



INSIDE EARTH

A Newsletter of the National Park Service Cave & Karst Programs

Vol. 5, No. 1

Late Spring 2002



Edited by Dale L. Pate

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Website Address:

<http://www2.nature.nps.gov/grd/geology/caves/newsletter.htm>

Webmaster: Jim F. Wood: jim_f_wood@nps.gov

Photo above: The Soda Straw Forest in the Guadalupe Room, Carlsbad Cavern. (NPS Photo by Dale Pate)

NATIONAL CAVE AND KARST RESEARCH INSTITUTE PROGRESS IN 2002 *by Zelda Chapman Bailey*

Key activities during the two-year interim period (2000-2002) of establishing the National Cave and Karst Research Institute (the Institute) were defining the scope of operation, designing an organizational structure, forming partnerships, finding funding sources and a physical facility, and defining

research needs. Considerable progress has been made in all these areas toward making the Institute operational.

The Institute will require about 12 employees to fully accomplish the goals, including the lead positions of Director, Science Coordinator, Education Coordinator, and Information Coordinator, and support staff under their direction. Voluntary advisory boards made up of representatives from a range of disciplines and organizations will play an important role in guiding the science and educational undertakings of the Institute. A nationwide announcement will be issued in summer 2002 to recruit the permanent Director for the Institute. The Director should report to Carlsbad early in fiscal year 2003. If additional operating funds are appropriated for 2003, additional positions will be recruited, probably including the Science Coordinator and administrative staff.

The Institute will not conduct research internally but will guide, focus, and encourage research through grants and partnerships. A primary function of the Institute will be to accumulate and organize data and information to make it accessible to investigators and for the Institute staff to use for synthesis of information on regional and national scales. The Institute will encourage focused research and studies in cave and karst systems so that a more coherent and unified body of knowledge can emerge, and will work toward accumulating funding that can be distributed to researchers through a grant program.

Partnerships with all types of cave and karst interest groups, agencies, and organizations are critical to the success of the Institute, and to create a national and international focus on

research, education, and information dissemination for better understanding and management of cave and karst resources. The Interim Director made numerous presentations at professional and special meetings to encourage dialog on formation of the Institute, and met individually with many representatives of interest groups, organizations, and agencies. More than a dozen articles or abstracts were published in venues such as *Environmental Geology*, *GSA Today*, and symposia proceedings to publicize the formation of the Institute to a wide audience. A web site (www2.nature.nps.gov/nckri) was launched to provide another avenue of communication to and from a wide range of potential partners.

The Institute received its first Federal appropriation in fiscal year 2002 to match the New Mexico State funding appropriated to New Mexico Tech (NMT) in support of the Institute. The Institute, the City of Carlsbad, and NMT are establishing a memorandum of understanding to define their partnership roles in establishing and managing the Institute. NMT is using their appropriation to create two new positions in cave and karst science: a hydrogeologist in the Bureau of Geology and Mineral Resources stationed in Carlsbad working in close association with the Institute, and a faculty position in cave and karst studies in the Department of Earth & Environmental Science in Socorro, serving as a liaison with the Institute. The Institute has begun funding a few projects, and if additional operating funds are appropriated for 2003, a formal grant process can be initiated.

The Institute, the City of Carlsbad, and NMT will constitute the founding members of the Institute's Management Advisory Board, and additional members will be added after the Board is officially chartered as a governmental advisory board. Additionally, a Science and Education Advisory Board will be chartered to review and oversee the Institute grant process. When these advisory board charters are approved, a process to solicit members will be announced in the Federal Register. The Secretary of the Interior will appoint members. A Federal Advisory Board will continue as an extension of the Federal Working Group that has been assisting the Interim Director in the initial phase of the Institute.

Temporary office space and clerical support will be provided for the Institute during initial staffing through a partnership agreement between the Institute and New Mexico State University in Carlsbad. The New Mexico State legislature has appropriated part of the funds to construct a building in Carlsbad for the Institute to occupy. The Institute, the City, and NMT are jointly working on funding and designing a building for the Institute.

