve in Barstow, California. The Division helped the park set up and equip an office for the new examiners. Also, working through the Denver Administrative Program Center the Division set up a contract mechanism for conducting validity exams in the California Desert parks. Four technical contractors were hired under a five-year contract and assigned specific exams to complete in FY-99.

At Joshua Tree National Park, the Division completed the validity examination of the U-Thor mining claims and recommended that the Bureau of Land Management deem the claims invalid because no discovery of a valuable mineral deposit supported the initial staking of the claims. At Mojave National Preserve, Division staff substantially completed the congressionally mandated examination of the Volco exams. The apparent "salting" of one of these claims with introduced gold complicated the exam, prompting re-sampling of the claim. Substantial progress was also made on the examination of 16 claims on the Golden Quail mine site in the park. Staff worked with the claimant's contractor to develop a mine model scenario that restricted operations to those claims exhibiting mineralization in order to facilitate the economic analysis portion of the mineral report. At Death Valley National Park, Division staff initiated a validity exam of the J.O. claims by sampling the claims and having the samples tested to ascertain if the industrial mineral present was suitable for specified applications. Finally, in

ongoing work with the Alaska Support Office, Division staff testified as an expert witness before an Administrative Law Judge in a hearing on contested claims in Denali National Park and Preserve. The judge is expected to render a decision early in the year 2000.

### Minerals Management Planning

In 1998, Division staff provided extensive support to efforts to prepare Minerals Management Plans at Padre Island, Big Thicket, and Lake Meredith. All three parks have numerous non-federal oil and gas operations within their boundaries and are in various stages of preparing comprehensive plans to guide future park decisions on individual development proposals. The minerals management plans, as they are known, also contain integrated analyses that comply with the National Environmental Policy Act. In 1998, Division staff provided extensive assistance to parks in implementing NPS guidance on use of in-park sources of sand and gravel for administrative purposes.

### Participation In External Minerals Permitting

In 1998, the Division assisted several parks to 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. In state forums such an avenue is not available, making intervention to influence state's decision making more challenging. ◆

<sup>1</sup> An unpatented mining claim is the creation of the federal Mining Law of 1872 and entitles the possessor to a property right interest to extract the underlying minerals and use as much of the surface and its resources (e.g., timber and soil) as is necessary for extraction. A patented mining claim is one that has already undergone a validity examination and found to be valid. Its owner possesses fee simple property; that is, owns the surface and subsurface. In the event an entity seeks to mine an unpatented or patented mining claim, the proposed activity triggers the Service's 36 CFR 9A regulations.

<sup>2</sup> NOTE: The primary responsibility for conducting validity examinations on unpatented mining claims rests with the Bureau of Land Management (BLM) as delegated by the Secretary. The NPS has a role in conducting such exams as a result of a Memorandum of Understanding with the Bureau. While the arrangement enables the NPS to identify priority exams and allocates staff resources accordingly, all mineral examinations and their accompanying mineral reports must be approved by the BLM.

—see Mineral Development Summary Chart on next page—

Summary of Mineral Development in NPS Units

Region	Oil and Gas			Mining			Administrative Sand and Gravel			Abandoned Mineral Lands			Total Parks affected
	Wells		Trans-park Pipelines	Operations		Parks affected	Extraction Sites (4)	Parks affected	Sites (5)	Parks affected	Sites (5)	Parks affected	
	Operations (1)	Parks affected		Operations (2)	Parks affected								
Alaska Region	0	0	1	1	5	2	72	8	438	1	9		
Intermountain Region	183	4	82	16	5	4	240	28	78	12	48		
Midwest Region	146	1	52	9	8	4	68	14	52	5	24		
National Capital Region	0	0	5	2	0	0	0	0	9	3	4		
Northeast Region	20	2	34	13	7	3	25	3	171	10	21		
Pacific West Region	0	0	20	5	19	4	172	21	503	19	29		
Southeast Region	248	3	55	9	8	1	276	2	421	11	16		
<b>Totals</b>	<b>597</b>	<b>10</b>	<b>249</b>	<b>55</b>	<b>52</b>	<b>18</b>	<b>853</b>	<b>76</b>	<b>1672</b>	<b>61</b>	<b>151</b>		

(1) "Well Operations" includes all active production wells, shut-in wells, and well sites where the operator has not completed required reclamation.

(2) "Trans-park Pipeline Operations" includes all pipelines that travel through a park and transport gas, crude oil, or refined petroleum products. They vary in size and may not be associated with oil or gas wells in parks.

(3) "Mining Operations" includes all active and inactive sites where the operator has not completed required reclamation.

(4) "Administrative Sand and Gravel Sites" includes all borrow sites where the agency is currently removing material and sites awaiting NPS reclamation.

(5) "Abandoned Mineral Land Sites" includes all inherited mineral development sites for which the NPS has reclamation responsibility, excluding administrative sand and gravel sites. Noted sites exclude sites where reclamation is complete or where the site has been used for other purposes and will not be reclaimed (e.g. the site is now hosting a parking lot, visitor center, etc.)

## Non-Federal Oil and Gas Management Highlights

By Lisa Norby, Petroleum Geologist

1998 was a lively year for oil and gas activities in and around numerous units of the National Park System. Division staff aided parks in evaluating many exploration and well development plans, provided guidance for site reclamation and remediation efforts, and assisted on two Oil and Gas Management Plans/Environmental Impact Statements that are being developed.

When access for nonfederal oil and gas operations in a park is on, through, or across federally owned or controlled lands or waters, the operator must comply with National Park Service regulations found at Title 36, Code of Federal Regulations, Part 9, Subpart B (36 CFR 9B). The regulations require the operator to submit a plan of operations for NPS approval. The plan details all operations associated with the oil and gas proposal (exploration, drilling, production, and transportation), describes how reclamation will be completed, and provides a basis for setting the performance bond amount. Once the plan is approved, it serves as the permit to operate in a NPS unit.

### Three-Dimensional Seismic Surveys

In recent years, the use of 3D seismic surveying has provided industry with high-resolution imaging of subsurface geology (see related article). The technology has significantly improved exploration-drilling results, and brought areas thought dead and buried back to life. The first 3-D seismic survey in an NPS unit was completed at Jean Lafitte National Historical Park and Preserve in 1998. During May, Jean Lafitte hosted a two-day workshop to demonstrate surveying, shothole drilling, and seismic recording techniques to NPS staff involved in oil and gas management. Geologic Resources Division staff was on hand to join in discussions of how the NPS will handle 3-D seismic operations under its oil and gas regulations – 36 CFR 9B. Some of the more innovative ideas that were developed include the use of 1) third-party compliance monitors, 2) GIS/GPS surveying technologies to locate and avoid sensitive resources, 3) high resolution aerial photography (pre and post surveying), 4) lightweight marsh buggies for drilling, 5) helicopters to reduce airboat passages, and 6) interpretive waysides, press releases, and newsletter articles to inform the public of the ongoing seismic operations.

Three-dimensional seismic operations present a unique challenge to the National Park Service. These operations typically run seven days a week, 12 hours a day, up to nine months at a time

and cover surface areas orders of magnitude greater than conventional seismic surveys. Providing for adequate monitoring of these operations will be a key component of submitted plans. At the park level, the NPS lacks the staff and needed expertise to monitor such operations. The Division, in consultation with the



*Example of well-maintained production operation near the Beaumont Unit, Big Thicket National Preserve, Texas.*

Santa Fe Regional Solicitor's office, has determined that regulatory authority exists for parks to require nonfederal oil and gas operators to hire 3<sup>rd</sup> parties to monitor operations in parks. Jean Lafitte was the first park to apply the third party monitoring requirement, and has been encouraged by the company's reaction to their monitor and the successes of having a person on-site to oversee the lengthy operations. Since the first 3-D survey in a NPS unit, several parks in Texas and the Big Cypress National Preserve in Florida have begun requiring the

operators to provide and pay for third party monitors. To date, the operators have accepted third party monitoring as a cost of doing business and as a means of shielding their companies from potential resource damage liability.

During the past year, the Division was busy evaluating 17 plans of operations submitted by Collier for nonfederal oil and gas operations in Big Cypress National Preserve, including 3-D seismic operations, and drilling of wells. Together, the proposal submitted cover essentially all of the preserve's "Addition" lands, as well as areas within the original preserve. One of the approved plans of operations for a 3-D seismic survey has just been completed in the Raccoon Point Field in the south Florida preserve (see related article on page 28).

The Big Thicket National Preserve in southeast Texas has a rich history of oil and gas activity dating back to the early years of this century. This area has been included in several large-scale seismic surveys that will be used to delineate previously undiscovered drilling prospects. During 1998, the Division evaluated five plans of operations for 3-D seismic operations throughout the preserve. Two seismic operations were completed by Continental Geophysical for the Lower Neches Corridor and the Beaumont Units. Resource impacts were localized and limited to vegetative trimming and soils disturbances caused by the detonation of dynamite in the seismic shotholes. As part of the reclamation requirement, a post operational assessment of impacts to soils and vegetation was done during the summer of 1999. 3-D survey plans were approved and operations completed in the Big Sandy Unit and Beaumont Unit, and a survey in the Jack Gore Baygall Unit was finished early in 1999. Positive results of the surveys could lead to future drilling activity and field development in and around the Preserve.

## Oil and Gas Operations Evaluations In and Around NPS Units

In 1998, Division staff conducted on-site evaluations of active and inactive oil and gas operations in Big Thicket National Preserve to determine compliance with NPS regulations and to identify potential actions to further reduce impact to park resources and values. The assessment included an ongoing 3-D seismic operation and 26 well sites. Park management was advised of several active well operations in need of improved site maintenance (e.g., removal of equipment, painting, tank battery repair, etc.), and of inactive wells requiring maintenance or well plugging and site reclamation. The superintendent was provided with specific recommendations for each operation. Operations at directional wells drilled outside the park appeared in very good order.

Near Big Thicket National Preserve, the Division has been working with park staff on Mariner Energy's future gas development plans just north of the Beaumont Unit. Mariner has drilled a directional well from outside the park to a bottom hole location inside the park. Having the company extract hydrocarbons from within the park from surface locations outside the park minimizes disturbances to park resources and lowers the risk of future resource degradation. Mariner had proposed to run a gathering line across the park. After consultation with Division and Preserve staff, Mariner decided to move the gathering line from within the preserve to a right-of-way near the northern and western boundary of the unit. Their decision will reduce impacts to park resources during installation of the line, and transport of hydrocarbons.

The Division has also been working with staff at Carlsbad Caverns National Park to protect sensitive cave resources from nearby drilling. New wells within a Cave Protection Zone prohibited under current law, and the Bureau of Land Management (BLM) has been negotiating to compensate the leaseholder for a lease in the Zone. At one point, the BLM asked the Service to allow drilling from an off-lease surface location inside the Zone, speculating that drilling could be conducted safely and would lower the government's payout for the lease rights. The NPS decided not to endorse the plan because the area is legally closed to new drilling, and an exception precedent was highly undesirable.

During 1998, new drilling was proposed on U. S. Forest Service lands adjacent to the South Unit of Theodore Roosevelt National Park in an area of significant oil and gas development adjacent to designated park wilderness. Division staff assisted the park prepare comments to the Forest Service addressing park protection techniques relative to visual intrusion, surface water quality protection, and noise abatement. The response also addressed the statutory prohibition on leasing in the park in the event that a lessee needed park acreage to fulfill well spacing requirements.

A petroleum development company holding a private oil and gas lease in Chickasaw NRA, Oklahoma has proposed to drill an exploratory well in the park. No exploratory drilling has occurred in the park over the past 21 years, since before promulgation of the NPS oil and gas regulations. Division staff met with

park management and the lessee to explain the permitting process, resource protection concerns, impact mitigation methods that may be required by the NPS, and alternative development scenarios such as directional drilling from outside the park.

## Reclamation and Remediation Efforts on Parklands

At Padre Island National Seashore, Louis Dreyfus Natural Gas filed an appeal with the NPS in 1998 objecting to being held totally responsible for the clean-up of the mercury contamination at its Yarborough Pass facility in the park. Dreyfus claimed that most of the contamination was caused by the prior owner. On December 11, 1998, the Director upheld the NPS's decision to hold Dreyfus liable for clean-up of the site. The Geologic Resources and Water Resources Divisions have been working with the park staff on a cost-effective clean-up strategy for the site. Dreyfus has been put under a May 1, 1999 deadline to begin its reclamation work at the Yarborough Pass facility.

## Planning for Oil and Gas Operations within the Parks

Over the past year, the NPS began preparation of Oil and Gas Management Plans/Environmental Impact Statements (OGMP/EIS) at Padre Island National Seashore, Big Thicket National Preserve, and Lake Meredith National Recreation Area. These plans will provide a framework for managing access and surface uses associated with the exploration, development and transportation of oil and gas resources underlying the parks. The plans will identify sensitive resources and values and define mitigation measures, establish reasonable performance standards to protect park resources and values, and avoid conflicts with visitor use, enjoyment, and public safety. The plans will also provide information to oil and gas operators to facilitate operations planning and compliance requirements.

