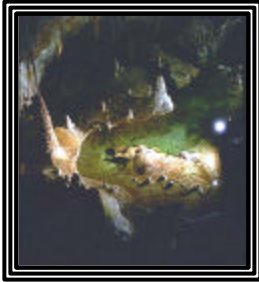


# INSIDE EARTH

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## A Newsletter of the National Park Service Cave & Karst Programs

Edited by Dale L. Pate



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### AN OPPORTUNITY FOR COMMUNICATION

*by Ronal Kerbo*

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. I agree.

To properly manage, protect, interpret, conserve, and understand our cave and karst resources we need to exchange information on a wide variety of topics. Topics that range from proper construction material for cave trails, and how to clean algae from cave walls and speleothems to the standards for conducting cartographic surveys of caves, and how to implement a permit system for the use of undeveloped back-country caves.

We need to know who has the expertise to survey a cave or inventory a cave's resources. We need to know where we can find information on speleological research on the age of speleothems or the latest theories of speleogenesis in a particular area, and a multitude of other cave and karst resource management, protection, and conservation concerns.

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. It seems to me that it was at the National Cave Management Symposium in Indiana in 1995 that the subject of a newsletter to encourage and provide a vehicle for just such a forum was first discussed.

Well, 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.

Now it is up to each of you involved in cave resources management to take an active role in this exchange of information and expertise. Here is an opportunity to seek answers, ask questions, and provide a place to enhance the protection, interpretation and understanding of some of the worlds greatest caves. I look forward, with great anticipation, to future issues of the NPS cave/karst forum and newsletter.

### GEOLOGIC RESOURCES DIVISION

*by Ronal Kerbo*

Since coming to Denver in 1996 as the National Cave Management Coordinator, the most frequent comments I get are: "...but there aren't any caves in Denver!"

That is not precisely true. From Denver you can see all of the National Park Service managed caves from a very

interesting perspective, and from that perspective quite a number of things are happening. A few of them include:

The cave section of the **Unified Call** will be for FY'99. For the past two years small cave projects have been funded in the same year that the request was made. This will no longer be the case. This will get the cave projects in synchronization with the rest of the Unified Call.

Cave safety and liability will be the main agenda for a workshop being organized with Mark Rich at **Mammoth Cave**. The course will be aimed at safety officers, ranger staff, interpreters, as well as cave managers. Dates are not yet set, but the workshop will be offered in the early fall of 1998. As some of our longest caves continue to extend out from under parklands, beneath private sector as well as other federal land management agency jurisdictions, liability questions become even more complex.

An interagency agreement for cave management is being written in cooperation with BLM cave specialist Jim Goodbar in Carlsbad, New Mexico. The agreement will provide for cooperative management of cave and karst resources on BLM, USFS, USFW, and NPS administered lands. Since the passage of the Federal Cave Resources Protection Act in 1988, no effort has been made to assure cooperation among the major agencies involved in managing caves on federal lands.

As a follow-up to previous consultation with the USFS on **Papoose Cave** in Idaho, an action plan to set priorities for research needs in the cave has been passed on to the District Forester. This action plan will be adapted from an original developed by the cave resources staff at Carlsbad Caverns and the USFS national cave management specialist, Jerry Trout. Cave diving guidelines developed some years ago by the NPS for **Papoose Cave** are being looked at for possible use by the Sequoia- Kings Canyon cave specialist. **Papoose Cave** is a difficult and deep cave on the Salmon River District of the Nez Perce National Forest in Idaho.

There has been recent correspondence with the Slovak Caves Administration (SCA) in Mikulas, Slovakia after a telephone conference with Paval Bella and Peter Gazik of the SCA. The EPA KANSAS City, KA office, arranged the tele-conference during a visit to the U.S. by the two SCA employees. The SCA has interest in our cave management programs in both developed and undeveloped caves. They are particularly interested in legislation that protects caves, cave microclimate monitoring and protection and management of World Heritage site caves.

A workshop focused on a review of, and final draft of, the NPS National Cave and Karst Guidelines and Handbook (from the current NPS-77 Cave Management section) will be held in the fall of '98. A number of people have been working on the draft revisions, and Jane Harvey of the Intermountain Region (in Santa Fe, New Mexico) will edit the final product.

Mike Yocum, of the Cave Research Foundation has requested a meeting to continue his work on National Survey Standards. The meeting will be held at Mammoth Cave National Park.

Two cave World Heritage Site nominations are being reviewed at the request of the IUCN, (the World Conservation Union). The cave sites are in Slovak Republic and in Uruguay. There are currently nine World Heritage sites with significant speleological and karst features around the world. Two of the sites are in the U.S., Mammoth Cave National Park and Carlsbad Caverns National Park.

An interagency workshop from May 19-21 will be hosted in Denver. The workshop will be for agency national cave coordinators. The workshop will focus on the development of the final version of the Interagency Agreement for cave and karst management, national cave cartographic survey standards, safety standards, the National Cave and Karst Research Institute, and the need for national cave and karst protection and conservation standards.

The fracture system at Wupatki National Monument in Arizona will be mapped during a new project starting later this month. The fracture system in the Monument contains segments of some of the deepest vertical descents in the Service. One of the so called "earth cracks" has a single vertical drop of 500 feet, making it one of the longest rappels in any cave system in the NPS. The earth crack and "**blow holes**" in the Monument are significant as cultural and natural features.

Based on a program at Denali National Park, we are examining ways to recognize members of the caving/speleological community who provide exemplary service in NPS cave areas. In cooperation with Pigeon Mountain Industries (PMI)-Petzl (a company that provides rope and caving gear), a program to provide pins and/or plaques to those in the caving community who survey, assist with cave protection, conservation and/or SAR events will be recognized and rewarded for their many contributions. Details of the program are yet to be worked out with PMI-Petzl and the cave parks. If anyone has any suggestions and/or would like to see the program that will be used at Denali, please let me know.