A 5-year cooperative agreement has been negotiated with Western Kentucky University (WKU) so that collaborative projects can be easily initiated with any of their several departments related to cave and karst studies.

PROJECTS

The Institute currently is sponsoring and participating in some initial projects that will provide useful products and

will help publicize the existence of the Institute:

- The Institute and the Karst Waters Institute (KWI) are collaborating to produce a booklet entitled *Guidelines for Cave and Karst Management for America's Protected Lands*. Associates of KWI and staff of the National Park Service (NPS), Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (FWS), and U.S. Forest Service (USFS) are contributing written sections. The Institute and FWS provided funding for KWI to edit, publish, and distribute the booklet. The booklet, anticipated to be completed in late 2002, can be used as a handbook for resource managers to comply with the requirements of the Federal Cave Resources Protection Act, as a source of information for interpreters, and as a training resource.
- The Institute and the U.S. Geological Survey (USGS) are collaborating to produce a USGS Circular (a magazine-style publication) on the topic of cave and karst science, resource management and research needs in the Federal agencies. In addition to the Institute and USGS, sections of the report are being written by BLM, FWS, USFS, and the Environmental Protection Agency. Authors are contributing their writing time, the Interim Director is editing and compiling the publication, and USGS is funding the cost of preparation, printing, and distribution in late 2002.
- The Institute and USGS are working closely to organize a program to produce an improved national karst map and an associated web-based network of karst information. Federal and State agencies, the speleological community, and academia have repeatedly expressed the need for an accurate and detailed national karst map to better understand the distribution of soluble rocks in the United States. Maps at a variety of scales are needed to educate the public and legislators about karst issues, to provide a basis for cave and karst research, and to aid Federal, State, and local land-use managers in managing karst resources. The Institute is in a position to coordinate the united efforts of a number of groups in a program of truly national scope. USGS will compile karst maps of each state into a national map by working with the states to establish standards and consistent digital products, and will facilitate the digital compilation and production of the national karst map. The Institute will establish a web-based network of karst information that was used to build the national map.
- The Institute provided partial funding to publish a book compiled by the Denver Museum of Nature and Science, titled "Vertebrate Paleontology of Pleistocene Cave Deposits in North America."
- The Institute provided partial funding to publish a book compiled by the National Speleological Society, titled "Cave Conservation and Restoration".
- Under the cooperative agreement with WKU, a nationwide exploratory survey of DNA extracted from cave sediments will be conducted through the WKU Biotechnology Center. Caves in different climatic, geologic, and geographic settings may have diverse and variable bacterial communities; however, the natural

microbial makeup of caves is unknown and un-inventoried on a broad scale. DNA fragment profiles of bacteria in cave sediments will be determined for a general view of community diversity. Initially, 12 caves across the country on federal, state, and private land have been identified for sampling 4 times over a 1-year period. The number of caves sampled will be increased as additional funds become available. The information will be made available on the Internet to any interested research scientists.

- WKU has, over the last several years, developed a graduate program tailored to the needs and schedules of NPS cave and karst resource management staff who wish to further their educational background. Under the cooperative agreement with WKU, the Institute is supporting this program to allow more students access to the benefit of advanced education.

NOTES FROM THE NATIONAL CAVE MANAGEMENT COORDINATOR

by Ronal Kerbo

The following is a brief summary of action items on my agenda for the first four months of fiscal year 2002.

October 2001 - On Monday, October 8, I gave a presentation titled, "The Stone Wilderness: Visiting the Great Caves Areas of the World" at the REI Flagship Store in Denver. Over 40 people attended the talk about the caves of the world and the National Park System.

During the week of October 9, I gave a talk to U.S. Geological Survey (USGS) managers at USGS headquarters in Reston, Virginia. The talk focused on cave and karst resources management. About 30 USGS managers in attendance represented several national programs and disciplines. The meeting and presentations were featured in the USGS Weekly Highlights.