During 1998, the division worked with park and regional staff on public scoping, formulation of alternatives, and a "reasonably foreseeable development scenario" for oil and gas at Padre Island. Impact analysis and preparation of the draft Padre Island OGMP/EIS was completed. The public review draft of the Padre Island plan was released in February 1999. Preparation of the Big Thicket OGMP/EIS began in the late fall 1998 with the release of a scoping newsletter and public open house. Public release of the draft Big Thicket document is expected in the winter 2000. The OGMP/EIS for Lake Meredith National Recreation Area will begin in the summer of 1999 with a release date of the draft plan anticipated in 2001.

As part of its work on the draft EIS for the Tallgrass Prairie National Preserve's general management plan, the Superintendent requested the Division's assistance in evaluating the current status of gas production in the Preserve and the potential for future gas and oil production. Oil and gas exploration and development is allowed within the unit under the Preserve's enabling statute. The Division prepared a report on the status of current production, potential for future gas and oil development, and applicable regulatory requirements. The Division also drafted a request for a solicitor's opinion regarding outstanding legal issues concerning application of the National Park Service's oil and gas regulations. ◆



## Seismic Exploration Blankets Gulf Coast Parks

By Pat O'Dell, Petroleum Engineer

From Padre Island National Recreation Area in Texas to Big Cypress National Preserve in Florida, national park units along the Gulf Coast have felt the oil and gas industry's quest for detailed pictures of what lies beneath the earth's surface. Three dimensional (3D) seismic imaging technology is to thank for making 1998 a banner year for the Division and five parks in terms of oil and gas exploration permitting and oversight. More of the same is expected for 1999. But just what is 3D and how is it affecting the parks where it is occurring?

Jean Lafitte, Big Cypress, Big Thicket, Padre Island, and Gulf Islands all are in various phases of 3D geophysical seismic projects. Projects covering over 200,000 acres of National Park Service lands have either been completed, are in progress, or in the permitting stage. This number does not include the numerous 3D proposals in Big Cypress by Collier Resources (see next article). A survey in Jean Lafitte National Historic Park and Preserve was completed in spring of 1998. The 50 square mile shoot included 5,760 acres in the park's Barataria Preserve Unit, a wetland complex that includes rare floating marshes, floating scrub/shrub thickets, and prehistoric archeological sites. In Big Cypress National Preserve, the operator of the producing Raccoon Point oil field began acquiring 3D seismic over the field to determine future development drilling potential. Currently proposed, permitted, or completed surveys in Big Thicket will cover all of the Beaumont, Jack Gore Baygall, Big Sandy, and Lance Rosier units of the Preserve. At Padre Island National Seashore, the entire island is targeted for 3D seismic over the next two years. A proposal for the northern section of Padre Island is now in the permitting process. Completing the "Gulf Coast Chain," a company has begun the permitting process with Gulf Islands National Seashore.

Seismic programs have long been a part of exploration for oil and gas. Geophysicists obtain images of subsurface formations by transmitting sound waves through the earth and analyzing the energy that comes back to the surface.

Until the early 1990s, all seismic reflection data were acquired as 2D images, a vertical slice of the earth's subsurface. While



*Hand-drilling seismic shot-holes for 3D survey in Big Thicket National Preserve, Texas.*

responsible for thousands of discoveries, 2D provides only part of the puzzle and leaves much room for error. Huge advances in computing and visualization technology combined with better geophysical models have made 3D possible. The new technology provides much more detailed and accurate images of the subsurface. Much of the guesswork is removed.

The industry promotes 3D as a risk reduction tool. It is expensive,

running up to \$50,000 per square mile of survey. The cost is justified by helping operators avoid drilling dry holes or minimizing the number of wells needed to efficiently drain a reservoir. For example, one company's west Texas exploration program went from an industry standard 14% drilling success rate to a 54% success rate using 3D. Another company claims using 3D adds four successful wells and avoids one dry hole to its projects. It essentially is an investment in the subsurface, not only for exploration but for the best field development as well.



*Shothole drilling for 3D seismic survey in Big Cypress National Preserve, Florida.*

With 3D, companies are able to find and produce reserves with a minimum number of wells. Some industry proponents claim this makes 3D an exceptional tool for environmental reasons. The increased efficiency tends to lower overall environmental impacts since well drilling is much more land use intensive than seismic surveys. This is a compelling argument, however the Gulf Coast parks have had historical oil and gas production in and around them. It is more likely these 3D surveys will generate, rather than discourage, new drilling prospects.

Park resource managers and the Division staff have worked to meet the new management challenges created by the use of 3D in parks. While a 2D survey program requires access along one to several lines space miles apart, the collection of 3D information requires placement of shot hole and recording locations in a dense grid pattern. A 2D project may entail several small crews working in the park for a few days. An average 3D program might involve up to 70 people working in different areas of the park for several months.

When conducted with care, impacts of 3-D surveys are short-term and typically limited to vegetative trimming and localized soil disturbance from vehicular traffic and shot hole drilling. For submerged lands, planning must often include protection of seagrass beds, fish, sea turtles, and marine mammals. While impacts can be minimal, the task of overseeing numerous crews operating in different areas of the park can quickly drain a park's human resources. Use of third-party environmental monitors hired at the expense of the companies has been a key component to minimizing resource impacts.

Environmental results thus far have been good. Ongoing monitoring in Jean Lafitte indicates the marsh is recovering nicely from impacts of airboat and marsh buggy traffic. At Big Thicket, good planning and proper selection of equipment have helped to limit damage to vegetative trimming in the understory and minor soil impacts from ATV traffic and shot hole drilling and detonation. In both areas, it will be take a keen eye to identify impacted areas after one growing season. ◆

## Big Cypress Swamped with Permit Applications

By Pat O'Dell, Petroleum Engineer

Collier Resources Company (CRC) provided Big Cypress National Preserve with a steady stream of permit applications during 1998. The Collier family owns the mineral estate over much of the Preserve. As of January 1999, CRC had submitted plans of operations for 24 exploration programs covering almost half a million acres of Preserve lands.

All of the plans include large-scale 3D seismic proposals and exploration drilling. Proposals include construction of permanent roads and large staging areas for both seismic and drilling operations. Some of the programs also include conventional 2D seismic. Acreage covered by all these programs approaches 500,000 acres with nearly 100,000 shot hole points, 80 miles of new roads, and 35 acres of improved staging pads for seismic. CRC also plans 28 exploration wells. If conducted one after the other, it would take over 30 years to complete everything that's been proposed.

In all of the plans submitted thus far, CRC has not provided the information needed to ascertain their right to operate in all areas where activities are proposed. This remains a basic impediment to moving forward in the permitting process. Overriding all these permit applications is the possibility that CRC is not truly interested in conducting any type of exploration program, but rather the actions could be meant to achieve other purposes such as: 1) fostering a buyout or property exchange via threats of large-scale development, 2) removing or relaxing environmental protection stipulations in hopes of attracting more oil and gas industry interest, or 3) forming the basis for some type of takings lawsuit.

Regardless of the company's intentions, the actions have had a very real administrative impact on the Preserve and the offices that support it. Each permit application requires processing time in the Preserve and the Division. In addition, the plans propose actions that do not comply with the Big Cypress Minerals Management Plan (MMP), which complicates the NEPA process and raises significant policy and regulatory issues. Some of CRC's disagreements with operational requirements have caused the NPS to rethink some of the MMP stipulations. Experience applying the MMP to operations has not only provided a good understanding of where stipulations need to be tightened, but also where requirements can be relaxed without resource degradation. Also, the MMP does not cover operations in the Addition Area of the Preserve. As a result, Big Cypress now plans to revise its MMP to cover the entire Preserve. ◆

## Mineral Economic Analysis

By Phil Cloues, Mineral Economist and Mining Engineer

The goal of the Division's economic analysis is to provide timely support to personnel at parks, regions, and the department in the areas of mineral appraisal for fair market value determinations, negotiation strategies, appraisal contracting, technical reviews, and consultation. These skills continue to be provided to other federal agencies (Internal Revenue Service, Bureau of Land Management, US Fish and Wildlife Service, United States Forest Service, Justice Department, Mine Safety and Health Administration, Minerals Management Service, Bureau of Indian Affairs, Environmental Protection Agency, etc.) on a priority basis. Given the premise that surrounding market transactions affect the potential fair market value of mineral rights inside parks, cooperative efforts are highly beneficial. This long term internal net work increases efficiency by sharing information and appraisal techniques as well as forging bonds of professionalism within the federal family.

Internal projects included appraisal review for the acquisition/donation of the abandoned Vulcan Mine (iron ore) in Mojave National Preserve, the contracting and review of the mineral appraisal for the Rainbow/Caliente Talc Mine in Death Valley National Park, and the technical appraisal review of two tracts of land containing sand and gravel in Indiana Dunes National Lakeshore. Considerable time was spent on review of the economic inputs for the validity report for the Golden Quail Gold Mine located in Mojave National Preserve. Appraisal negotiations were initiated for the CIMA Cinder Mine in the same park.

External projects included the economic feasibility/appraisal analysis of the Moncrief oil and gas leases near Carlsbad Caverns National Park that are located in the cave protection buffer area, appraisal assistance to the IRS for lands near Mt. Rainier National Park as well as coal appraisal input for lands in the western states, ongoing assistance to the USFWS for the 275,000 acre native corporation land exchange at Aniakchak National Monument and Preserve, the review of economic models and negotiation strategies involving the Lake Belt Limestone Project near Everglades National Park, and the review of appraisal information for the acquisition of federal coal leases in the Grand Staircase- Escalante National Monument in Utah for the Bureau of Land Management.

Economic assistance was given on a daily basis on a wide variety of projects within the park system. Some examples include the ammonia conversion research project at Mammoth Cave National Park, reclamation bonding information for Mojave National Preserve, socio-economic inputs for an environmental analysis for the Alaska Regional Office, and budget estimates for various reclamation projects for abandoned mine sites.

The aim of the economic analysis is to provide accurate estimates of value that follow the Uniform Appraisal Standards for Federal Land Acquisition, 1992. Such values are supported by documented facts, are justified by market derived data, are reasonable, are fair to the seller and buyer, and would be supported in a court of law should they be challenged. ◆

## Servicewide Minerals Database

By Judy Geniac, Environmental Protection Specialist

For over 10 years the Division has maintained summary Servicewide minerals data and a variety of disjointed information tables and systems. Such data is related to minerals development sites in over 150 parks. This year, the Division continued its quest to find a means to meet the requests of Congress, the Director, and the public, while minimizing the workload to parks who are responsible for providing the data. Division staff and managers reviewed in-house data systems, identified critical data fields, and developed necessary report formats. After checking on database consultants, the Division hired a student to complete some of the work. The student accomplished a great deal of programming to help reach our goal, and the Air Resources staff provided helpful database expertise. The work in 1998 addressed problems caused by converting the data to the new NPS standard software, resolved some existing data conflicts, and determined what additional data must be obtained from the parks. While some parks have provided required data updates, additional work is needed to complete all the data updates and additions. Data quality will be checked via Division staff, which may require travel to some parks. Static raw data will be posted to the Intranet for park viewing. Data summaries will be posted to the Internet and questions regarding such data will be referred to the appropriate parks. The data update and conversion project will continue into the next year. ◆

## Division Translates Solicitor Opinions Into Practical Guidance For Parks

By Julia Brunner, Policy and Regulations Specialist

Spurred by recent federal court decisions, the Department of the Interior Solicitor issued three legal opinions in 1997 and 1998 that limited the rights of mining claimants on federal lands to patent their mining claims and millsites. Initially, the full implication of the opinions for NPS minerals management was unclear because of their focus on mining claim patent applications, a process administered by the Bureau of Land Management (BLM). The opinions also caused some confusion because, if applied to NPS lands, they would overrule previous Solicitor's Office advice. To address this confusion, the Geologic Resources Division's policy staff worked with the Solicitor's Office and drafted NPS guidance in 1998 to help park staff understand and implement the opinions. Similar to the instruction memoranda used by BLM to assist state offices with new legal interpretations, the guidance is currently under review by the Solicitor's staff attorneys and should be sent to the NPS Director in 1999.

As summarized below, the Solicitor's opinions and the draft NPS guidance explain which mining claims in parks may be patented and the maximum amount of millsite acreage that may be used and patented.

**Mining Claims:** Despite restrictions in most park enabling statutes, the Solicitor's Office advised the NPS in the mid-1980's that owners of valid unpatented mining claims had the right to patent their claims in parks. An unpatented mining claim is a right established under the 1872 mining law in which the owner may extract the minerals, and use but not own the surface. Via the patenting process, claimants obtain fee simple title to the

surface and minerals of their claims. Such owners can develop their patented claims in parks in a manner that creates long-term, conflicting uses such as private tourist facilities.

The recent Federal court decisions caused the Solicitor to re-examine the 1872 Mining Law and issue two opinions that significantly restrict the eligibility of claimants to patent their claims on withdrawn lands like parks. On such lands, patents may only be obtained *if* the Secretary determines that a claimant complied fully with the patenting requirements of the 1872 Mining Law by the date of withdrawal.



The Gold Strike Casino in Lake Mead NRA illustrates the development on patented mining claims in parks.