## CAVE PARK UPDATES

### Carlsbad Caverns National Park (CAVE)

*by Dale Pate*

Development of **Carlsbad Cavern** began in the 1920's with buildings, parking lots, sewer lines, gas tanks, and other man-made structures being built directly over the cave. This continued into the 60's with the building of 12 3-bedroom apartments during Project 66, an effort to

update park housing across the country. A study to look at infiltration routes and contaminants was initiated in 1995 with a contract to the Colorado School of Mines. This study was recently completed. A Master's thesis by Mark Brooke defined major water routes and identified some contaminants that are dripping into the cave. A final report outlined major contaminants and worse-case scenarios for catastrophic events (such as a fire in the Maintenance Yard) and their possible effects on **Carlsbad Cavern**. Also included in the final report were recommendations to eliminate or mitigate these events. Park Management is in the process of evaluating these recommendations and establishing short-term and long-term goals to help protect the Caverns for the future. These goals and a timetable will be included in a future issue.

Oil and Gas drilling north of the park continues to be an issue. Moncrief, a company with leases within the Cave Protection Zone (CPZ) established by the Lechuguilla Cave Protection Act of 1993, recently submitted Applications for Permits to Drill (APD's) to the Bureau of Land Management (BLM) on these leases. These leases are located as close to **Carlsbad Cavern** as they are to **Lechuguilla Cave**. Moncrief has several wells that were drilled before the establishment of the CPZ in this area that are major gas producers. The National Park Service is working with the BLM and the Department of the Interior to assure that no more drilling within the CPZ takes place and that Moncrief is compensated fairly for any "takings" that may occur.

Research in park caves continues to be on the forefront of cave science. Victor Polyak recently released information from his dissertation that establishes ages on the formation of caves of the Guadalupe Mountains including **Carlsbad Cavern** and **Lechuguilla Cave**. Victor has been able to achieve this by radioisotopic dating of the mineral **alunite** which is formed as a by-product of speleogenesis. In **Carlsbad Cavern**, the following 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. **Cottonwood Cave** and **Virgin Cave**, located higher in elevation in Lincoln National Forest yielded dates of 11.3 to 12.3 myo.

Exploration and survey of **Lechuguilla Cave** continues. The most recent expedition led by Pat Kambesis and Rod Horrocks added approximately 8,000 feet of new survey. This all came from the Chandelier Maze area of the Southwest Branch. This brings the surveyed length of the cave to 96.24 miles (154.9 kilometers).

#### **Hawaii Volcanoes National Park (HAVO)** *by Bobby Camara*

The last three months have been amazingly productive here. Some of the highlights are as follows:

Work is progressing on an update of our Cave Management Plan, with great input from Ron Kerbo. We hope to have a draft available by early summer.

Because of the great workshop we had at CAVE a year ago, HAVO naturalist turned cave resources specialist Bobby Camara finally understood the need for standardized sketching and inventory protocols. We've adopted, though not quite officially, a modified version of CAVE's standards, which we're fine tuning for work in lava tubes.

HAVO has hosted more than 20 volunteer cavers since mid December 1997. The largest group was led by Pat Kambesis and Don Coons, and worked in the Park off and on for a month or so. There were great conversations, exchanges of information, and thoughtful discussions of how and why we're doing what we're doing. I led two 3-hour orientation sessions which were helpful in getting the cavers to understand the special resources of HAVO caves, as well as our way of doing business. We've embarked on a remapping and inventorying project of all Park caves. The majority of field work will take place in the winter (Nov - Feb).

Greg Stock and Steve Bumgardner from SEKI will leave on 26 March, after two months in the Park. They've been incredibly productive and enthusiastic, cleaning up loose ends from previous projects, working with myself and Park archeologists on a couple of special caves, and taking lots of photos. Greg, Steve, and I also spent a few days working with Bernie Szukalski from ESRI (the ArcView folks) on fine tuning a Compass to ArcView converter written by Bernie. It's a fantastic tool with seemingly unlimited potential, which I'm sure will be useful to lots of others. Bernie deserves a lot of thanks for all his (free) help here.

A number of us finally got up the nerve to get into **Highcastle Tube**, just cool enough to allow entry, after being created 3 years or so ago. Lots of incredible primary and secondary features in there; enough to keep us busy for a long time, trying to figure out how and why. Stay tuned...

I'll be at the NSS Convention in August, last I heard, keynoting a special half day "Hawaii" session, as well as presenting a couple of papers. I'm also hoping to have a "Guide to Cave Resources of HAVO" ready by then, which will be a discussion of the archeological, biological, and geological resources of Park caves, as well as "why we do it the way we do it at HAVO".

#### **Jewel Cave National Monument (JECA)** *by Mike Wiles*

**Jewel Cave** has begun its first efforts in underground camping to facilitate exploration. In June 1997 we conducted a trial camping trip to test the feasibility of such activities. **Jewel Cave** has a policy of removing all human

waste, and we were concerned that the resultant pack size would slow travel time unacceptably, especially through the extensive crawls called the Miseries and the Mini-Miseries. However, this trip was as productive as a normal, one-day trip and showed us that camping was indeed feasible.

By November the Monument had established a permanent camp site, five quick hours (about five miles) into the cave and about half an hour from the previously known end of the cave. With camp packs (typically a 15-pound TAG pack), the trip takes only an hour longer. The nearby water supply is the only one for miles -- a site dripping 20-30 drops a minute; water drips into a plastic tarp and is funnelled into a series of five-gallon collapsible containers. The camp area is an almost-flat, sloping slab covered with polyethylene tarps. Three Trangia stoves serve a maximum of six people. The park supplies sleeping gear, dessicant and stoves -- which remain in the cave -- and the cavers bring liners to keep the sleeping bags clean.

Six people participated in the November trip, with two teams mapping and inventorying 9,800 feet over four days. In February, a four-person team documented 4,000 feet on another four-day trip. The campsite is also used for shorter trips, such as one for checking pits. The major benefit is to allow cavers to return to the surface only six hours after a night's rest, rather than after 20 hours of continuous caving.

Even with the restrictions of waste removal and pack size (because of the Miseries), underground camping has proved to be a worthwhile effort. It ensures the ability to continue exploration in a large cave system, allows cavers to do better work, and provides an extra measure of safety.