I attended the National Cave and Karst Management Symposium held in Tucson, Arizona on October 15-16 where I paneled a session on "Caves as Confined Spaces". Other items at the Symposium included a meeting of the National Cave & Karst Research Institute (NCKRI) Working Group and meeting with attending National Park Service (NPS) cave specialists on the status of the new cave & karst guidelines replacing the guidelines in the old NPS-77, Natural Resources Management Guidelines.

November 2001 - A draft Oregon Caves National Monument site-visit report was completed with recommendations for an off-trail cave experience and forwarded to the park Superintendent.

The first annual report on GPRA goal 1a9B cave floors was submitted to Eileen Peterson. Based on the data submitted from eight parks with a cumulative 63,710 square feet of cave floor to be restored, 66,820 sq. ft. was restored exceeding the planned goal of 14,500 square feet of cave floor.

December 2001 - I accompanied Zelda Bailey, Interim Director of the NCKRI, on a trip to meet with private cave owners in Branson, Missouri (Marvel Cave and Talking Rocks Cavern) and the Ozark Underground Laboratory (Tumbling Creek Cave) in Protom, Missouri. In Branson we met with Jim, Bruce, and Jack Herschend of Silver Dollar City Enterprises, owners of Marvel Cave and Talking Rock Caverns, to discuss NCKRI funding issues. Another agenda item included how the NCKRI could provide support to the private sector. At the Ozark Underground Laboratory (OUL) we met with Director Tom Aley and Chief Scientist Phillip Moss on the application of cave science to protect endangered species and ways that the NCKRI and OUL could cooperate.

A meeting was held in the USGS offices in Reston on December 13, 2001, to discuss the long-term approach to national karst mapping. This meeting was a result of the karst mapping session at the National Speleological Society (NSS) Convention in July 2001. Participants were: NPS-Zelda Bailey, Ron Kerbo, Lindsay McClelland; Kentucky Geological Survey-Jim Currens; USGS-Jack Epstein, Randall Orndorff, David Weary; Karst Waters Institute (KWI)-Bill Jones, (President); National Speleological Society-George Veni (also representing George Veni and Associates), Bet White, Will White (also representing Pennsylvania State University and KWI); Environmental Systems Research Institute, Inc. (ESRI)-Bernie Szukalski.

I attended the winter technical meeting of the Southwest Region of the NSS where I presented a talk on the NPS national cave program and the NCKRI. Met with John Lujan, Superintendent of El Malpais National Monument and provided input for upcoming cave surveys.

January 2002 - I attended a meeting with Dr. Jack Hess of the Geologic Society of America in Boulder, Colorado. In the meeting, discussions focused on the NPS cave programs, the NCKRI, the NPS Geologist-In-Parks program and arranged for Dr. Hess to meet with employees of the Geologic Resources Division at a later date.

I attended a meeting in Lakewood, Colorado with Dr. Chris Groves of Western Kentucky University about the joint Masters program for NPS employees and the NCKRI.

I wrote an article for 2001 Natural Resources Year in Review about the IMAX film *Journey Into Amazing Caves* and the book *Caves: Exploring Hidden Realms*. The book and film follow two experienced cavers, Hazel Barton and Nancy Aulenbach, as they explore caves in Iceland, Mexico, and Grand Canyon National Park. The National Park Service has been involved with the production of the film and book since their inception. Dr. Hazel Barton has been very active in the survey and exploration of Wind Cave in Wind Cave National Park. The foreword for the book was written by NPS Cave Specialist Ron Kerbo, who also presented a series of talks for the premiere of the IMAX film on March 8, and 9, 2001, at the Duluth, Minnesota, Omnimax Theater.