These requirements include fees, a survey, paperwork and the discovery of a valuable mineral deposit as determined through a mineral exam. The Solicitor warned that the “First Half Final Certificate” does not necessarily mean that a claimant possesses a right to a patent, and advised BLM to stop issuing such certificates to claimants. If claimants fail any one of the patenting requirements, they are ineligible for a patent but still may be able to mine subject to NPS regulations.

The Solicitor’s new direction is significant and should reduce the number of future patents in parks. The Division’s guidance advises parks that, although final decisions about patenting are made by the Secretary, the NPS should apply the two opinions in its discussions with mining claimants and BLM, and when conducting mining claim appraisals.

**Millsites:** The third Solicitor opinion concludes that claimants may only operate and patent 1 millsite consisting of 5 acres per associated mining claim. A millsite is an area that is non-mineral in character where claimants typically construct support facilities. In reviewing claim records, the Solicitor became aware that claimants possessed far more millsite acreage than allowed under the 1872 Mining Law. For example, at Mojave National Preserve in California, a claimant submitted a proposed plan covering 2 unpatented mining claims and 18 millsites to the NPS for approval. Under the Mining Law, the claimant is only entitled to 2 millsites. Like the two opinions summarized above, the Solicitor’s clarification of the maximum millsite acreage enhances park protection by narrowing claimants’ property rights, although it is currently under review by Congress.

The NPS may not approve proposed plans of operation that rely on more than five acres of millsite per mining claim. The Division’s guidance advised parks to return to mining operators or claimants any proposed plan of operation that relies on millsite acreage exceeding the 5-acre per claim limit. The NPS should ask the claimant or operator to resubmit the proposed plan either with evidence that the excess millsite acreage was obtained prior to withdrawal by means other than the 1872 Mining Law, or with reliance on the correct millsite acreage. The NPS should also ask BLM to contest the claimant’s excess millsite acreage. ◆

## External Minerals Development

By Kerry Moss, Environmental Protection Specialist

The Division continued its involvement with external mineral development proposals and enjoyed several successes in 1998. The participation in external proposals is designed and administered to help reduce impacts upon NPS resources from oil and gas or mining operations adjacent to parks. NPS minerals regulations found at 36 CFR Parts 9A and 9B give the Service the ability to control most mineral extraction within park boundaries. However, we do not enjoy the same luxury for mineral development that occurs outside our boundaries, but can still adversely affect lands in parks.

To complicate the external mineral development issue, many land management agencies bordering parks, such as the Bureau of Land Management, U.S. Forest Service, state, local or private entities do not necessarily possess the same preservation mandate and conservation ethic as that held by the NPS. Most of the time, it is this difference in the mission of the various government entities that can result in the approval of a mineral extraction operation by those agencies that can have deleterious effects on adjacent NPS lands.

Often, due to a lack of direct regulatory authority, the NPS is relegated to the same status as any other landowner, public or private, that needs to have mineral development plans altered to protect resource values. With this in mind, it is fortunate that most Federal, state, and local jurisdictions that permit mineral operations provide an avenue for public input into the permit approval process. In addition, on adjacent Federal property all land management agencies are required to meet the requirements of the National Environmental Policy Act (NEPA) prior to any Federal action that “may significantly affect the quality of the human environment.” The NEPA process as well as the various state environmental policy acts allows for public involvement in which the NPS can play at least a limited role.

By relying on the diligent, watchful eyes of park management and staff, the Geologic Resources Division hopes to continue assisting park units in the struggle to keep the sometimes harmful affects of external mineral development at bay. It is only when the NPS is able to become involved in the early stages of mineral operation permitting or environmental analysis that we can attempt to effectively protect park resources. As a Division, we look forward to continuing our efforts to help parks through the external minerals planning and permitting assistance in 1999 and beyond.

Listed below are some of the more noteworthy external mineral issues in which the Geologic Resources Division was involved in 1998:

**COMPANY SEEKS TO EXPAND GAS DEVELOPMENT OUTSIDE BIG THICKET** — The Division has been working on an issue with Mariner Energy regarding their future gas development plans just north of the Beaumont Unit of the Big Thicket National Preserve. The company holds lease rights in and adjacent to the park. Mariner has directionally drilled a

successful well from outside the park to a bottom hole location in the park and is proposing to run a gathering line across the park. Mariner holds three additional leases that straddle the northern boundary of the park's Beaumont Unit. Mariner raised the following issue: if there are straight hole wells drilled on the portion of the leases located outside the park, would the NPS permit Mariner to run the gas through the gathering line that crosses the park? In consultation with the Regional Solicitor's Office, our current position is that Mariner can run gas through the gathering line if the company can demonstrate that part of the production unit associated with those leases is located inside the park. Asking the company to extract oil and gas in the park from well locations outside the park minimizes immediate surface disturbance to park resources and lowers the risk of future park resource degradation.

**Departmental Decision Imminent on Lead Exploration Permits Adjacent to Ozark National Scenic Riverways** — The Doe Run Company applied to the BLM for five prospecting permits to explore for lead on the Mark Twain National Forest 16 miles from the park's boundary and in the heart of Big Spring's groundwater recharge zone. In consultation with the USGS, the Division and the NPS Water Resources Division determined that the effects to park resources from full-scale lead mining in this area could be devastating.

The BLM and the US Forest Service jointly prepared an EA that only examines the environmental effects of exploration, deferring examination of the effects of full-scale mining until after the company has applied for a preference right lease. The NPS and the public raised concerns that under the existing regulatory scheme, exploration will vest the company with a legal right to a lease and the government will be faced with having to allow lead mining or buying out the lease right.

The Division assisted the park in elevating the park protection concerns related to this matter to the Solicitor and to the Secretary of the Interior. In late October 1998 the Doe Run Company cancelled its bid for five prospecting permits, citing the strict demands placed by the Secretary on permit approval. At the NPS request, the Secretary deemed the proposed conditions necessary to protect the park resources and the public interest. On December 1, Missouri's Attorney General sent a formal petition to the Secretary of the Interior requesting a withdrawal of all federal minerals (~400,000 acres of land) in the Mark Twain National Forest adjacent to Ozark National Scenic Riverways. In mid-December, the NPS Director and the Assistant Secretary for Fish, Wildlife, and Parks followed suit. Since without a mineral withdrawal the threat of adverse effects from future lead development remains, the Department is now deliberating whether to withdraw the Federal minerals in the Big Spring recharge zone in a long-term strategy to protect the park and region's unique water resources. (See article on page 33.)

**Division Comments on Red Hills Power Project Draft Environmental Impact Statement** — In March the Division, in coordination with other Natural Resource Program Center offices and the park, commented on the draft environmental impact statement (EIS) for the proposed Red Hills Power

Project. Overall, the draft EIS came up short in addressing impacts to Natchez Trace Parkway from the adjacent proposed 5800-acre lignite strip mine and accompanying 400-mw power plant. In response to the concerns raised, the project proponent and the Tennessee Valley Authority, which prepared the document, worked with the NPS to satisfactorily address in-park issues such as impacts on cultural or eligible sites, visual resources, night sky, noise, visitor and socioeconomic impacts. Project changes and mitigation measures were negotiated that resolved the critical NPs concerns. In August the Mississippi State Environmental Quality Permit Board issued a mining permit to project proponents. Natural Resource Program Center offices will continue working with the mining company and the Parkway on monitoring projects designed to better define the existing environment adjacent to the proposed mine area and assist mine-related mitigation efforts. A memorandum of agreement between the company and the National Park Service has been completed outlining the future working relationship between the two entities to ensure that park protection efforts continue into the future. (See article on page 35.)

**Big Bend Adjacent Humate Mine Looms in Future** — Division staff assisted Big Bend National Park in its continuing attempts to provide input into the permitting process for a proposed mine adjacent to the park. Various landowners, land management companies, and mining companies' plan to surface mine humate, marketed as a soil amendment, two miles from the park's western boundary. The park's efforts to voice concerns about the project were hindered because Texas doesn't regulate humate mining or even conduct environmental studies. Big Bend staff are now working with the Army Corps of Engineers and the state Air Quality Board to discuss concerns, identify possible adverse impacts, and address permitting issues.

**Carlsbad Decides Not to Endorse BLM Offer to Leaseholder** — A Federal oil and gas lease held in part by W.A. Moncrief, Jr. predates the establishment of and is located inside a Cave Protection Zone (Zone) in Carlsbad Cavern National Park. Law prohibits drilling of new wells in the Zone to cancel existing leases. When Moncrief sued the BLM for compensation, the BLM began negotiating with Moncrief for the value of the lease. In 1998, the BLM asked the Park Service to endorse an offer to Moncrief to drill from an off-lease surface location inside the Zone, assuring the NPS that BLM would not make the offer without NPS consent. The BLM speculated that such drilling could be conducted safely and that it would lower the government's pay out for the lease rights. However, based in part on Geologic Resources Division advice, the park decided not to endorse the offer because legally the Zone is off limits to new surface drilling locations, and cave protection could not be assured.

**Cumberland Gap National Historic Park Urges the State of Kentucky to Take Action to Revoke Coal Mining Permit** — On January 20, 1998, a State of Kentucky hearing officer determined that the state had improperly issued a surface coal mining permit outside the park and recommended that the state rescind the permit for proper consideration, including joint approval by the NPS. Under both state and federal law, surface

coal mining that will adversely affect public parks or place on the National Register of Historic Sites is prohibited unless the mining proponent has “valid existing rights” to mine or can obtain the joint approval of the agency that manages the affected park or site. In the Cumberland Gap case, the permitted mine adversely affected the park’s viewshed and the state failed to engage the NPS as a joint decision-maker. On May 6, 1998, the Regional Solicitor’s Office, on behalf of the NPS, wrote to the state requesting expedited action on the hearing officer’s recommendation. At the State’s request the NPS agreed to engage in settlement negotiations with the state to determine if an alternative to revoking the permit existed. Agreement was finally reached to modify the permit to account for park concerns. The mining proponent also committed to never mine an area immediately outside the park but prominently in the park’s viewshed. The park and the state are now engaged in discussions to strengthen the State of Kentucky’s surface coal mining program to avoid park protection conflicts in the future.

#### **Yellowstone: NPS Seeks Meaningful Role in Mine Cleanup**

— Natural Resource Program Center and Yellowstone NP personnel worked closely with The Department of Justice and the Interior Solicitors to effect a meaningful role for the National Park Service in the proposed environmental cleanup of the New World Mining District adjacent to Yellowstone. The cleanup of historic mining sites in the district is a result of the United States’ purchase of mining properties held by Crown Butte Mining Inc., proponents of the hotly debated New World mine. Cleanup of the historic mining properties, now owned by the U.S. Forest Service, will be coordinated by way of a Memorandum of Agreement (MOA) between the Department of Agriculture, Environmental Protection Agency, and the Department of the Interior. At the time of this writing, the Department of Agriculture has acknowledged Park Service concerns about cleanup activities since Yellowstone is a downstream recipient of runoff from a portion of the New World Mining District. The Department of the Interior, with input from the NPS will participate in the mining district cleanup by providing technical comments on pertinent cleanup planning documents.

**New World Mine Buyout Becomes Reality** – On August 7, the two-year \$65 million Federal buyout of properties associated with the proposed New World mine adjacent to Yellowstone National Park was finally accomplished, making those properties part of the Gallatin National Forest. The buyout was initiated because of government and conservation group concerns that the mine, if constructed, posed a significant risk to the park and ecosystem. The final step in the buyout process was the transfer of \$42.5 million to Crown Butte Mining and their associated companies and the payment of \$22.5 million to the New World Mining District cleanup account.

**Division Provides Technical Support to Theodore Roosevelt National Park on Adjacent Oil and Gas Well Drilling Proposal** — The U.S. Forest Service, Little Missouri National Grasslands, received an application for the drilling of an oil and gas well on lands adjacent to the South Unit of Theodore Roosevelt National Park. The Forest Service requested comments from the park regarding park resource protection issues for consideration in the permitting process. Since the proposed drilling is in an area of significant oil and gas development adjacent to designated park wilderness, the park superintendent contacted the Division for assistance in preparing a response to the Forest Service. The Division suggested impact mitigation techniques relative to visual intrusion, surface water quality protection, and noise abatement. The Division also recommended that the response address the statutory prohibition on Federal mineral leasing in the park in the event that a lessee would need acreage in the park to fulfill state well spacing requirements.

#### **Regional Director Cook Briefed on Proposed Uranium Mine in Australian National Park**

— John Cook was part of a World Heritage Commission (WHC) team assigned to evaluate whether the highly controversial Jabiluka mine places Kakadu National Park “in danger” of losing its world heritage qualities and features. The mine is legally excluded from the Park/World Heritage Site but is physically located within its boundaries and is on ancient Aboriginal lands. Like the team that examined the threats to Yellowstone NP at the height of the proposed New World mine controversy, the WHC team conduct a fact-finding mission that heard from industry, environmentalists, and the Aboriginal clan opposing the mine. In preparation for the mission, Mr. Cook was extensively briefed by Joe Sovick, Southwest SO, and Geologic Resources Division staff about environmental aspects of the proposed mine and technical and policy lessons that can be drawn from U.S. mining and Indian law and actual case studies. (See article on page 36.)