### **Mammoth Cave National Park (MACA)**

*by Vickie Carson*

Going Batty: Dr. Merlin Tuttle of Bat Conservation International wrote in the winter 1997 issue of Bats magazine how Mammoth Cave NP staff are working to restore bat hibernaculum within the cave. In 1996, Tuttle, with other experts, determined that Mammoth Cave's main tour routes "...had been used by 9-13 million gray or Indiana bats. The entire system easily could have supported more than twice that number, making Mammoth Cave by far the world's most important bat hibernation site of the past...This once vast population was lost so long ago, with so little notice, that by the time Mammoth Cave National Park was founded in 1941, no one even remembered..." Park staff are 'naturalizing' air flow at the Historic Entrance in an attempt to return cave passageways to conditions that are both compatible with bat hibernation and continued public use.

### **Oregon Caves National Monument (ORCA)**

*by John Roth*

During the last year, the staff at Oregon Caves National Monument has been working on a \$35,000 grant from Canon Corporation to develop a CD-ROM and webpage on cave data from Hawaii and North America north of Mexico. About 2,000 pages of material have been developed so far, including cave faunas and folklore, bibliographies, lesson plans, teachers' guides, cave RM and I&M generic plans, cave biology and geology summaries, info on NPS caves and lists of equipment and addresses. Any further additions to this material would be welcomed. Contractual work with many of the major cave taxonomists in the US and Canada is yielding revised taxon and state lists for the most important cave states and cave-associated groups of animals. The next phase will be to acquire photographs and drawings of many of the major cave features for use in an illustrated geo-glossary.

A review of G1 cave species (globally known from five sites or less) revealed that NPS and other federal caves as well as many privately owned commercial caves are major repositories of such species. **Oregon Caves** currently leads the pack with 9 species known only from a single cave, followed by **Samwell** (USFS), **Malheur**, **Carlsbad** and **Mammoth**. Oregon Caves will most likely lose its lead as some of the species (most undescribed) appear to be **trogloxenes**. Tracking of G1 cave species by USFWS or state natural heritage programs averages 26%, a much higher percentage than what was tracked ten years ago.

The focus in **Oregon Caves** during the last year has been paleontology. Hundreds of claw marks and some paw prints indicate that a remote part of the main cave was used as a hibernaculum during the Pleistocene. Renovation of the last part of the cave trail revealed in-situ bones of Ice Age black bear under a thick layer of flowstone. The trail was routed around the bones and a permanent exhibit is being developed to showcase the bones to cave visitors. Excavations by Dr. Mead and associates from Northern Arizona University has uncovered one grizzly, two black bears, a jaguar, a bobcat, many bats, and part of a mountain beaver. There are only two other caves known to have bones of mountain beavers, the most ancestral of all surviving rodents.

### **Sequoia and Kings Canyon National Parks (SEKI)**

*by Joel Despain*

It is the winter office season for the cave management program at Sequoia and Kings Canyon National Parks, California. The primary objective of the last few months was the drafting of a series of maps documenting **Crystal Cave**. **Crystal Cave** is the second longest cave in the park at 2.94 miles in length. It is also the only commercial cave in the either of the two parks. Previous mapping efforts in the 1950s documented only about 4,000 feet of passage, and failed to include floor detail and mineralogical information. Another mapping effort in 1991 failed to produce any maps, though most of the cave was surveyed. The latest survey project began in 1995 and mapping continued through 1996. The final data was processed in

*Compass* and from there lineplot files were imported into *CorelDraw* for drafting. A series of three maps, that are most similar to traditional cave maps, were used to document the mineralogy of the cave. This mineralogy includes hydrothermally emplaced quartz and pyrite, perhaps a unique type of raft cone, and at least 88 shields. Three additional maps show overall cross-sections for the caves and profile views. Another map documents the cave's levels by representing the cave passages as solid fills with different colors representing different elevations. Other maps show the cave's groundwater hydrology, and the survey history of this most recent effort. A final completed map will be sold by the Park's cooperating association at **Crystal Cave**. Proceeds from the sale will benefit the park cave management program. This map includes photos, educational text blocks, and will not show any sensitive or unusual features. The current suite of maps is being reviewed for accuracy, consistency, and content by Rodney Horrocks from Timpanogos Cave National Monument and Great Basin National Park, and by Mike Futrell from Ohio, and Sequoia seasonal cave specialist, Greg Stock. Future maps will incorporate a GIS style database to document current knowledge about the caves' unique biology, which includes at least five endemic species of invertebrates. Other planned maps will show the exploration history of the cave and document the limited habitat of the *Pimosa sp.* spider that is believed to be unique to the cave. A final set of maps will be created specifically for in-cave inventory work.

Other winter projects have included a site visit to a new California state park, Grey Whale Ranch Park, near Santa Cruz. This is only the second California state park to have caves in carbonate rock. The cave entrances are literally across the street from the UC Santa Cruz dorms. Can you say "party caves". This widespread illicit use has meant that state park employees want to build strong gates to protect the mineralogical and hydrological features of the caves as well as a number of endemic species.

An article for a new park children's newspaper was completed last month. The article features facts about park caves, information on "cave specialist" as an occupation, and a conservation message. The article will be accompanied by photos of kids in Park caves.

Other winter projects have included the monitoring of the reinstalled **Clough Cave** gate, which has been vandalized at least six times, ridgewalking which turned up two small new caves bringing the park total to 198 and mapping in **Soldier's Cave**.

### **Timpanogos Cave National Monument (TICA) & Great Basin National Park (GRBA)**

*by Rodney D. Horrocks*

In the fall of 1996, Timpanogos Cave National Monument and Great Basin National Park created a shared Cave Management Specialist position. Rod Horrocks filled that

position during 1997 and was kept busy running both cave management programs, supervising four seasonal assistants and managing 55 volunteers. He spent two weeks of each month at each park.