PARK UPDATES

CARLSBAD CAVERNS NATIONAL PARK

by Dale L. Pate

CAVE RESEARCH FOUNDATION (CRF) - Led by Area Manager, Barbe Barker, CRF members donated over 1200 hours to the park in 2001. Many of these volunteer hours have been spent in Carlsbad Cavern on restoration, survey, inventory and exploration efforts in Carlsbad Cavern. Over many years CRF members have volunteered tens of thousands of hours helping document, restore and conserve caves of the park. Working mostly on holiday weekends, during a weeklong restoration camp in the summer, and occasionally other weekends, CRF continues to work in the park in 2002.

This past Memorial Day Weekend saw Brian Alger, Barbe Barker, Sonya Boyd, Tim Boyd, Frank Everitt, Kevin Justus, Tim Kohtz Lois Lyles, Pam Massey, Greg McCarty, Jennie McDonough, William Payne, Georganne Payne, Karen Perry, Damon Worrell, and Jimmie Worrell restoring flowstone areas in Lower Cave and the Dome Room, surveying in Left-Hand Tunnel and doing an inventory of features in Secondary Stream Passage.

All photos are NPS Photos by Dale Pate.



From top to bottom: Frank Everitt, Sonya Boyd and Barbe Barker clean flowstone around the new walkways in Lower Cave during the Memorial Day Weekend, 2002.

If you see any CRF members that have worked at Carlsbad Cavern, tell them thanks. They have done a great job with one of the world's most spectacular caves.



Lois Lyles and Tim Boyd inventory mineral features in Secondary Stream Passage over the Memorial Day Weekend, 2002.

SLAUGHTER CANYON CAVE RESEARCH - **Victor Polyak and Yemane Asmeron** from the University of New Mexico have an ongoing study to reconstruct the paleoclimate record for the Holocene and late Pleistocene for the Southwest from previously broken speleothems. A broken piece of the flowstone cap recovered from the guano trench area of Slaughter Canyon Cave yielded a date of 210,000 years old. This indicates that the guano below the flowstone cap is older than 210,000 years. A recovered piece of broken drapery from the cave was dated as being older than 450,000 years old.

Gary Morgan from the New Mexico Museum of Natural History recently excavated two areas in Slaughter Canyon Cave, obtaining literally thousands of bat bones from the extinct bat *Tadarida constantinei*. This species is only known from deposits in Slaughter Canyon Cave. Dr. Morgan will reevaluate the taxonomic status of this species, if possible determine the age of the guano deposits and how the deposit formed. Bones of other animals were also recovered from one of the excavation sites. This included bones of a turtle or tortoise and possibly bones of an antelope.



Excavation begins: From left to right: Glenda Dawson, Gary Morgan, Carol Belski and Patty Dawes.



Rick Toomey and Gary Morgan plan out the excavation on an exposed face in a trench left over from the guano mining days.

NEW CARLSBAD CAVERNS NP POSTCARD - On June 7, 2002 at the entrance to Carlsbad Cavern, the U.S. Postal Service held a First Day of Issue ceremony for a new postcard honoring Carlsbad Caverns National Park. Gale Norton, Secretary of the Interior, was on hand for the ceremony.



The new postcard released by the U.S. Postal Service on June 7, 2002.



Dignitaries unveil the new postcard during a ceremony at the entrance to Carlsbad Cavern. From left to right: Mick Holm, Gale Norton, Eric Martinez, and Jay Jenkins.

While at the park, Secretary Norton, her husband John Hughes and a staff member, Reid Schuster, took the time to view the Big Room and go on off-trail trips to the Hall of the White Giant and Lower Cave.



Secretary Norton easily negotiates Matlock's Pinch in route from the Hall of the White Giant back to the paved trail in Carlsbad Cavern.

LOWER CAVE WALKWAYS COMPLETED - The Lower Cave walkways project has been successfully completed. Designed to keep visitor and employee's feet out of wet areas, numerous sections of walkways spanning a total length of over 100 feet have been installed. Leader for the project was Jason Richards.



Jimmy Worrell inspects Lower Cave walkways.