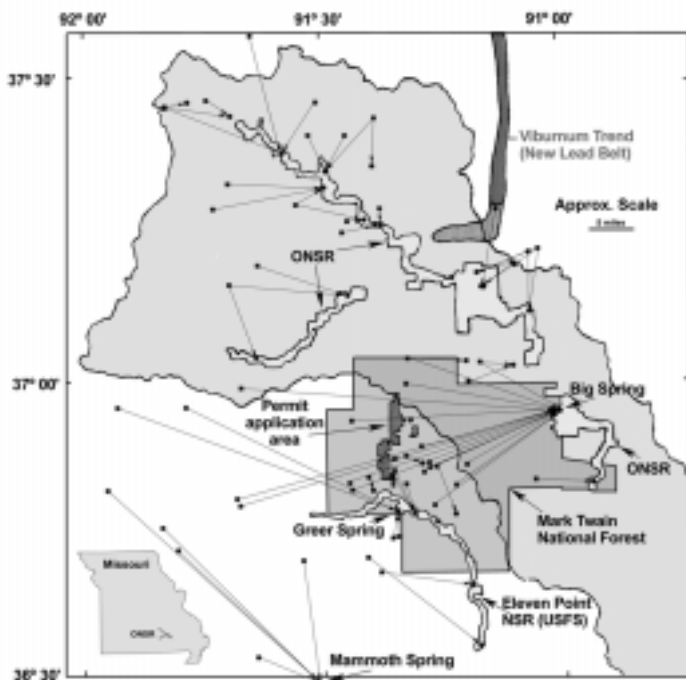
**Poor Planning for Adjacent Underground Coal Mine Surfaces at New River Gorge** — At the park’s request, the Geologic and Water Resources Divisions reviewed a permit application that has been submitted to the state of West Virginia for a coal mine adjacent to the park. Overall, the mine proponents failed to address important mine engineering, water quality, and subsidence issues. Of greatest concern was the proposal to mine directly underneath Glade Creek, which flows to the New River and is valued for its excellent water quality and trout habitat. The proximity of the proposed mine to the flooded underground workings of several abandoned mines also presented severe safety hazards, particularly since the precise locations of these abandoned workings are not adequately mapped. The park forwarded NPS comments to the state’s permitting authority. ◆

## Ozark National Scenic Riverways Protected From Lead Mining

By Ed Kassman, Policy and Regulations Specialist

In 1998, the Division, in tandem with the Superintendent and staff of Ozark National Scenic Riverways, convinced top-level Departmental officials that issuance of five lead exploration permits to the Doe Run Company on the Mark Twain National Forest in Missouri would place park resources at substantial risk of long-term degradation or cost taxpayers millions of dollars to buy-out mining rights. In negotiations with Doe Run over the issuance of these permits, the Department took a strong position and in October 1998 the company withdrew its permit applications from further consideration.

The park's fresh water springs, rivers, streams and caves are world class examples of a highly developed and complex karstic system. USGS dye tracing studies confirm that groundwater beneath the exploration area resurfaces primarily at Big Spring, 16 miles east in the park. *See Figure 1.*



**Figure 1. Dye Traces in Area of Ozark National Scenic Riverways**

This map shows USGS dye-trace studies conducted in the upper "Ozark" aquifer. A tailings impoundment failure in the permit application area would release untreated tailings directly into the Ozark aquifer, putting park resources at extreme risk of long-term degradation.

\* shows injection point, arrow shows direction to dye recovery, \* shows dye recovery point

Thus, any adverse impacts from mining activities in this area, such as discharge of untreated mine wastes, would manifest inside the park. Lead mining in the New Lead Belt, just north of the Ozark Riverways region, has left a legacy of widespread environmental harm.

## Exploration Leads to Development

The federal minerals underlying the Mark Twain National Forest are "acquired" minerals, administered by the BLM through a "preference right leasing scheme." To secure a lease right, an applicant must follow BLM's two-step regulatory process. The first step requires that an applicant secure an exploration or "prospecting permit." If at the end of the exploration phase (core drilling), the permittee believes it has acquired enough evidence to support a "valuable deposit" finding by the BLM, it applies for a preference right lease. If the requisite showing is made, the regulations give the BLM no discretion; it must issue the lease. A lease is a compensable property right interest. While the BLM regulations do provide the Forest Service (as the surface managing agency) with a consent role at the prospecting and lease stages, "consent" only means that the Forest Service can request that environmental mitigation measures be added to the lease. The regulations give the Forest Service no specific decision making authority, and it can not veto an affirmative BLM decision to issue a lease. Under this regulatory scheme, the last real opportunity for the federal government to prevent a mining company's entitlement to a lease is prior to the issuance of a prospecting permit.

Further, in this two-step process, BLM and FS analyze each decision via a separate NEPA document. For the prospecting permit determination, the agencies limit the analysis, under an EA, only to those impacts that may immediately result from drilling and associated exploration activities. The BLM and FS defer an examination of the impacts from full-scale development until after the permittee has applied for a preference right lease. At that stage, however, the permittee may have the drilling documentation to support entitlement to a lease.

Given this framework, the Division and the park became increasingly concerned as Doe Run repeatedly sought new exploration permits in the Mark Twain as existing permits expired. If the company secured new exploration permits and took additional core samples to fill in its information gaps, the company would likely be able to marshal a strong case that it had discovered a "valuable mineral deposit" and was entitled to a preference right lease. The BLM would either need to issue the lease and allow lead mining, or acquire the vested lease right from the company to prevent almost certain adverse impacts.

The NPS argued that sound fiscal and environmental stewardship demanded an up-front analysis of the environmental effects of both exploration and development prior to the issuance of a prospecting permit. In that way, the federal government could assess the region's suitability for lead mining prior to the vesting of any property rights, and would not give the company any false expectations of gaining a lease right by issuing an exploration permit. If the analysis of full-scale development supported the determination that the lands were suitable for lead mining, the federal government could identify protective mitigation measures that would attach to a lease. If the analysis supported the determination that the lands were unsuitable for lead mining, the Division and the park recommended that the minerals be permanently withdrawn from any further exploration and development.

### Interagency Effort to Find a Reasonable Solution

For the past decade, the Division and the park persistently raised NPS resource protection concerns to local BLM and FS officials. Largely, this effort focused on trying to persuade the agencies to prepare an EIS, examining the effects of both exploration and development, prior to the issuance of any prospecting permits. The BLM and FS consistently rebuffed the NPS, claiming that sufficient mitigation measures would be in place to protect park and surrounding resources in the event a lease right was granted. Further, the local officials argued that they would not spend the money on an EIS prior to a decision on permits, since the company may not find an economic deposit of lead. The Division and the park argued that rather than assuming that Doe Run will not find an economic deposit of minerals, prudence dictated that the federal government operate under the assumption that the company will find lead in economic quantities. In addition, we argued that even well designed mitigation measures would likely fall short of preventing adverse impacts to park resources in perpetuity given the complex and unpredictable geologic and hydrologic setting. The agencies should, we concluded, undertake a comprehensive analysis prior to initiating a process that could vest the company with a compensable property right interest to avoid any potential risk to park resources.

In May 1997, faced with five new prospecting permit applications, the BLM and USFS released a joint draft EA analyzing only the effects of exploratory drilling. The agencies specifically refused to address the effects of full-scale development until the company applied for a preference right lease. The public reaction to this EA was strong and negative. The lead agencies received over 3,000 public comments including comments from EPA, the Attorneys General from Missouri and Arkansas, the FWS and the NPS. Two thirds of the comments requested that the agencies deny the pending prospecting permits based on the risk to the nationally significant resources at stake.

Armed with broad public support, the NPS secured a consensus at the Departmental level that certain technical and legal questions needed to be addressed before the Department could make a decision on Doe Run's permit applications. The Division subsequently prepared a request to the Solicitor's office to answer variety of outstanding legal issues, including whether the Secretary could consider the impacts to park resources on a BLM prospecting permit decision.

The Division also engaged USGS experts to address key outstanding technical questions related to lead mining and environmental risk in the region. The key questions were: what are the geologic and hydrologic differences in the New Lead Belt and the Riverways region; how would the mobilization of lead affect the water quality in the Riverways region; what are the implications of placing a tailing impoundment in the Riverways region; and what effect lead mining would have on the region's biota? In early 1998, USGS's responded to these questions and highlighted the risks and uncertainties presented by full-scale lead mining in this region. This, in turn, assisted Departmental decision makers in evaluating the prudence of issuing the five prospecting permits.

### Park Protection Beyond the Boundaries

On April 16, 1998, the Department of the Interior Solicitor published a 32-page opinion addressing many of the outstanding legal issues surrounding this case. The Solicitor agreed with the NPS that to issue the prospecting permits without other safeguards in place would be an imprudent use of the Secretary's discretion. The Solicitor also concluded that "[the NPS Organic Act] does have application to the Secretary's exercise of his authorities over activities taking place outside the boundaries of park units" and that the administrative record must reflect more than a mere awareness of a threat to park resources. This part of the Solicitor's holding is significant not just for Ozark N.S.R., but for all parks dealing with external threats to their resources. It provides a solid basis for park managers to demand a seat at the table on external development decisions that could adversely impact park resources.

Upon the Solicitor's recommendation, the Secretary chose to offer Doe Run the prospecting permits under an agreement whereby Doe Run would "relinquish any and all property rights that may arise under BLM's regulations." In late October 1998, after months of negotiations with the Department, Doe Run withdrew its applications citing the strict conditions that would attach to the prospecting permits.

### The Long Term Park Protection Solution

Doe Run's withdrawal of its prospecting permit applications was a victory for the NPS, but it did not solve the long-term problem. With the minerals still available for exploration and development, any company can apply for a prospecting permit to explore for a valuable mineral deposit in the Mark Twain. Thus, the specter of full-scale lead mining still looms over the Riverways region.

On December 15, 1998, the Director sent a formal request to the Secretary asking that he initiate a permanent withdrawal under section 204 of the Federal Land Policy and Management Act. At the same time, the Attorney General for the State of Missouri, and the Sierra Club sent petitions to the Secretary requesting the same action. The withdrawal study would last up to 2 years and would provide the basis for the Secretary to remove these lands from any further exploration and development. The Secretary has not yet decided on the withdrawal petitions, but a decision is expected in 1999. ◆



## Red Hills Power Project

By Kerry Moss, Environmental Protection Specialist

### Natchez Trace Parkway, Mississippi

In 1998, the Geologic Resources Division became involved in a lignite development proposal adjacent to Natchez Trace Parkway. Lignite is a low-grade coal, and from the onset it appeared that the large surface mine and accompanying coal-fired power plant had the potential to pit the electrical power needs of modern America against National Park Service efforts to preserve an important part of our cultural heritage.

This potential conflict occurred when the Mississippi Lignite Mining Company, in partnership with Tractabel Power, proposed construction of the Red Hills Power Project, a combination 5000 acre surface lignite mine and 440-megawatt coal-fired power plant only 2000 feet from Natchez Trace Parkway in Choctaw County, Mississippi. The proposed mine would parallel the Parkway for nearly five miles with some of the open pit mining operations occurring adjacent the Parkway's Jeff Busby Developed Area. The Jeff Busby Developed Area contains one of the Parkway's few campgrounds, and features an overlook from which visitors can view the historic scene in Choctaw County.

In late 1997, the Mississippi Department of Environmental Quality made available to the NPS the company's permit application for the mine. The NPS and the public were allowed to comment on the permit application. Division staff found the permit application lacking in an adequate description of how the mine would be physically developed. Necessary clarification included exact size of the proposed pits, directional orientation of the pits, sequencing of pit development, haul routes, water control structures, and storage methods for stockpiling lignite. Mississippi DEQ was very receptive to NPS concerns and communicated our comments back to the company.

In February 1998, in addition to updating their permit application to include items called for by the NPS and others, Mississippi Lignite Mining Company conducted a tour of the proposed Red Hills Power Project site. Tour participants included members of the Geologic and Water Resources Divisions as well as Natchez

Trace Parkway and Southeast Regional Support Office staff. The tour was designed to help NPS personnel understand the physical setting



of the proposed Red Hills Power Project. To further provide tour participants with a better understanding of how an active surface lignite mine operates, the mining company also conducted a tour of the South Hallsville Mine, another lignite strip mine, near Longview, Texas. The site visits were helpful to NPS staff understanding of the possible impacts that could accompany the project, and to the company's appreciation of NPS concerns.



NPS concerns regarding the proposed 5000 acre surface mine and accompanying power plant centered on possible visual intrusion and night sky degradation, water quantity and quality impacts, noise, and air quality impacts. The NPS was able to negotiate with the company to mitigate significant visual, night sky and noise impacts through the elimination pit areas scheduled to be developed in years 25 through 30 of

the mine's life. These pits were to be located adjacent to the Jeff Busby Developed Area and Little Mountain Overlook. This voluntary logistical and economic concession by the company resulted in a significant decrease in impacts to park resources throughout the life of the mine.