### **TIMPANOGOS CAVE**

- Designed light placement for some new low-voltage lights in the Organ Pipe Room and then for numerous additional lights throughout the rest of the caves. This new system has nearly eradicated the once prevalent algae from the caves and uses 1/3 of the electricity of the old system. It has also reduced vandalism and minimized impact to the cave from routine maintenance procedures. This marks the completion of a two-year effort to install the new system in the caves.
- Completed the Artificial Fill Removal project in the Organ Pipe Room of **Hansen Cave**. During the project, 207 tons of tunnel blasting debris were removed from the room and numerous historical artifacts were found.
- Installed a new 30-foot long stainless-steel catwalk across the six-foot deep hole created by the Fill Removal project.
- Removed the two 2,500-gallon redwood storage tanks from the Tank Room in **Hansen Cave**.
- Removed the 500-gallon chlorinator tank from the Organ Pipe Room in **Hansen Cave**. This prepares the way for some new Caving Introduction Tours to begin in the wild section of **Hansen Cave** next spring. Currently, we are planning a few stainless steel ladders and the logistics for these special tours.
- Dismantled the old lighting system by removing wires, light fixtures and cement light shields from throughout the caves.
- Installed a tarp below the floor grating of the new catwalk to catch debris tracked into the cave by visitors.

### **GREAT BASIN**

- Met with representatives from several Native American tribes to decide how to re-enter into the cave the skeletal remains of 21 individuals archaeologically excavated from **Lehman Caves** in 1964.
- Finished a draft of the Cave Management Plan.
- Wrote an EA and designed and completed compliance work for nine additional bat gates on wild caves in the park.
- Installed 30 brass monuments at the entrances of all the known caves in the park. GPS located those monuments and completed inventories of the entrance zones of each cave.
- Completed a year-long bat survey (visual and mist

netting) for all the wild caves in the park. Roosting sites, species, and entrance and exits times were determined.

- Installed a bat gate on the natural entrance of **Lehman Caves**.
- Surveyed and inventoried 9,200 feet of passage in **Lehman Caves**.
- Surveyed and inventoried 1,050 feet of passage in **Little Muddy Cave**.
- Ridgewalked 1,200 acres of the park and discovered two new caves and five new rockshelters, bringing the total cave count to 28 caves and 13 rockshelters for the park.

### **Wind Cave National Park (WICA)**

*by Jim Nepstad*

Cave Management staff at Wind Cave continue to sample water from several cave locations for traces of fluorescent dyes injected in July of 1996. In December 1997, two new sites were discovered to be positive for one of the dyes. This illustrates the importance of long-term monitoring when tracing dyes to drip or pools in an underlying cave. A total of fifteen sites have received at least one of the dyes to date. At some sites, the dye arrived within six hours of injection; other sites took much longer to go positive. In all cases, the dye persists in the incoming drips for well over one year. At least at some locations above **Wind Cave**, a serious hazardous material spill could impact the cave for years after the actual event. Park staff are busily trying to secure funding to redesign the parking lot to prevent such an occurrence.

Major construction projects are scheduled to begin at Wind Cave during the next year. The cave elevator equipment will be completely replaced during next fall and winter. This will force the park to close the cave to tours beginning in October 1998 and running through March 1999. The current elevator equipment is very old and has become almost impossible to maintain. The new equipment will provide a welcome relief to all park divisions.

Also beginning in the fall of 1998, the replacement of all park utility lines will begin. In addition to replacing the park's ancient water lines, every foot of the park's 8,000 feet of aging sewer lines will be replaced with modern dual-contained HDPE lines. The primary line of this extraordinarily strong material will be surrounded by a secondary line, which will capture and contain any leaks that may arise in the primary line. Visual inspection ports will be built into the system, allowing the park to quickly and easily monitor for leaks. Sewer systems tend to be replaced only after they fail and begin to leak. This is mainly due to their "out of sight, out of mind" nature, and to the difficulty of inspecting them. This is unacceptable

when a world-class cave lies directly below the lines. The new system at Wind Cave will eliminate these problems.

We have also spent this winter slowly and carefully removing the light system from the cave's **Candlelight Tour** area. The lights distracted from the otherwise fairly primitive nature of the area, but past park staff always seemed to justify having them. Once we received permission to perform the work, we decided to do it in such a way as to make it very difficult to restore. This has involved removing not just the light fixtures, but the transformers and power lines, too. Cutting lines, some of which carry as much as 2,300 volts, proved to be a nerve-racking experience. The end result, however, should be a tour route much more faithful to the 1890's era the tour interpreters.

### **STRATIGRAPHY OF CAVE-FILL DEPOSITS AND SPELEOTHEM DATING FROM CRYSTAL CAVE, SEQUOIA NATIONAL PARK, CA**

*by Greg Stock and Joel Despain*

Caves have long been recognized as valuable recorders of climate and surface processes because they can preserve fill deposits. Organic debris, pollen, bones, speleothems and fluvial sediment deposits are often well preserved in cave passages, and can provide valuable information both on the nature and timing of cave development and on the conditions of the surface area outside during the time of deposition.

Since most cave passages in limestone or marble bedrock form at or below the water table, these fill deposits may also yield insight as to base-level lowering rates, since most fill material is deposited after the cave passage has drained of its solutional groundwater. In caves with multiple levels, a comprehensive study of the fill stratigraphy will often allow the calculation of a base-level lowering rate (i.e. downcutting rate), which in turn provides information on local uplift rates. However, determining absolute ages of the fill material is necessary for this type of calculation.

**Crystal Cave**, a commercial cave in Sequoia National Park, is an ideal cave for such a study, in that it has several distinct levels over a vertical range of approximately 60 meters, and has abundant fill material throughout, mainly in the form of clastic fluvial sediments and flowstone deposits. A detailed study of this stratigraphy is already underway, but without absolute dates for certain deposits to fix the stratigraphy in time this information would yield no valuable insights. Thus, dating certain deposits within **Crystal Cave** became desirable. Given the nature of the deposits within Crystal Cave, Uranium-series dating of flowstones appears to be the most practical means of determining absolute ages. It is known that Uranium isotopes decay into Thorium isotopes at a given rate, and by comparing the ratio of Uranium to Thorium in a given

sample, it is possible to determine the "time zero" (time of deposition) with a good degree of accuracy.

Funding for the speleothem dating was acquired through a grant from the Sequoia Natural History Association, which provided \$2,500, or enough money for six samples. Speleothems were sampled in October 1997 on a single day outing. Small stalagmites, which are common in these caves, were our first choice as samples and we used five of these for the study. A sixth sample was flowstone. Stalagmites are preferable to stalactites for dating because they are less likely to have been saturated after initial deposition and thus re-crystallized, resetting the Uranium – series clock. These samples are currently being dated at a laboratory in Canada.