ADIOS TO JASON RICHARDS - Jason recently accepted a transfer to the Stewardship Education & Visitor Services Division at Carlsbad Cavern. Recent accomplishments in Jason's 10-year stint in the Cave Resources Office include the replacement of the Lechuguilla Cave culvert and airlock and the completion of the Lower Cave walkways. We will miss Jason's expertise in construction activities and wish him well in his new work environs.

GREAT BASIN NATIONAL PARK

by Gretchen Shenk

Great Basin National Park in cooperation with the National Cave Rescue Commission, Western Region, offered an Orientation to Cave Rescue class on May 11 & 12. This class was offered to Park employees, local cavers, and local search and rescue members to develop basic skills to help in the event of a cave rescue. Fortunately, no major rescues have occurred recently in eastern Nevada, and finding any cavers in eastern Nevada is often a challenge. However, Great Basin National Park began its three-year wild cave survey and inventories this past spring, so more people will be caving in the area. Hopefully the training will make people more aware of what a rescue would entail, and as a result they will be safer cavers.



Carrying a patient out of Lehman Caves. (NPS Photo by Gretchen Schenk)

Eighteen participants completed the training. The success of the training is highlighted by one participant's comment after being packaged in a Sked litter and bumped through the cave: "I never want to be a patient again!"

The training included several hours of classroom instruction, litter-handling practice in a nearby playground (we're sure the playground equipment manufacturers never considered how a litter would move through play equipment!), a carryout of Lehman Caves that simulated a real rescue from two years ago, and an all-day mock rescue out of Model Cave. Techniques to find a person, package a patient in a

litter, and move the litter out of the cave were covered, along with cave conservation and personal safety while caving.



Unpackaging patient Krupa Patel after her "rescue" from Model Cave. (NPS Photo by Gretchen Schenk)

WIND CAVE NATIONAL PARK

by Rod Horrocks

We recently hired Jason Walz as our new seasonal Physical Science Technician. He has previously volunteered with Resource Management and worked in Interpretation at Mammoth Cave National Park. He will be working with us through October.

We have redesigned our candlelight tour buckets to reduce dripping wax. With this new design we are able to preserve the historic flavor of the old buckets while preventing wax from dripping into the cave.

We have started the public scoping process for a new Cave and Karst Resource Management Plan with a public meeting held on 5/11/02 at the park. Interested persons can send us the issues they would like addressed in the proposed plan by logging onto our web site at (www.nps.gov/wica/) until May 28. We will have a draft of the plan for public review on our web site soon after that date.

Dr. Andreas Flitsch has set up an electronic anemometer in the natural entrance of Wind Cave to measure the direction and speed of the barometric winds. This instrument will measure speeds accurately down to 3 cm/sec. During the

first two months of monitoring, he has recorded the cave blowing for up to 32 hours in a single direction.



The Sonic Anemometer in the Natural Entrance.
(NPS Photo by Rod Horrocks)

Dawn Cardace, a graduate student at Washington University in Saint Louis, has started a project to compare isotopes between Wind Cave waters and meteoric waters. She will be analyzing drip and pool water from the various levels of the cave as well as snow melt and water from Beaver Creek.

The Environmental Assessment (EA) for our parking lot resurfacing project is on our web site and is available for public review. This project will replace the asphalt parking lot with concrete and add a filtering system. The comment period closes on 6/4/02.

Alan Heakin, a USGS hydrologist, has started a project to create a background characterization of hydrocarbons levels in cave drip water at sites located below or near the asphalt parking lot. This project is in preparation for the parking lot resurfacing project.

The Wind Cave portion of the annual Wind/Jewel Cave Restoration Camp will be held on 6/10-11/02. Fifteen participants are scheduled to attend this year's camp.

Rod's article titled, "Using a Geographic Information System to Develop a Cave Potential Map of Wind Cave", was published in the special GIS issue of the NSS Journal of Cave and Karst Studies, VOL. 64, No. 1, p. 63-70. In the article Rod predicts that approximately 150 more miles of survey may be possible even if the boundaries of Wind Cave remain unchanged. He also establishes a likely maximum extent for the cave that runs NE - SW and falls mostly within park boundaries. The current boundaries are 1/10 the size of those maximum likely potential boundaries.