Along with modifying the logistical and physical parameters of the proposed mine, NPS Water Resources Division personnel also gained the company's cooperation in committing to additional water quality and quantity monitoring prior to, and during mining operations. The NPS Air Resources Division also contributed significantly by focusing power plant and Mississippi state officials on the technical aspects of possible degradation of the Parkway's air resources through an exhaustive examination of predicted pollution sources and power plant control technology.



The effort made by the NPS to develop and work within this resource-oriented partnership between Federal and state resource managers and proponents of the Red Hills Power Project avoided triggering a portion of the Mississippi state coal mining law that grants managers of adjacent publicly owned parks "co-permitting authority" if adverse impacts are predicted. Support for the Red Hills Power Project from the Mississippi Legislature and U.S. Senate Majority Leader Trent Lott evidenced the importance of the project to the economic viability of Choctaw County. Clearly, by working as partners with the state permitting authorities and the company, the NPS was able to mitigate adverse impacts to Parkway resources during the design stage of the power project and avoid what could have been an adversarial relationship for years to come. ◆

## The Jabiluka Uranium Mine

By Kerry Moss, Environmental Protection Specialist

### Kakadu National Park, Australia



In 1998, the Geologic Resources Division charted new territory in mining impact mitigation by expanding its reach to Australia. At the request of the Intermountain Region, Division staff researched and briefed Regional Director John Cook on the possible adverse environmental impacts associated with the proposed Jabiluka uranium mine in Kakadu National Park, Australia. Kakadu National Park is a designated World Heritage site. Kakadu gained its World Heritage designation because of the outstanding natural and cultural resources contained in the park.

Regional Director Cook found himself immersed in the Jabiluka issue as part of his assignment to work with a World Heritage Commission committee that was attempting to determine if, as a result of the Jabiluka mine proposal, Kakadu National Park would be placed on the list of World Heritage Sites “in danger.” The World Heritage Commission was in need of National Park Service experience gained when Yellowstone National Park, also a designated World Heritage Site, was placed on the “in danger” list partially as a result of the New World gold mine, proposed near Cooke City, Montana, at the park’s northeast entrance.

Neither the World Heritage Site designation nor the “in danger” listing carry any legal weight in most countries. However, the in danger listing does constitute a warning by the World Heritage Commis-

sion that helps the host country of the World Heritage site understand that protective action may be needed to safeguard the designated site. If no action is taken and the designated site continues to degrade, parks or other selected sites can lose their World Heritage designation. The United States took Yellowstone’s “in danger” listing seriously enough to purchase the proposed New World mine site adjacent to the park for \$65 million in an effort to protect NPS lands and the surrounding ecosystem from potential harm.

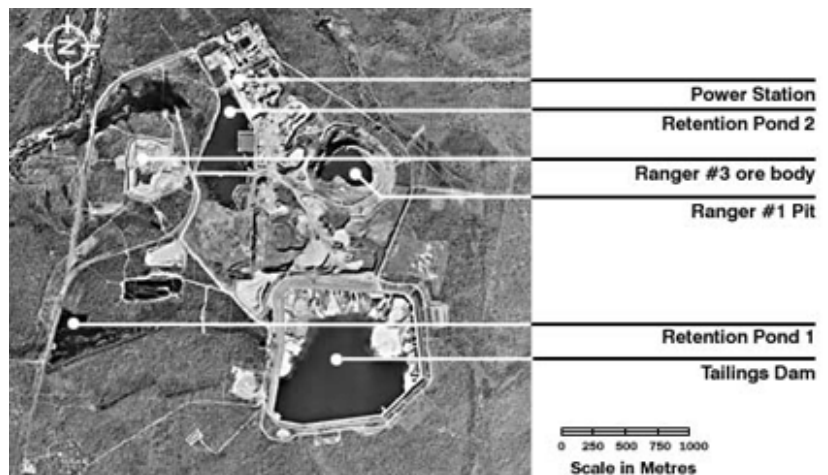
The underground Jabiluka mine would operate for approximately 28 years on administratively excluded lands in Kakadu National Park. The proposed mine would be located adjacent to the Ranger Mine, a recently depleted open-pit uranium mine that operated under the same administrative exclusion. Operators of the Jabiluka mine plan to haul uranium ore from the Jabiluka site to the old Ranger mine site where Ranger’s processing facilities will produce concentrated uranium (U308). Process tailings will be stored in the Ranger mine’s existing tailings impoundment.



Opponents of the Jabiluka mine believe that the environment, particularly groundwater will further suffer radioactive contamination. Studies show that the Ranger tailings impoundment is leaking into the underlying groundwater. Environment Australia, the Australian government’s agency that oversees mining, claims that groundwater impacts are within acceptable levels.

In addition to environmental impacts, mine opponents argue that the Jabiluka mine will further impact the Aboriginal Mirrar tribe, the traditional landowners that inhabit the area. The Mirrar people are adamantly opposed to the new mine, claiming that the Jabiluka mine will bring about an end to their traditional way of life and destroy their homeland.

Prior to Regional Director Cook’s trip to Kakadu with World Heritage Committee members, Division and Southwest Systems Support Office staff researched and acquired a considerable amount of relevant information on the Jabiluka mine. Information presented to Mr. Cook included:



- ▶ a documented history of the Ranger open pit mine and the Jabiluka proposal;
- ▶ the physical environment, including adverse environmental impacts resulting from the Ranger mine;
- ▶ uranium production statistics, global consumption, and market prices;
- ▶ Native American experiences with uranium mining;
- ▶ multiple news items chronicling the international effort to stop Jabiluka;
- ▶ an overview of World Heritage involvement at the New World Mine, Yellowstone;
- ▶ overviews of Department of the Interior mineral leasing and mining policy and regulatory scenarios;
- ▶ environmental issues associated with mining and tailings deposition;
- ▶ use and storage of processed uranium;
- ▶ ore hauling techniques; and
- ▶ potential impacts to Kakadu National Park.

As a result of the World Heritage Committee's on site investigation as well as considerable input from Regional Director Cook and other technical and policy specialists, the World Heritage Committee is seriously considering placing Kakadu National Park on the list of World Heritage sites "in danger." Continued degradation of the environmental and cultural values for which Kakadu was selected as a World Heritage site in the first place, would place Kakadu in jeopardy of losing its World Heritage designation entirely.

However, even in the face of on-going stringent international mine opposition by environmental groups, indigenous peoples, and the potential World Heritage "in danger" designation, construction of the Jabiluka mine is underway. ◆

## NPS Administrative Use of Sand, Rock and Gravel

By Mark Ziegenbein, Geologist

Park visitors demand smooth roads, well-maintained campgrounds, and safe facilities. Few, however, consider the millions of tons of sand, rock and gravel needed to build and maintain the conveniences we all take for granted. Fewer yet think of the large areas of land that we disturb to get these raw materials. Geologic Resources Division staff are helping parks in the difficult task of providing adequate roads and facilities while protecting sensitive park resources.

At last count, the National Park Service was responsible for maintaining at least 16,000 buildings, 8,000 miles of roads, 1,450 bridges and tunnels, 400 dams, 5,000 housing units, 1,500 water and sewer systems, 300 fueling facilities, and 2,000 fuel storage tanks. All these require sand, rock, clay, or gravel to build and maintain.

Resurfacing a typical two-lane road can take 12,000 cubic yards of aggregate per mile, even when the pavement is recycled. Consider the miles of roads in parks as well as the fact that each mile will be resurfaced every 15 years and our staggering consumption rate becomes evident. While most parks get gravel outside their boundaries, others may need to extract internally due to material availability, the park's remoteness, or the economic and environmental impacts of gravel importation. Nationwide, the NPS has over 1,000 extraction sites in more than 80 National Park units. Park units are mining 165 of these sites for maintenance or construction projects.

In 1998, division staff drafted revisions to NPS Management Policies, developed implementation guidelines, and helped 7 parks deal with administrative sand, rock, and gravel issues. Staff provided background information, example documents, and advice to parks, regions, and systems offices on how to proceed with NPS extraction at Wupatki National Monument, Death Valley National Park, and City of Rocks National Reserve. In addition, division staff participated in sand, and gravel related planning efforts at Wrangell-St Elias National Park & Preserve, Denali National Park, Point Reyes National Seashore, and Grand Teton National Park – John D. Rockefeller Jr. Memorial Parkway.

Summaries of these four planning efforts are provided below.

### Point Reyes National Seashore

Point Reyes National Seashore was created in 1962 almost entirely out of private land owned by dairy and cattle ranchers. These ranches, though now owned by the NPS, continue to operate under federal leases. The ranches and dairies operating in the park have been allowed to continue "traditional activities" including extraction of sand, rock and gravel by a provision in their leases. To date, approximately 30 pits and quarries have been used in the park for road construction and ranch operation and eight pits or quarries are still in use. Division staff working with the park to review this in-park mining and is providing

assistance with project definition, project planning, site inventory, site mapping, mine planning, restoration design, and economic evaluation. The goal of this effort is to insure that all sites are properly restored and to assure that continuing extraction activities are economically logical, environmentally sound, incrementally restored, and in compliance with Federal, State and local requirements.



Grossi Pit — Point Reyes National Seashore

volunteer assistance from a retired engineer/surveyor from Sacramento, California. An interdisciplinary team composed of revegetation specialists, a restoration and mine-planning geologist, and park maintenance and resources staff, will prepare a sand, rock, and gravel plan and environmental analysis. When complete, the plan will enable the park to decide which sites should remain open to extraction, if any, and which sites should be closed and restored. The plan will also guide future restoration or extraction, and provide documentation to protect the park in the event of legal challenge.

**Wrangell-St Elias National Park & Preserve**



Alaska Department of Transportation gravel extraction along the McCarthy Road. The McCarthy Road is visible on the right.

Preserve. Since the establishment of the park, and the selection of lands by native organizations, the ADOT has been affected by a reduction in the availability of gravel sources along the road. To keep the road passable, the ADOT is currently attempting to mine material for road repair from within the right-of-way, which has the following negative effects:

- The ADOT is often forced to use inferior materials for road repair and surfacing,

In 1998, Division staff mapped, and developed restoration plans for 17 extraction sites in the park. Staff also arranged for site surveying to be done with

- Extraction creates safety hazards and excessive visual impacts adjacent to the road,
- Wetlands and floodplains are being disrupted, and
- Historic and cultural resources are being disrupted by extraction activities.

The State is now beginning a McCarthy Road reconstruction project that will require significantly more sand, rock and gravel than needed in the past.

The Division assisted the park by reviewing the park’s current situation, helping compile baseline geologic information, and assisting in field investigations to inventory existing gravel sources and to investigate potential road material extraction sites. This inventory is intended to be the first step in a regional gravel planning effort with the goal of selecting a few, well placed sites along the McCarthy road based on superior material quality and quantity, optimum spacing to reduce haul distances, and minimal environmental and visual impacts. All gravel users along the road corridor would then be encouraged to use the established extraction sites. In the summer of 1999, the Alaska Department of Transportation plans to test drill sites identified as favorable in last year’s investigation.

**Denali National Park**

Denali National Park & Preserve has had difficulty providing gravel for road maintenance and construction projects for decades. The impacts of in-park extraction sites, the hazards, cost and impacts of hauling gravel into the park, conflicts with adjacent landowners and communities, and consistency issues between Park operations and mining claim operations have all been difficult to resolve. Park projects often require individual EA’s to address gravel acquisition. The park did develop a Borrow Source Inventory in 1988 and a Gravel Acquisition Plan in 1992. However this plan only provided for extraction from the Teklanika Pit and at the Toklat River. Park staff have since determined that this plan: 1) is not adequate for normal road maintenance needs, 2) did not identify material needed for existing and proposed construction projects and 3) did not identify a material source for the western end of the Denali Road.



Teklanika Pit – Denali National Park



*Snake River Pit – John D. Rockefeller Jr. Memorial Parkway. View south across one of three water-filled extraction areas from a gravel stockpile.*

To address these concerns, and with the park the ultimate goal of determining the most cost effective and environmentally sound way to provide sand, rock and gravel for long-term NPS construction and maintenance, the division is working with the park to develop a gravel plan. Division staff worked with the park geologist to inventory the existing extraction sites as well as sites with a potential for future extraction. Park resources and maintenance staff then discussed the range of reasonable alternatives and the logistics of preparing a sand, rock, and gravel plan. The Division's technical specialist provided the park with a template for putting together a gravel acquisition plan including:

- ▶ a Project Plan (defining the goal, the team, the product and the timeframe);
- ▶ a table of contents (showing the typical plan components and suggesting responsible parties); and
- ▶ a Task Plan (breaking the job into tasks, participants, and a best-case timeline).

Division staff will work as part of the project team as needed to complete the analysis.

### **Grand Teton National Park – John D. Rockefeller Jr. Memorial Parkway**

The Snake River Pit was opened under a U.S. Forest Service permit in the 1950s and was in continuous use until June 1992. The National Park Service and the Federal Highway Administration used gravel from the pit for road construction and maintenance projects. In 1992 the Army Corp of Engineers halted operations at this site for violations of the Clean Water Act. The Park Service is required to restore wetlands at the site under an EPA/Army Corp of Engineers order. The park is exploring wetland restoration options, and options to continue removing gravel from the site while complying with the restoration order. The geologic and hydrologic conditions at the site make extraction and restoration more complex than at most gravel extraction sites. The gravel deposit is 30 feet in depth and the groundwater is within 5 feet of the ground surface. Therefore, the deposit lies almost entirely below water level. Three different equipment options to perform extraction and restoration were analyzed: conventional equipment (excavator, dozer, loader) with large dewatering pumps and sediment ponds; floating suction dredge extraction; and dragline extraction. The cost and performance analysis will help the park to select the proper equipment or combination to best meet park needs at this site. ◆

## Division Park Assistance Listing

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

#### Alaska Region

##### ALASKA CLUSTER

- Obtained baseline paleontological information and compiled curatorial records related to paleontological resources.