A seventh stalagmite from the Sugar Cookie Passage had been tested in 1988 with results released in an unpublished paper by J. Tinsley and B. Szabo. This sample, from an area 13 meters above base level, yielded a date of 10,000 years before present and an error calculation of plus or minus 3,000 years.

If sufficient absolute ages of cave fills are determined from this latest set of samples, much information will be gained. First, we will get some feeling for the age of **Crystal Cave**, which is a commonly asked question for both the Park visitor and the Park interpreter. Second, we will be able to use the cave fill stratigraphy to determine a local base-level lowering rate for Cascade Creek (i.e. how fast Cascade Creek is eroding its channel). Finally, we will be able to use this information to make inferences about regional Sierra Nevada geology, including local tectonic uplift rate and the nature and timing of glacial cycles.

This effort is primarily a research project for Sequoia and Kings Canyon National Parks. However Greg Stock will use the study to fulfill the requirements for a Bachelor of Science degree from Humboldt State University.

### **CARLSBAD CAVERN RESURVEY 22.05 MILES AND "STILL GOING"**

*by Jason M. Richards*

Through the years, Carlsbad cavern has had an ongoing mapping project. In the 1960's and early 1970's, the Guadalupe Cave Survey (GCS) was the primary group surveying in Carlsbad Cavern. The "old timers" of the GCS were the forerunners and trailblazers to much of the cave we know today. Cave surveying at that time was in it's infancy and much of the detail we require on today's maps was not included in their notes, or on their sketches. The GCS joined ranks with the Cave Research Foundation (CRF) in the early 70's and surveys improved, however, there was still a lack of set survey standards. Up until the early 90's much of the survey in Carlsbad Cavern was resurvey. There were resurveys over resurveys, floor detail on sketches was omitted, there were no running profiles and very few cross sections. Survey designation numbers were totally out of control, with some designations having as much as nine characters. Foresites on azimuths were not verified by backsites and therefore

inaccurate loop closures were common. Although not required at that time, there was no inventory of mineralogical, historic, or archeological features tied in to the survey. The impact to the cave was tremendous by resurveying the same areas over and over.

Taking on the monumental task of resurveying a 30 plus mile cave was not a spur of the moment decision. Careful planning by the cave resource staff and those who would actually be involved in the resurvey were the first steps. Cave specialists met with CRF officials and agreed upon a game plan. It was determined that:

1. All original survey notes will stay with the park and eventually be archived into the museum.
2. The cave resource office will give out survey designations for all areas of the cave.
3. Survey designations will be short and concise and not change as side passages are encountered. An example is as follows: A1 to A2 and continuing to A100 and beyond. Sketchers may not change alphabetical designations without advance permission.
4. The cave will be divided into sections to make data management easier.
5. No single group will have exclusive access to the cave for survey/exploration purposes.
6. All groups must strictly comply with Appendix H: Cave Survey Standards for Carlsbad Caverns National Park, part of Carlsbad Caverns National Park's Cave & Karst Management Plan.
7. All sketchers must be approved by the cave specialist before they will be allowed to sketch in any caves of the park.

To date, the resurvey project of Carlsbad Cavern has been a total success. CRF, as well as private expeditions, have been working hard and bringing back quality data and sketches. Prior to the resurvey project, the old map stood at 30.85 miles of passage. Thus far over a two year period, the new map of Carlsbad Cavern is 22.10 miles of mapped passage....and still going.

### **REGULATIONS, LEGISLATION, AND POLICY RELATED TO NATIONAL PARK SERVICE CAVE RESOURCES MANAGEMENT**

*compiled by Ronal Kerbo*

The following is an annotated list of cave management regulation, policies, and legislation applicable to the management, conservation, and protection of cave resources. Unfortunately most of the following is applicable specifically to the hollow portions of karst and do not offer much in the way of managing and protecting karst terrain.

## NPS POLICY AND CAVE RESOURCES MANAGEMENT OBJECTIVES

The National Park Service's *Natural Resources Management Guideline* (NPS-77) provides basic guidance for cave resources management and protection within the NPS system. (Paleontological resources are included within NPS-77 coverage). NPS-28, the *Cultural Resource Management Guideline*, provides general guidance for cultural resources, including those in caves. NPS-14, the *Cave Radiation Safety and Occupational Health Guideline*, describes procedures to be followed by parks to protect visitors and employees

The *NPS Management Policies* (1988) state that caves will be managed to perpetuate their atmospheric, geologic, biological, ecological, and cultural resources in accordance with approved cave management plans....Natural drainage patterns, air flows, and plant and animal communities will be protected (4:20).

## LEGISLATIVE MANDATES / REGULATORY REQUIREMENTS

National Park Service (NPS) authority for the management of natural, cultural, and paleontological resources in caves comes from three basic laws: the 1916 NPS Organic Act (PL 64-235), the General Authorities Act of 1970 and its 1978 revision (PL 91-383 and PL 94-458), and the Federal Cave Resources Protection Act of 1988 (FCRPA, PL 100-691). This act recognizes that significant caves are an invaluable and irreplaceable part of our natural heritage, and that caves may be threatened by improper use and increased recreational demand. The purpose of the act is to secure and protect significant caves on federal land for the benefit and enjoyment of all people while fostering increased cooperation and information exchange among those who use caves for scientific, educational, or recreational purposes. The FCRPA also specifically addresses confidentiality of information regarding the nature and location of caves to ensure their protection.

Cultural resources within the caves are generally within the scope of the National Historic Preservation Act of 1966 (PL 89-665) and the Archeological Resources Protection Act of 1974 (PL 93-291). The 1906 Antiquities Act (PL 59-209) provides for the protection of historic, prehistoric, and scientific features (including paleontological resources). The management of some caves may also be regulated by the provisions of the Wilderness Act (PL 88-577).