We are continuing the monitoring of What the Hell Lake. Over the past few months the drop in water level dramatically slowed until it finally stopped three months ago. The lake level still needs to drop another six inches to once again allow access to the main lakes.

Since the last issue of *Inside Earth* the surveyed length of Wind Cave has increased by 2.63 miles, raising the total length of the cave to 104.13 miles.

ARTICLES

FORMATION REPAIR AT JEWEL CAVE

by Rene Ohms

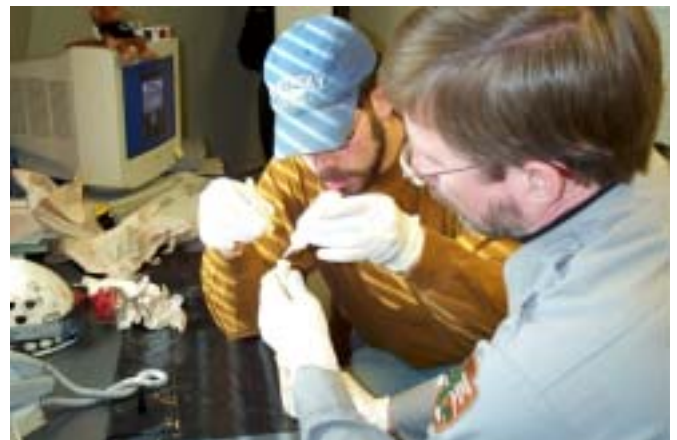
Last year, a stalactite along the Scenic Tour at Jewel Cave was broken. It measured just over 1 foot long, and was broken into 7 pieces. The cave management staff repaired the stalactite on February 27, 2002 using Epon 828 epoxy, Versamid 40 hardener, and Special T quick-drying adhesive.

All photos are NPS photos by Rene Ohms.



The broken stalactite.

The broken pieces were removed from the cave and allowed to dry thoroughly before being glued together. Special T, which sets within one minute, was used to bond the broken pieces in the office. Special T is recommended for small formations, or parts of formations (less than 2 inches in diameter).



Brian Sokofsky and Mike Wiles use Special T to epoxy the speleothem back together.

After drying the in-cave attachment point thoroughly with a hair dryer, a thin ring of Epon/Versamid was spread around the outer edge of the cross-section, with a few drops of Special T in the middle. Because Special T was used,

holding the stalactite in place for a few minutes was sufficient. No support was needed to hold the stalactite up while the epoxy set (~24 hours).



Before the repair.



Ten weeks after the repair.

Thanks to Jim and Val Werker for their advice!

CONTRIBUTORS

Zelda Chapman Bailey
National Park Service
7333 West Jefferson Ave.
P.O. Box 25287
Denver, Colorado 80225
Phone: 303/969-2082
Email: zelda_bailey@nps.gov

Rod Horrocks
Wind Cave National Park
R.R.1, Box 190
Hot Springs, South Dakota 57747-9430
Phone: 605/745-1158
Email: rod_horrocks@nps.gov

Ronal Kerbo
NPS-Geologic Resources Division
P.O. Box 25287
Denver, Colorado 80225-0287
Phone: 303/969-2097
Email: ron_kerbo@nps.gov

Rene Ohms
Jewel Cave National Monument
RR1, Box 60AA
Custer, South Dakota 57730
Phone: 605/673-2288
Email: rene_ohms@nps.gov

Dale Pate
Carlsbad Caverns National Park
3225 National Parks Highway
Carlsbad, New Mexico 88220
Phone: 505/785-2232, ext. 368
Email: dale_pate@nps.gov

Gretchen Schenk
Great Basin National Park
Baker, Nevada 89311
Phone: 775/234-7331
Email: gretchen_schenk@nps.gov