##### Aniakchak National Monument and Preserve

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Bering Land Bridge National Preserve

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Cape Krusenstern National Monument

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Denali National Park and Preserve

- Provided expert testimony before the Interior Board of Land Appeals on mineral report for Comstock Lode mining claims.
- Performed on-site inspections, provided advice and written guidance regarding park extraction of sand, rock and gravel.
- Provided assistance in funding and recruiting a Geologist-in-the-Parks (GIP) intern position for resource management
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Gates of the Arctic National Park and Preserve

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Glacier Bay National Park and Preserve

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Katmai National Park and Preserve

- Assisted NPS planning team in developing alternatives for continued extraction and reclamation of gravel pits along the Valley of 10,000 Smokes Road.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Kenai Fjords National Park

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Klondike Gold Rush National Historic Park

- Funded a USGS geologist to go to the park to help develop a geologic interpretation product and lead a geology field trip for the staff.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Kobuk Valley National Park

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Lake Clark National Park

- Provided funding and recruitment services for a Geologist-in-the-Parks (GIP) intern position to assist the park with resource management and geologic interpretation.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Noatak National Preserve

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Wrangell-St Elias National Park and Preserve

- Inventoried existing and potential sources of sand and gravel along the McCarthy Rd. Provided advice and written guidance regarding park extraction of sand, rock and gravel
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Yukon Charley Rivers National Park & Preserve

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Intermountain Region

##### Regional Director

- Provided briefing and background information to Intermountain Regional Director on the proposed Jabiluka uranium mine in Kakadu National Park, Australia. (See article on page 36.)

##### Alibates Flint Quarries National Monument

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Arches National Park

- Assisted park to develop stipulations to improve resource and visitor protection in the renewal of a special use permit for a natural gas pipeline through the park.
- Provided funding and recruitment services to support a Geologist-in-the-Park (GIP) intern position to assist the park with geologic interpretation.
- Initiated collection of background data for paleontological resources.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Bandelier National Monument

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

##### Bent's Old Fort National Historic Site

- Conducted scoping meeting as part of Geologic Resource Inventory to review coverage, availability, and quality of existing geologic maps and reports. (See article on page 16.)

##### Big Bend National Park

- Assisted park staff in assessing effects of proposed humate mine adjacent to park. Researched avenues for permitting input with the Federal Office of Surface Mining and the State of Texas, as well as local county authorities. Learned that mining proposal may include mining through “waters of the

U.S.” — discussed issue with Army Corps of Engineers who agreed to inform mining company of the importance of necessary plan reviews and permits (404) to protect drainage’s adjacent to park. The operator dropped Humate mining proposal in early 1999.

- Provided technical support and training related to the paleontological resources.
- Provided outline for cave assessment project to resource management staff.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Big Thicket National Preserve

- Inspected all active oil and gas operations in the Preserve and provided park management with an “Evaluation of Oil and Gas Operations and Management Recommendations.”
- Provided guidance for use of third-party monitors for overseeing 3D seismic programs.
- Performed technical evaluation of plans of operations for: Unocal 3D seismic survey, Duncan Energy 3D seismic, Seismic Exchange, Incorporated 3D survey, Continental Geophysical’s Shinney Lake cable-only seismic, and Grant Geophysical’s cable-only seismic operations.
- Assisted the Preserve in the technical and legal aspects of Mariner Energy’s proposed routing of an oil and gas flowline across the Little Pine Island Bayou Unit.
- Met with the park, Regional Office staff and the Regional Solicitor’s Office in Albuquerque, New Mexico to discuss regulatory and policy issues regarding nonfederal oil and gas development in the park.

#### Bighorn Canyon National Recreational Area

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Black Canyon of the Gunnison National Monument / Curecanti National Recreation Area

- Conducted scoping meeting as part of Geologic Resource Inventory to review coverage, availability, and quality of existing geologic maps and reports (See article on page 16.)
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>
- Assisted park on obtaining information on mineral rights inside park.

#### Bryce Canyon National Park

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Canyon de Chelly National Monument

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Canyonlands National Park

- Provided comments on EA and Bid Specifications, and arranged transfer of funds for bat gate and native rock wall closures of Shafer Trail and Musselman mine sites.
- Provided recommendations for cave assessment project for newly discovered cave.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Capitol Reef National Park

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Capulin Volcano National Monument

- Served on park’s General Management Plan team providing input on a wide range of geologic and geotechnical issues.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Carlsbad Caverns National Park

- Assisted park in the engineering and economic aspects as well as policy guidance to park on proposal to drill wells in the Cave Protection Zone north of the park.
- Assisted WASO Solicitor’s Office with pretrial litigation tasks (*Moncrief v. DOI*).
- Provided on site assistance to cave management program and cave interpretative program.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Chiricahua National Monument

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Colorado National Monument

- Conducted scoping meeting as part of Geologic Resource Inventory to review coverage, availability, and quality of existing geologic maps and reports (See on page 16.)
- Provided financial support for specific geologic research in park.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Coronado National Memorial

- Provided water quality data on mine properties to park, and NPS Water Resources Division.

#### Curecanti National Recreational Area

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Devil’s Tower National Monument

- Linked park resource management with USGS technical experts to review a geologic research proposal.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

#### Dinosaur National Monument

- Conducted scoping meeting as part of Geologic Resource Inventory to review coverage, availability, and quality of existing geologic maps and reports (See article on page 16.)

#### El Malpais National Monument

- Contributed \$1,000 to the park’s 10<sup>th</sup> Anniversary Stewardship Symposium
- Provided input and review of cave management program and provided funding for cave assessment projects.
- Assisted park in pursuing USGS mapping and report products.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Florissant Fossil Beds National Monument**

- Provided funding and recruitment services for two Geologist-in-the-Parks (GIP) intern positions for geologic interpretation, resource management and research.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>
- Conducted scoping meeting as part of Geologic Resource Inventory to review coverage, availability, and quality of existing geologic maps and reports (See article on page 16.)

**Fossil Butte National Monument**

- Provided support to paleontology program through interns to assist with interpretation at the quarry, fossil preparation demonstrations, correcting curatorial deficiencies, producing a paleontological resource education card game, conducting field surveys of Wasatch Formation exposures, and producing an original painting depicting Eocene primates.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Gila Cliff Dwellings National Monument**

- Linked park resource management staff with USGS geologist interested in contributing interpretive display.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Glacier National Park**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Glen Canyon National Recreational Area**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Grand Canyon National Park**

- Assisted Intermountain Region and park in acquiring funds from USEPA for site characterization work at Orphan Mine and provided input to scope of work.
- Reviewed EA for Last Chance Mine bat habitat assessment and mine closures.
- Funded a study of the minerals of the caves of the Grand Canyon.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Grand Teton National Park**

- Conducted the first park paleontological resource inventory.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Great Sand Dunes National Monument**

- Conducted scoping meeting as part of Geologic Resource Inventory to review coverage, availability, and quality of existing geologic maps and reports (See article on page 16.)
- Assisted park in obtaining promised proceedings document from USGS.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Guadalupe Mountains National Park**

- Provided paleontological resource training to park staff. Negotiated the return of a Permian fish fossil from Southern

Methodist University.

- Provided assistance to 25<sup>th</sup> Anniversary Research and Resource Management Symposium by facilitating cave research session.
- Provided park with technical advice relating to geologic research, literature, and policy.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**John D. Rockefeller, Jr. Memorial Parkway**

- Assisted NPS planning team in developing alternatives for continued extraction and/or restoration of the Snake River Pit gravel extraction area.

**Lake Meredith National Recreation Area**

- Provided a technical evaluation of plans of operations for the Bivens No. 1 gas well, the Lee and Sneed Leases, and Seagull Energy’s proposals to deepen several existing gas wells.

**Mesa Verde National Park**

- Provided funding and recruitment services for a Geologist-in-the-Parks (GIP) intern position to help the park with geologic research.
- Conducted scoping meeting as part of Geologic Resource Inventory to review coverage, availability, and quality of existing geologic maps and reports (See article on page 16.)
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Natural Bridges National Monument**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Navajo National Monument**

- Provided funding and recruitment services for a Geologist-in-the-Parks (GIP) intern position to assist the park with geologic interpretation.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Organ Pipe Cactus National Monument**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Padre Island National Seashore**

- Provided technical evaluation of the plans of operation for: Yarborough Pass remediation, Fina Oil’s plan for plugging the State Tract 181-1 well, American Exploration’s plan for plugging the State “A” 233-1 well, continuing operations on the Dunn-McCampbell “A” Lease, and amendments to Amoco’s South Sprint Field plan.
- Provided guidance for abandonment requirements of cathodic protection wells used in pipeline operations.
- Assisted regional staff in preparing Regional Director’s response to the Louis Dreyfus Natural Gas Corporation request that the Regional Director reconsider clean-up conditions on plan approval at the company’s Yarborough Pass Facility.
- Prepared the Director’s response to an appeal by the Louis Dreyfus Natural Gas Corporation to alter the Regional Director’s decision with respect to clean up at their



Yarborough Pass Facility.

- Researched question regarding the ability of the NPS to halt the transfer of contaminated sites to new owners. In short, the NPS cannot prevent the transfer but can require an environmental audit and sampling prior to the transfer.
- Provided park with USGS estimates on remaining hydrocarbon reserves as part of the park's Mineral Management Plan.
- Provided park with Colorado School of Mines Master Thesis on oil and gas operating costs inside parks and an annotated bibliography on environmental impacts related to oil and gas operations as part of the park's Minerals Management Plan.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Petrified Forest National Park

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>
- Provided funding and recruitment assistance for a Geologist-in-the-Parks (GIP) intern to assist the park with geologic research and interpretation.

#### Pipe Spring National Monument

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Rocky Mountain National Park

- Conducted scoping meeting as part of Geologic Resource Inventory to review coverage, availability, and quality of existing geologic maps and reports (See article on page 16.)
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Saguaro National Park

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Sunset Crater Volcano National Monument

- Provided funding and recruitment assistance for a Geologist-in-the-Parks (GIP) intern to assist the park with geologic interpretation
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Timpanogos Cave National Monument

- Initiated excavation of Pleistocene/Holocene cave fill and packrat middens.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### White Sands National Monument

- Provided funding and recruitment assistance for a Geologist-in-the-Parks (GIP) intern to assist the park with geologic interpretation.
- Conducted meeting with park resource staff and USGS personnel on park research needs.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Yellowstone National Park

- Continued extensive efforts to define and highlight potential effects of the New World Mine, culminating in the President's

August 7, 1998, announcement of the \$65 million buyout of Crown Butte Company's holdings. Provided language for the New World consent decree that consummated Federal purchase of the New World properties.

- Worked with the Solicitor's Office, Department of Justice, and U.S. Department of Agriculture to provide the NPS a more prominent role in the cleanup of the New World Mining District.
- Worked with the Solicitor's Office and the Department of Justice to include "NPS friendly" language in the interagency New World Memorandum of Understanding.
- Prepared Yellowstone Paleontological Survey Report, published by the Yellowstone Center for Resources, which provides an assessment of park paleontological resources and concerns.
- Facilitated park assistance request to provide geologic mapping as part of Yellowstone Compact regional groundwater studies.
- Provided forum and venue for USGS Cooperative Mapping Team to obtain existing park digital geologic map coverage.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Zion National Park

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

### Midwest Region

#### Jewel Cave National Monument

- Provided funding and recruitment services for a Geologist-in-the-Parks (GIP) intern position to assist the park with cave resource management.
- Provided funding for cave specialist to attend training at Mammoth Cave National Park and to present paper at the National Speleological Society Convention.