## LAWS, REGULATIONS, AND POLICIES

PL 59-209, The 1906 Antiquities Act

PL 64-235, NPS Organic Act

PL 89-665, The National Historic Preservation Act of 1966

PL 91-383 and PL 94-458, General Authorities Act as amended

PL 93-291, Archeological Resources Protection Act of 1974

PL 100-691, Federal Cave Resources Protection Act of 1988

36 CFR Chapter 1, Section 1.6 *Permits*.

36 CFR Chapter 1, Section 2.1 *Preservation of natural, cultural and archeological resources*

36 CFR Chapter 2.21 (B) *Smoking*

36 CFR Chapter 1, Section 2.5 *Research Specimens*

## AN UPDATE ON THE NATIONAL CAVE & KARST RESEARCH INSTITUTE

*by Ronal Kerbo*

On November 15, 1990, Public Law 101-578 directed the National Park Service to study the feasibility of establishing a Cave Research Institute. A study was completed and transmitted to Congress in December of 1994. This study summary indicated that a Cave Research Institute could be sited near Carlsbad Caverns National Park in New Mexico and that the Institute should be administered by the NPS in a manner similar to the then existing Cooperative Park Study Units program, affiliated with a University.

During the last nine years since the introduction of the original legislation to conduct the feasibility study, several things have taken place: (1) The title of the Institute has changed to include the word "Karst" (2) The NPS Geologic Resources Division (GRD) has come into existence as a part of the Natural Resources Program Center (3) A position to coordinate service-wide NPS cave management has been established in GRD (4) The USFS has established a National Cave Management Coordinator position in Tucson, Arizona (5) S.231, a bill to establish the Institute was introduced in the Senate and (6) On February 5, 1998 there was a hearing on H.R. 2098, to establish a National Cave & Karst Institute in the State of New Mexico.

S.231 and H.R. 2098 would establish a National Cave & Karst Research Institute for the purpose of furthering the science of speleology, encouraging public education in the field, and promoting and developing environmentally sound and sustainable resource management practices. The Institute would be located near but not in Carlsbad Caverns National Park. Both Democratic and Republican members of the New Mexico congressional delegations are supportive of the legislation to establish the Institute.

The Carlsbad, New Mexico Department of Development has convened a panel to solicit input, funding, and cooperation from State and private sector individuals and institutions. There has been press coverage in both local and state newspapers in New Mexico with some television news coverage. All coverage has been positive.

Testimony for H.R. 2098, delivered by Michael G. Soukup, Associate Director for Natural Resources on February 5, 1998 supported the legislation, but pointed out



that "...funding has not been requested in the Administration's budget request." In testimony for S.231, delivered by Katherine H. Stevenson on May 21, 1997, the NPS supported this legislation as follows: "...funding has not been requested in the Administration's budget request. For the Institute to become a reality, additional funding would need to be provided by Congress for the NPS share..."

For the Institute to become a reality, we need two things: (1) funding by Congress for the NPS share and (2) public or private partners must match the federal appropriations.

Management and operation of the Institute would be based on a partnership between the National Park Service and a public or private agency selected by the Secretary.

The following individuals and/or groups have been most involved in the Institute considerations: National Park Service: Carlsbad Caverns National Park (Frank Deckert – Superintendent), Geologic Resources Division (Ronald Kerbo, Denver; Lindsay McClelland, Washington, D.C.); New Mexico State University: Marsha Conley, Dir. Of Operations, Carlsbad Environmental Monitoring and Research Center; Carlsbad Department of Development.

**A MESSAGE FROM THE EDITOR  
DALE L. PATE**

*The National Cave Management Coordinator, Ronald Kerbo, is proud to present this first issue of **Inside Earth**. Our goal is to produce this newsletter on a quarterly basis as a forum for information and idea exchanges between National Park Service units that contain caves. On a national level, this will also serve as an excellent historical overview of cave management in the NPS. All NPS units that contain caves are urged to submit updates and other articles concerning cave management efforts in their park. As stewards to some of the world's finest cave and karst areas, we present this newsletter as a symbol of the commitments we have made to protect and conserve our treasured underground heritage. Education of park personnel must go hand-in-hand with the education of the visiting public if we are to preserve these fragile cave and karst resources for future generations.*

# The Federal Cave Resources Protection Act of 1988

1.SEC 1. SHORT TITLE. 2.Sec. 2. FINDINGS, PURPOSES, AND POLICY. 3.Sec. 3. DEFINITIONS. 4.Sec. 4. MANAGEMENT ACTIONS. 5.Sec. 5. CONFIDENTIALITY OF INFORMATION CONCERNING NATURE AND LOCATION OF SIGNIFICANT CAVES. 6.Sec. 6. COLLECTION AND REMOVAL FROM FEDERAL CAVES. 7.Sec. 7. PROHIBITED ACTS AND CRIMINAL PENALTIES. 8.Sec. 8. CIVIL PENALTIES. 9.Sec. 9. MISCELLANEOUS PROVISIONS. 10.Sec. 10. SAVINGS PROVISIONS.

BE IT ENACTED BY THE SENATE AND THE HOUSE OF REPRESENTATIVES OF THE UNITED STATES OF AMERICA IN CONGRESS ASSEMBLED,

## **SEC. 1. SHORT TITLE.**

This Act may be referred to as the "Federal Cave Resources Protection Act of 1988"

## **SEC. 2. FINDINGS, PURPOSES, AND POLICY.**

- (a) FINDINGS.-The Congress finds and declares that-- (1) significant caves on Federal lands are an invaluable and irreplaceable part of the Nation's natural heritage; and (2) in some instances, these significant caves are threatened due to improper use, increased recreational demand, urban spread, and a lack of specific statutory protection.
- (b) PURPOSES.-The purposes of this Act are-- (1) to secure, protect, and preserve significant caves on Federal lands for the perpetual use, enjoyment, and benefit of all people; and (2) to foster increased cooperation and exchange of information between governmental authorities and those who utilize caves located on Federal lands for scientific, education, or recreational purposes.
- (c) POLICY.-It is the policy of the United States that Federal lands be managed in a manner which protects and maintains, to the extent practical, significant caves.

## **SEC. 3. DEFINITIONS.**

For purposes of this Act:

### (1) CAVE

The term "cave" means any naturally occurring void, cavity, recess, or system of interconnected passages which occurs beneath the surface of the earth or within a cliff or ledge (including any cave resource therein, but not including any vug, mine, tunnel, aqueduct, or other manmade excavation) and which is large enough to permit an individual to enter, whether or not the entrance is naturally formed or manmade. Such term shall include any natural pit, sinkhole, or other feature which is an extension of the entrance.

### (2) FEDERAL LANDS.

The term "Federal lands" means lands the fee title to which is owned by the United States and administered by the Secretary of Agriculture or the Secretary of the Interior.

### (3) INDIAN LANDS.

The term "Indian lands" means lands of Indian tribes or Indian individuals which are either held in trust by the United States for the benefit of an Indian tribe or subject to a restriction against alienation imposed by the United States.

### (4) INDIAN TRIBE.

The term "Indian tribe" means any Indian tribe, band, nation, or other organized group or community of Indians, including any Alaska Native village or regional or village corporation as defined in, or established pursuant to, the Alaska Native Claims Settlement Act (43 U.S.C. 1601 et seq.).

### (5) CAVE RESOURCE.

The term "cave resource" includes any material or substance occurring naturally in caves on Federal lands, such as animal life, plant life, paleontological deposits, sediments, minerals, speleogens, and speleothems.

### (6) SECRETARY.

The term "Secretary" means the Secretary of Agriculture or the Secretary of the Interior, as appropriate.

### (7) SPELEOTHEM.

The term "speleothem" means any natural mineral formation or deposit occurring in a cave or lava tube, including but not limited to any stalactite, stalagmite, helictite, cave flower, flowstone, concretion, drapery, rimstone, or formation of clay or mud.

### (8) SPELEOGEN.

The term "speleogen" means relief features on the walls, ceiling, and floor of any cave or lava tube which are part of the surrounding bedrock, including but not limited to anastomoses, scallops, meander niches, petromorphs and rock pendants in solution caves and similar features unique to volcanic caves

#### **Sec. 4. MANAGEMENT ACTIONS.**

- (a) REGULATIONS.-Not later than nine months after the date of the enactment of this Act, the Secretary shall issue such regulations as he deems necessary to achieve the purposes of the Act. Regulations shall include, but not be limited to, criteria for the identification of significant caves. The Secretaries shall cooperate and consult with one another in preparation of the regulations. To the extent practical regulations promulgated by the respective Secretaries should be similar.
- (b) IN GENERAL.-The secretary shall take such actions as may be necessary to further the purposes of this Act. These actions shall include (but not be limited to)-
- (1) identification of significant caves on federal lands;
    - (A) The Secretary shall prepare an initial list of significant caves for lands under his jurisdiction not later than one year after the publication of final regulations using the significance criteria defined in such regulations. Such a list shall be developed after consultation with appropriate private sector interests, including cavers.
    - (B) The initial list of significant caves shall be updated periodically, after consultation with appropriate private sector interests, including cavers. The Secretary shall prescribe by policy or regulation the requirements and process by which the initial list will be updated, including management measures to assure that caves under consideration for the list are protected during the period of consideration. Each cave recommended to the Secretary by interested groups for possible inclusion on the list of significant caves shall be considered by the Secretary according to the requirements prescribed pursuant to this paragraph and shall be added to the list if the Secretary determines that the cave meets the criteria for significance as defined by the regulations.
  - (2) regulation or restriction of use of significant caves, as appropriate;
  - (3) entering into volunteer management agreements with persons of the scientific and recreational caving community; and
  - (4) appointment of appropriate advisory committees
- (c) PLANNING AND PUBLIC PARTICIPATION.

The Secretary shall-

- (1) ensure that significant caves are considered in the preparation or implementation of any land management plan if the preparation or revision of the plan began after the enactment of this Act;
- (2) foster communication, cooperation, and exchange of information between land managers, those who utilize caves, and the public.

#### **Sec. 5. CONFIDENTIALITY OF INFORMATION CONCERNING NATURE AND LOCATION OF SIGNIFICANT CAVES.**

- (a) IN GENERAL.-Information concerning the specific location of any significant cave may not be made available to the public under section 552 of title 5, United States Code, unless the Secretary determines that disclosure of such information would further the purposes of this Act and would not create a substantial risk of harm, theft, or destruction of such cave.
- (b) EXCEPTIONS.-Notwithstanding subsection (a), the Secretary may make available information regarding significant caves upon the written request by Federal and state governmental agencies or bona fide educational and research institutions. Any such written request shall, at a minimum:
- (1) describe the specific site or area for which information is sought;
  - (2) explain the purpose for which such information is sought; and
  - (3) include assurances satisfactory to the Secretary that adequate measures are being taken to protect the confidentiality of such information and to ensure the protection of the significant cave from destruction by vandalism and unauthorized use.

#### **Sec. 6. COLLECTION AND REMOVAL FROM FEDERAL CAVES.**

- (a) PERMIT.-The Secretary is authorized to issue permits for the collection and removal of cave resources under such terms and conditions as the Secretary may impose, including the posting of bonds to insure compliance with the provisions of any permit.
- (1) Any permit issued pursuant to this section shall include information concerning the time, scope, location, and specific purpose of the proposed collection, removal or associated activity, and the manner in which such collection, removal, or associated activity is to be performed must be provided.
  - (2) The Secretary may issue a permit pursuant this subsection only if he determines that the proposed collection or removal activities are consistent with the purposes of this Act and with other applicable provisions of law.
- (b) REVOCATION OF PERMIT.-Any permit issued under this section shall be revoked by the Secretary upon a determination by the Secretary that the permittee has violated any provision of this Act, or has failed to comply with any other condition upon which the permit was issued. Any such permit shall be revoked by the Secretary upon assessment of a civil penalty against the permittee pursuant to section 8 or upon the permittee's conviction under

section 7 of this Act. The Secretary may refuse to issue a permit under this section to any person who has violated any provision of this Act or who has failed to comply with any condition of a prior permit.