#### Agate Fossil Beds National Monument

- Facilitated park staff links with possible assistance on geologic research needs.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Apostle Islands National Lakeshore

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Badlands National Park

- Provided funding and recruitment services to support two Geologist-in-the-Parks (GIP) intern positions to assist geologic interpretation, resource management and research.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Buffalo National River

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Cuyahoga Valley National Recreational Area**

- Evaluated of Bass Energy's plan of operations for drilling Old Trail School Well No. 1.
- Assisted in development of specifications for plugging orphaned oil and gas wells in the park.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Hot Springs National Park**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Ice Age National Scenic Trail**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Ice Age National Scientific Reserve**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Indiana Dunes National Lakeshore**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Isle Royal National Park**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Jewel Cave National Monument**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Keweenaw National Historic Park**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Ozark National Scenic Riverways**

- Coordinated NPS's response to a Freedom of Information Act request for all NPS records pertaining to lead mining in the Mark Twain National Forest, near the park. As part of this effort. Drafted "Statement of Harm" for Solicitors to use in evaluating Doe Run's appeal; handled remand of documents withheld, and coordinating the release and withholding of documents with Regional FOIA officer.
- Prepared an Administrative Record that consisted of 8 volumes of material and prepared a summary statement for the Solicitor in support of the NPS's position for denial of Doe Run's five prospecting permits.
- Worked with USGS to address key technical questions on the effects of lead mining adjacent to the park.
- Prepared numerous briefing statements for the Secretary of the Interior and NPS Director on the status and recommended actions regarding the threats presented by lead mining, attended and represented park's interest at technical team meetings and interagency policy meetings, advocated park protective strategies at the Departmental level.
- Provided funding and recruitment assistance for a Geologist-in-the-Parks (GIP) intern to assist the park with geologic resource management.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Petroglyph National Monument**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Pictured Rocks National Lakeshore**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Pipestone National Monument**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Saint Croix & Lower St. Croix National Scenic River**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Sleeping Bear Dunes National Lakeshore**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Tallgrass Prairie National Preserve**

- Evaluated status of gas operations in the preserve. Provided recommendations to the park for inclusion in GMP regarding management of existing and future gas operations.
- Drafted request for opinion from Regional Solicitor on outstanding legal issues concerning park's authority over nonfederal oil and gas operations within the preserve, and met with Regional Solicitor to discuss park concerns.
- Evaluated status of gas operations in the preserve. Provided recommendations to the park for inclusion in GMP regarding management of existing and future gas operations.
- Drafted request for opinion from Regional Solicitor on outstanding legal issues concerning park's authority over nonfederal oil and gas operations within the preserve, and met with Regional Solicitor to discuss park concerns.

**Theodore Roosevelt National Park**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Voyageurs National Park**

- Identified a geology graduate student interested in preparing a geologic map of the park and facilitated a request to the USGS to fund the project through their EMAP program.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Wind Cave National Park**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**National Capitol Region****Catoctin Mountain Park**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**George Washington Memorial Parkway**

- Provided funding and recruitment services for a Geologist-in-the-Parks (GIP) intern position to assist the park with an interpretative program for Roosevelt Island.

## Northeast Region

### Acadia National Park

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

### Allegheny Portage Railroad National Historic Site

- Provided park staff with technical information on acid mine drainage from abandoned coal mines located on recently acquired boundary expansion.

### Assateague Island National Seashore

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

### Bluestone National Scenic River

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

### Cape Cod National Seashore

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>
- In coordination with the Solicitor’s Office, determined that sand from a park parking lot could not be removed and disposed of outside the park by a local town because the sand constituted federal property and no legal mechanism existed for allowing its conversion to nonfederal use.

### Colonial National Historic Park

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

### Delaware Water Gap National Recreational Area

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

### Fire Island National Seashore

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

### Gateway National Recreational Area

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

### Gauley River National Recreational Area

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

### New River Gorge National River

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>
- Provided comments and coordinated Natural Resource Program Center comments on the Glade Creek #1 underground coal mine proposed adjacent to New River Gorge.

### Shenandoah National Park

- Provided funding and recruitment assistance for a Geologist-in-the-Parks (GIP) intern to assist the park with geologic education and interpretation.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

## Pacific West Region

- Provided assistance in drafting a memo for delegating decision making under the NPS 36 CFR 9A mining regulations from the Regional Director to the California Desert Superintendents.
- Clarified that the delegation of decision making from the Regional Director to the California Desert Superintendents did not create a second appeal level under the NPS 36 CFR Part 9A regulations.
- Provided background information to the Associate Regional Director for Park Operations and Education on the fact that the Wilderness Act does not prohibit mining in wilderness.

### Channel Islands National Park

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

### Crater Lake National Park

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

### Craters of the Moon National Monument

- Provided funding and recruitment assistance for a Geologist-in-the-Parks (GIP) intern position to assist Pa the park with geologic resource management.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

### Death Valley National Park

- Researched and advised park about applicability of California Surface Mining and Reclamation Act to the proposed Rainbow Talc/Caliente mines.
- Provided guidance regarding administrative extraction and in-park use of mineral materials.
- Reviewed and provided comments on a draft letter to the claimants of the Rainbow Talc mine informing them of the status of efforts to develop an EIS on their mining proposal and soliciting funds for studies associated with the EIS.
- Reviewed and provided comments on draft GMP and LPP.
- Developed a “fill-in-the-blanks” short plan of operations for the park to use with mining claimants seeking vehicular access to valid mining claims.
- Initiated J.O. (Ostrenger) mineral examination on seven lode claims for wollastonite, inclusive of two weeks fieldwork and extensive analytical work to determine quality of material.
- Prepared reserves estimate for Rainbow and Caliente Mine, and interacted with PWR Lands Division and contractor on mineral appraisal for the property.
- Responded to questions from a reporter writing an article in California Wild Magazine on Rainbow/Caliente Mine issues.
- Conducted paleontological field survey in Copper Canyon and produced site report with recommendations.
- Provided funding and recruitment assistance for a Geologist-in-the-Parks (GIP) intern position to assist the park with paleontological resource management.
- Facilitated park technical assistance request to obtain geologic map coverage of entire park.
- Provided park with USGS MOU and cooperative agreement language.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Devils Postpile National Monument**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Golden Gate National Recreational Area**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Great Basin National Park**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Hagerman Fossil Beds National Monument**

- Provided funding and recruitment services for a Geologist-in-the-Parks (GIP) intern position to assist the park with paleontology research.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Haleakala National Park**

- Provided funding and recruitment services for a Geologist-in-the-Parks (GIP) intern position to assist the park with geologic interpretation.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Hawaii Volcanoes National Park**

- Drafted an action plan and for the park caves during a January site visit to the area.
- Developed a set of recommended cave survey standards implementation by the park’s cave specialist.
- Provided funding for assistance to a cave assessment project.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**John Day Fossil Beds National Monument**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Joshua Tree National Park**

- Assisted park staff to evaluate the plan of operations and provided policy and technical input on an environmental assessment for access across park lands to claims outside the park.
- Advised the park on authority over a private inholding that straddles the park boundary.
- Assisted the park in applying the NPS regulations to mining claimants seeking motorized access to their in-park claims for reconnaissance purposes by developing a fill-in-the-blanks access plan of operations for use by the park.
- Assisted the park in requesting the Bureau of Land Management to issue a decision declaring null and void the mining claims whose owner failed to pay annual maintenance fees.
- Suggested course of action when disgruntled mining claimant threatened to drive bulldozer across NPS land to his mining claims.
- Advised park on pre-closure assessment of bat habitat in abandoned mines, mine closure techniques, and coordinated winter surveys for February 1999.
- Completed the validity examination of the U-Thor mining claim. Claimant found not to possess valid existing rights. The

Bureau of Land Management subsequent declared the claim null and void.

- Assisted the park in obtaining cost information for purchasing a polyurethane foam machine to be use for plugging abandoned mine shafts. Provided funding for machine.
- Reviewed and provided comments on the proposed Storm Mine Plan (garnet mine).
- Provided funding and recruitment services for a Geologist-in-the-Parks (GIP) intern position to assist the park with resource management.
- Provided assistance in responding to letter from John Wheeling, a mining claimant with claims in Joshua Tree, Death Valley and Mojave.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Kaloko-Honokohau National Historic Park**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Kalaupapa National Historic Park**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Lake Chelan National Park**

- Worked with park, regional, and central office staff to interpret and develop potential revisions of the NPS solid waste regulations, on acceptance of non-NPS waste.

**Lake Mead National Recreational Area**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Lake Roosevelt National Recreational Area**

- Provided funding and recruitment services for a Geologist-in-the-Parks (GIP) intern position to assist the park with geologic interpretation.
- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Lassen Volcanic National Park**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Lava Beds National Monument**

- Prepared and posted park geology notes on “Park Geology Tour” webpage at <http://www.nature.nps.gov/grd/tour/>

**Mojave National Preserve**

- Advised San Francisco Field Office Solicitor and park about use of a 9A plan of operations, rather than a special use permit or temporary approval, for evaluating and permitting Morningstar mine proposed reclamation.
- Commenced researching and developing guidance for removing or compelling removal of abandoned personal property, some hazardous, from abandoned mining claims.
- Assisted park geologist with comments on a Memorandum of Understanding among the California Office of Surface Mining and Reclamation, counties, and the three desert parks that would coordinate the application of the Surface Mining and Reclamation Act and the NPS regulations at 36 CFR Part 9A.
- Hired two mineral examiners and acquired equipment to

establish Division field office at the Preserve.

- Reviewed and provided comments on draft GMP and LPP.
- Initiated work on Golden Quail mineral examination of 16 lode claims including one trip to check operator's mine model, data acquisition, and preliminary stages of report preparation.
- Substantially completed the validity exam report on the Volco unpatented mining claims.
- Provided park geologist with bond and mine land reclamation cost information.
- Supplied technical assistance to park geologist on Cow Hole Mountain limestone deposit.
- Provided a list of potential mineral appraisals to the park geologist to assist in possible mineral acquisition.
- Advised park geologist on engineering aspects of testing material and pumping water before back-filling of decline shaft at abandoned mine property.
- Assisted park superintendent with fair market value negotiations of Cima Cinder Property and formulated possible negotiation strategies.
- Reviewed and commented on draft and final BLM EIS for expansion of the Castle Mountain Mine adjacent to Mojave BLM implemented nearly all NPS comments in revised mine plan and EIS.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Mount Rainier National Park

- Provided funding and recruitment services for a Geologist-in-the-Parks (GIP) intern position to assist the park with geologic interpretation.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Mount Rushmore National Memorial

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### North Cascades National Park

- Advised park staff and provided draft responses to owner on variety of issues pertaining to patented mining claim owners' proposals to remove stockpiled ore from their claims in wilderness.
- Provided funding and recruitment services for a Geologist-in-the-Parks (GIP) intern position to assist the park with geologic interpretation.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Olympic National Park

- Responded to park staff's questions about NPS policies and guidance pertaining to mining activities in NPS wilderness.
- Participated in meetings and conference calls on exploration proposals on Shi Shi Beach. Provided park and region with policy guidance regarding mineral owners exploration proposals on Shi Shi Beach.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Oregon Cave National Monument

- Provided funding and recruitment assistance for a Geologist-in-the-Parks (GIP) intern to assist the park with geologic interpretation
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Pinnacles National Monument

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Point Reyes National Seashore

- Performed on-site inspections, developed extraction and reclamation plans for 14 sites, provided advice and written guidance regarding park extraction of sand, rock and gravel.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Pu'uuhonua o Honaunau National Historic Park

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Redwood National Park

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Santa Monica Mountains National Recreational Area

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Sequoia and Kings Canyon National Parks

- Provided funding through the Geologists-in-Parks program to continue the ongoing cave inventory and assessment project in the park.
- Provided on-site assistance to cave NNL assessments.
- Provided funding and recruitment assistance for a Geologist-in-the-Parks (GIP) intern to assist the park with geologic resource management.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Whitman Mission National Historic Site

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Yosemite National Park

- Compiled, all NPS policies pertaining to geohazards, to help park staff frame their technical assistance request about the development of geohazards policies and guidance.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

## Southeast Region

#### Big Cypress National Preserve

- Provided technical review and regulatory adequacy assessment for 25 separate plans of operations submitted to the Preserve by Collier Resources Company. In total, the plans include proposals for 23 3D seismic programs, 26 exploration wells, and 5 conventional 2D seismic proposals. (See "Big Cypress Swamped with Permits" on page 28.)

**Big South Fork National Recreation Area**

- Prepared a draft letter to inform an operator of a potential trespass action and explain his responsibilities under the Service's nonfederal oil and gas regulations.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Biscayne National Park**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Blue Ridge Parkway**

- Provided funding and recruitment assistance for a Geologist-in-the-Parks (GIP) intern to assist the park with geologic interpretation
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Buck Island Reef National Monument**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Canaveral National Seashore**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Cape Hatteras National Seashore**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Cape Lookout National Seashore**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Chickasaw National Recreational Area**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Cumberland Gap National Historical Park**

- Initiated and arranged a meeting between the NPS, Solicitor's and Office of Surface Mining Directors to discuss opportunities for strengthening the park protection aspects of OSM regulations that implement the Surface Mining Control and Reclamation Act of 1977. A permit issued by the State of Kentucky outside Cumberland Gap illustrated the shortcoming of the existing regulatory regime.
- Prepared a follow-up memo from Director Stanton to Kathy Karpan, Director of the Office of Surface Mining, to encourage a continuation of the dialogue between the agencies and also to relay the favorable recommended ruling by the Kentucky Administrative Law Judge deliberating on the NPS's appeal of a coal mining permit issued by the state.
- Provided assistance to the park and Regional Solicitor's Office in determining what course of action to take in light of the State of Kentucky's elongated delay in acting on the Administrative Law Judge's recommendation to protect the park and rescind the coal mining permit.
- Prepared briefing paper for the Director on the coal mining controversy outside the park with the State of Kentucky.
- Provided input to negotiations with the State of Kentucky over

- needed improvements to the state's implementation of §522(e)(3) of the Surface Mining Control and Reclamation Act of 1977. This section prohibits surface coal mining that will adversely affect units of the National Park System. The state permitted a mine in 1997 that would adversely impact the viewshed of Cumberland Gap without first seeking joint approval of the NPS. The state's handling of this permit underscored the need for improvements in the state program.
- Provided the Office of Surface Mining with comments on the Petition Evaluation Document Draft EIS.
- Provided travel funding for a cave specialist site visit for restoration and redevelopment planning for Cudjo Cave.
- Provided review and position descriptions to Superintendent for cave specialist position.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Cumberland Island National Seashore**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Dry Tortugas National Park**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Everglades National Park**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Great Smoky Mountains National Park**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Gulf Islands National Seashore**

- Assisted the park in working with an operator to develop a plan of operations for conducting 3D seismic operations in the submerged lands within the park.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Jean Lafitte National Historical Park and Preserve**

- Provided a technical evaluation of Burlington Resources plan of operations for a 3D seismic survey in the Barataria Unit.
- Participated in a 3D seismic workshop conducted in the Preserve while Burlington's operations were ongoing.
- Provided park with guidance on requiring 3-D seismic companies to hire 3<sup>rd</sup> party monitors to oversee operations.