- (c) TRANSFERABILITY OF PERMITS. Permits issued under this act are not transferable.
- (d) CAVE RESOURCES LOCATED ON INDIAN LANDS.-
  - (1)(A) Upon application by an Indian tribe, the Secretary is authorized to delegate to the tribe all authority of the Secretary under this section with respect to issuing and enforcing permits for the collection or removal of any cave
  - (B) In the case of any permit issued by the Secretary for the collection or removal of any cave resource, or to carry out activities associated with such collection or removal, from any cave resource located on Indian lands (other than permits issued pursuant to subparagraph (A)), the permit may be issued only after obtaining the consent of the Indian or Indian tribe owning or having jurisdiction over such lands. The permit shall include such reasonable terms and conditions as may be requested by such Indian or Indian tribe.
  - (2) If the Secretary determines that issuance of a permit pursuant to this section may result in harm to, or destruction of, any religious or cultural site, the Secretary, prior to issuing such permit, shall notify any Indian tribe which may consider the site as having significant religious or cultural importance. Such notice shall not be deemed a disclosure to the public for purposes of section 5.
  - (3) Indian lands or activities associated with such collection, by the Indian or Indian tribe owning or having jurisdiction over such lands.
- (e) EFFECT OF PERMIT.-No action specifically authorized by a permit under this section shall be treated as a violation of section 7.

### **Sec. 7. PROHIBITED ACTS AND CRIMINAL PENALTIES.**

- (a) PROHIBITED ACTS.-
  - (1) Any person who, without prior authorization from the Secretary, knowingly destroys, disturbs, defaces, mars, alters, removes or harms any significant cave or alters the free movement of any animal or plant life into or out of any significant cave located on Federal lands, or enters a significant cave with the intention of committing any act described in this paragraph shall be punished in accordance with subsection (b).
  - (2) Any person who possesses, consumes, sells, barter or exchanges, or offers for sale, barter or exchange, any cave resource from a significant cave with knowledge or reason to know that such resource was removed from a significant cave located on Federal lands shall be punished in accordance with subsection (b).
  - (3) Any person who counsels, procures, solicits, or employs any other person to violate any provisions of this subsection shall be punished in accordance with subsection (b).
  - (4) Nothing in this section shall be deemed applicable to any person who was in lawful possession of a cave resource from a significant cave prior to the date of enactment of this Act.
- (b) PUNISHMENT.-The punishment for violating any provision of subsection (a) shall be imprisonment of not more than one year or a fine in accordance with the applicable provisions of title 18 of the United States Code, or both. In the case of a second or subsequent violation, the punishment shall be imprisonment of not more than 3 years or a fine in accordance with the applicable provisions of title 18 of the United States Code, or both.

### **Sec. 8. CIVIL PENALTIES.**

- (a) ASSESSMENT.-
  - (1) The Secretary may issue an order assessing a civil penalty against any person who violates any prohibition contained in this Act, any regulation promulgated pursuant to this Act, or any permit issued under this Act. Before issuing such an order, the Secretary shall provide such person written notice and the opportunity to request a hearing on the record within 30 days. Each violation shall be a separate offense, even if such violations occurred at the same time.
  - (2) The amount of such civil penalty shall be determined by the Secretary taking into account appropriate factors, including (A) the seriousness of the violation; (B) the economic benefit (if any) resulting from the violation; (C) any history of such violations; and (D) such other matters as the Secretary deems appropriate. The maximum fine permissible under this section is \$10,000.
- (b) JUDICIAL REVIEW.- Any person aggrieved by an assessment of a civil penalty under this section may file a petition for judicial review of such assessment with the United States District Court for the District of Columbia or for the district in which the violation occurred. Such a petition shall be filed within the 30-day period beginning on the date the order assessing the civil penalty was issued.
- (c) COLLECTION.-If any person fails to pay an assessment of a civil penalty
  - (1) within 30 days after the order was issued under subsection (a), or

- (2) if the order is appealed within such 30-day period, within 10 days after the court has entered a final judgment in favor of the Secretary under subsection(b), the Secretary shall notify the Attorney General and the Attorney General shall bring a civil action in an appropriate United States district court to recover the amount of penalty assessed (plus costs, attorneys' fees, and interest at currently prevailing rates from the date the order was issued or the date of such final judgment, as the case may be). In such an action, the validity, amount, and appropriateness of such penalty shall not be subject to review.
- (d) SUBPOENAS.-The Secretary may issue subpoenas in connection with proceedings under this subsection compelling the attendance and testimony of witnesses and subpoenas duces tecum, and may request the Attorney General to bring an action to enforce any subpoena under this section. The district courts shall have jurisdiction to enforce such subpoena and impose sanctions.

### **Sec. 9. MISCELLANEOUS PROVISIONS.**

- (a) AUTHORIZATION.-There are authorized to be appropriated \$100,000 to carry out the purposes of this Act.
- (b) EFFECT ON LAND MANAGEMENT PLANS.-Nothing in this act shall require the amendment or revision of any land management plan, the preparation of which began prior to the enactment of this Act.
- (c) FUND.-Any money collected by the United States as permit fees for collection and removal of cave resources; received by the United States as a result of the forfeiture of a bond or other security by a permittee who does not comply with the requirements of such permit issued under section 7; or collected by the United States by way of civil penalties or criminal fines for violations of this Act shall be placed in a special fund in the Treasury. Such moneys shall be available for obligation or expenditure (to the extent provided for in advance in appropriation Acts) as determined by the Secretary for the improved management, benefit, repair, or restoration of significant caves located on Federal lands.
- (d) Nothing in this act shall be deemed to affect the full operation of the mining and mineral leasing laws of the United States, or otherwise affect valid existing rights.

### **Sec. 10. SAVINGS PROVISIONS.**

- (a) WATER.-Nothing in this Act shall be construed as authorizing the appropriation of water by any Federal, State, or local agency, Indian tribe, or any other entity or individual. Nor shall any provision of this Act-
  - (1) affect the rights or jurisdiction of the United States, the States, Indian tribes, or other entities over water of any river or stream or over any groundwater resource;
  - (2) alter, amend, repeal, interpret, modify, or be in conflict with any interstate compact made by the States; or
  - (3) alter or establish the respective rights of States, the United States, Indian tribes, or any person with respect to any water or water-related right.
- (b) FISH AND WILDLIFE.-Nothing in this Act shall be construed as affecting the jurisdiction or responsibilities of the States with respect to fish and wildlife.

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