**Mammoth Cave National Park**

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

**Natchez Trace Parkway**

- Met with Mississippi Lignite Mining Company and Tractabel Power Company officials in Denver.
- Commented on the State of Mississippi's proposed regulations governing surface coal mining in the state.
- Undertook site visit to Natchez Trace to view the area slated for proposed Red Hills lignite mine and power plant, and traveled to Louisiana visit an MLMC lignite mine near Longview, Texas to analyze lignite mining impacts and methods. Coordinated NRPC comments on the preliminary

draft Red Hills mine permit application prior to its release for public comment on public draft of the permit application and coordinated draft comments on Red Hills Power Project draft environmental impact statement prepared by the TVA—NRPC submits 47 pages of comments.

- Participated in a meeting in Atlanta to discuss the Red Hills project with Tennessee Valley Authority officials. Monitoring plans were set up for water, noise and visibility concerns. Company made concessions on mining near a popular park overlook.
- Negotiated the use of Mississippi Lignite Mining Company's surface mining bonding template for dispersal to NPS 9A mineral operators to improve quality of 9A plans of operation.
- Submitted comments on the Record of Decision for the Tennessee Valley Authority's Red Hills Power Project EIS.
- Work with the proponents of the Red Hills Power project and posted their receipt of a state permit, to insure that adequate monitoring and mitigation of mining impacts. (See "Red Hills Power Project" article on page 35.)

#### Russell Cave National Monument

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/RussellCaveNationalMonument>

#### Virgin Islands National Park

- Prepared text for a geologic interpretative display explaining the numerous earthquakes in the Virgin Islands.
- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

#### Wright Brothers National Historic Site

- Prepared and posted park geology notes on "Park Geology Tour" webpage at <http://www.nature.nps.gov/grd/tour/>

## Servicewide

### Abandoned Mineral Lands Program

(See article on page 4.)

- Attended Western Bat Working Group Workshop in Reno, NV and served as NPS representative on Colorado board, primarily as bat conservation efforts interface with preservation of habitat in abandoned mines.
- Assisted in coordination and preparation of materials, for April USEPA workshop in Grand Junction, CO on radiation at abandoned mine sites.
- Participated on the faculty for 3 AML safety training sessions for the USDA-FS, teaching underground mine safety.
- Aided BLM in multi-agency study of the effects of bat-compatible mine closures on underground environments in several uranium mines in western Colorado. Data collected will be used, in part, to assess the impact of radiation on roosting bat species and to determine if there is a net benefit to protecting habitat at radiologically- contaminated sites.
- Provided assistance to the NPS representative on the inter-agency Northwest Forest Plan secure the help of a recently hired mineral examiner who also in a noted mollusk expert.
- Participated in staff level discussions under the National Interagency Coordinating Committee regarding mining on how to amend the agreement to account for specific tasks

under the President's Clean Water Action Plan. Member agencies include the NPS, Bureau of Land Management, United States Forest Service and the Environmental Protection Agency.

## Policy and Regulatory Assistance

- Prepared draft regulatory changes to §6.7 of the 36 CFR Part 6 regulations governing Solid Waste Disposal in parks. Existing §6.7 addresses the generation and disposal of solid waste associated with mining. This section inadvertently contains ambiguous and problematic language that needs to be rectified.
- Provided substantive input to the Solicitor's Office regarding the breath of the Secretary's duties beyond park boundaries under the NPS Organic Act.
- Worked extensively with the Solicitor's Office in identifying the meaning of recent mining related opinions for park management (see related article above).
- Clarified language in the draft final 36 CFR Part 14 regulations pertinent to mining operations in parks.
- Prepared draft revisions to the *NPS Management Policies* pertinent to minerals management and geologic resources.
- In coordination with field specialists, initiated revisions and drafted new sections for inclusion in *Natural Resources Reference Manual 77*. Topics being covered by the Division include: overview of geologic resources, soils, caves, paleontological resources, disturbed lands restoration, geologic hazards, shorelines, NPS administrative use of sand and gravel, and minerals management.
- Reviewed and provided comments on draft Director's Order #41 regarding NPS Wilderness Management.
- Provided input on efforts to improve Servicewide research and collection policies.
- Engaged the Solicitor's Office in discussions over whether NEPA compliance was required in conjunction with a validity exam, in general and specifically where claims are located in designated wilderness. The attorneys advised that compliance with NEPA was not required because of the nondiscretionary function of a validity exam, which determines whether a mining claimant holds bona fide property rights. In park wilderness, while NEPA compliance is not required the park should undertake a minimum tool analysis.
- Reviewed Corps of Engineers proposed nationwide §404 permit governing mining.
- Under the Cooperative Agreement negotiated by the Intermountain Region with the University of Denver, established an arrangement with the university's law school for obtaining student research assistants.

## Validity Program

- Represented the NPS as panel member to Departmental Mineral Examiners Certification Panel, including interaction on mining claims management issues facing the Department, reviewing certification applicants, and participation in biannual panel meetings.
- Established a contracting mechanism for performing mineral examinations on NPS unpatented mining claims. Initial contracts were awarded for exams in Mojave and Joshua Tree

- N.P. The mechanism can be used for exams in other parks, such as Death Valley and Alaska NPS units.
- Prepared validity task / timeline chart to aid management's understanding of time and process required for a "typical"

### 1998 Publications

- ▶ Hunt, A.P. and V.L. Santucci, 1998. Taxonomy and ichnofacies of Permian tetrapod tracks from Grand Canyon National Parks, Arizona. in Santucci and McClelland (eds.), National Park Service Paleontological Research Volume, NPS/NRGRD/GRDTR-98/01, p. 94-96.
- ▶ Hunt, A.P. and V.L. Santucci, 1998. An identification key to Permian tetrapod tracks from Grand Canyon National Park. in Santucci and McClelland (eds.), National Park Service Paleontological Research Volume, NPS/NRGRD/GRDTR-98-01, p.97-98.
- ▶ Santucci, V.L., 1998. The Yellowstone Paleontological Survey. Yellowstone Center for Resources, YCR-NR-98-1, 54p.
- ▶ Santucci, V.L., 1998. Paleontological resource management of the Copper Canyon fossil track site, Death Valley National Park., National Park Service, Geologic Resources Division Report, 9p.
- ▶ Santucci, V.L., 1998. New approach to paleontological surveys having success. in Natural Resources Year in Review, ed., J. Selleck, p.9.
- ▶ Santucci, V.L., 1998. Early discoveries of dinosaurs from North America and the significance of the Springfield Armory dinosaur site. in Santucci and McClelland (eds.), National Park Service Paleontological Research Volume, NPS/NRGRD/GRDTR-98/01, p.152-154.
- ▶ Santucci, V.L. and A.P. Hunt, 1998. Biostratigraphy and paleoecology of Late Paleozoic tetrapod tracks from Grand Canyon National Park, Arizona (abstract). *Journal of Vertebrate Paleontology* 18(3 supplement): 75.
- ▶ Santucci, V.L. and M. Hughes, 1998. Fossil Cycad National Monument: A case of paleontological resource mismanagement. in Santucci and McClelland (eds.), National Park Service Paleontological Research Volume, NPS/NRGRD/GRDTR-98-01, p.84-89.
- ▶ Santucci, V.L., A.P. Hunt, and M.G. Lockley, 1998. Fossil vertebrate tracks in National Park Service areas. *Dakoterra* 5:107-114.
- ▶ Santucci, V.L., M.G. Lockley, and A.P. Hunt, 1998. An inventory of National Park Service vertebrate ichnofossils (abstract). Fifth Conference on Fossil Resources, Abstracts with Programs, #RP02, Rapid City, South Dakota.
- ▶ Santucci, V.L. and L. McClelland, (eds.), 1998. National Park Service Paleontological Research Volume 3, NPS/NRGRD/GRDTR-98-01, 163p.
- ▶ Santucci, V.L., K.E. Sikoryak, A.K., Aase, and M.D. Fagnant, 1998. Paleontological resource interpretation and the definition of a fossil (abstract). Fifth Conference on Fossil Resources, Abstracts with Programs, #E04, Rapid City, South Dakota.
- ▶ Santucci, V.L., W.P. Wall, A.K. Aase, and B.R. Cortez, 1998. Reinterpretation of Yellowstone Paleoecosystems through recent paleontological discoveries (abstract). *Yellowstone Science* 6(2): 48 (spring supplement).

## Financial Summary of the Geologic Resources Division

By David B. Shaver, Division Chief

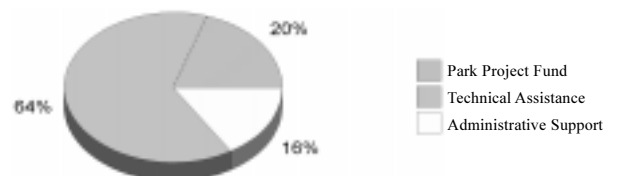
In FY98 base funding for the Geologic Resources Division was \$2,474,000. This represented an increase of over \$1 million from the previous year, due to first-time increases of \$500,000 for the Servicewide Abandoned Mineral Lands (AML) Program and \$580,000 for a California Desert Mining management. The division received an additional \$133,000 from other NPS accounts to support program activities, for a program total of \$2.6 million.

The figure shown illustrates the distribution of total funding managed by the Geologic Resources Division. Park project funding includes primarily abandoned mineral land restoration projects, mining claim validity contracts, and cave resource projects. Technical assistance represents day-to-day operational support to parks, field offices, and WASO and includes staff

- mineral examination.
- Completed mineral examiner certification materials for an additional staff member. ◆

salaries, park-based geology interns, travel, field equipment, and associated expenses. Administrative support includes program management costs, administrative support, office equipment, and supplies and materials. Expenditures for particular program areas are presented in the more detailed articles in this report, such as the Abandoned Mineral Lands, Cave and Karst Management, and Geologist-in-the-Parks Program. ◆

Distribution of Geologic Resources Division FY '98 Funding





## Organization and Staff



### GEOLOGIC RESOURCES DIVISION

303-969-2090

**Division Chief:** David Shaver  
**Program Analyst:** Diane Diedrichs  
**Secretary:** Da Von Moore  
**WASO Liaison/Geol.:** Lindsay McClelland (202-208-4958)

**Policy and Regulations Branch**  
 303-969-2096

**Branch Chief:** Carol McCoy  
**Regulatory Specialist:** Eddie Kassman  
**Regulatory Specialist:** Julia Brunner  
**Geologist:** John Burghardt

**Mineral Operations Branch**  
 303-969-2635

**Branch Chief:** Jim Woods  
**Environmental Protection Specialist:** Judy Geniac  
**Environmental Protection Specialist:** Kerry Moss  
**Mining Geologist:** Mark Ziegenbein  
**Mining Engineer:** Phil Cloues  
**Petroleum Engineer:** Pat O'Dell  
**Petroleum Geologist:** Lisa Norby

**Science & Technical Services Branch**  
 303-969-2018

**Branch Chief:** Bob Higgins  
**Cave Specialist:** Ron Kerbo  
**Geologist:** Sid Covington  
**Geologist:** Bruce Heise  
**Geologist:** Dave Steensen  
**Geologist:** Tim Connors<sup>1</sup>  
**Geologist:** Diann Gese<sup>2</sup>  
**Paleontologist:** Vince Santucci<sup>3</sup>  
**Physical Scientist:** Jim F. Wood

**Telefax:** 303-987-6792

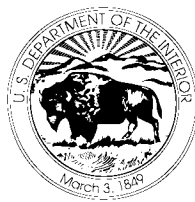
**Mailing Address:** National Park Service  
 Geologic Resources Division  
 P.O. Box 25287  
 Denver, CO 80225-0287

**Street Address:** 7333 W. Jefferson Avenue, Room 480  
 Lakewood, CO 80227

**Notes:**

1. Student appointment funded by NRID Inventory and Monitoring Program.
2. Temporary appointment funded by EPA interagency agreement for abandoned mine work.
3. Half time temporary appointment, shared position with Fossil Butte NM, duty stationed at Fossil Butte.





As the national's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

