



# Inside Earth

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Edited by Joel Despain, Sequoia and Kings Canyon National Parks

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



National Park protection of regions of karst and caves is a growing idea in countries around the world. This aerial view of a small portion of the Sangkulirang karst in Indonesian Borneo shows part of what may soon be set-aside as Indonesia's newest national park, a new Biosphere Reserve, and Indonesia's first park focused on caves and karst. Photo by Djuna Ivereigh. Copyright Djuna Ivereigh 2003.

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# Twenty Seven Years of Radon Monitoring in Wind Cave, Wind Cave National Park

By Marc Ohms  
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## Background

Radon is a naturally occurring radioactive, colorless and odorless gas that in recent years has gained increasing notoriety as a health threat. It is considered to be the leading cause of lung cancer in non-smokers and it is estimated to cause 20,000 deaths a year (*Environmental Protection Agency 1992*). Radon comes from the natural decay of uranium in the rock and soil. Radon is present in the outside air but is at such low levels that it is not a concern. Where it becomes a problem is in enclosed areas such as buildings, mines, and caves.

The U.S. Geological Survey has determined that the sedimentary rocks surrounding the Black Hills contain uranium deposits, especially the sandstone in the southern Hills. This means that there is the potential for high radon levels. In comparison, the granite core of the Black Hills has a moderate radon potential (*U.S.G.S. 2002*).

## National Park Service Radon History

In 1968 the first evidence appeared that radon could be a possible threat to cavers and cave employees. Tests conducted in Carlsbad Caverns suggested a possible health hazard for National Park Service cave employees under existing OSHA uranium mining radiation exposure standards for radon (*Yarborough 1977*). Following this the NPS launched into a service-wide radon-monitoring program for NPS caves. The problem was the NPS did not have any guidelines on radon exposure and was forced to utilize mining standards.

In 1980 the "Cave Radiation Safety and Occupational Health Management Guideline-NPS 14" was written. It was later revised in 1990 and is now under revision once again by the NPS Occupational Health and Safety Program and will be included in the Director's Order/ Reference Manual 50B.

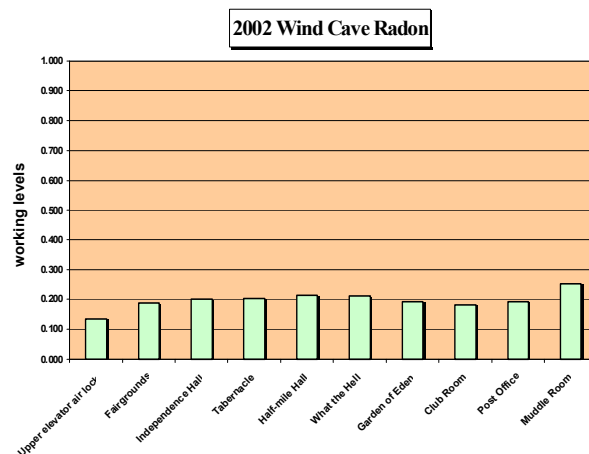
## Wind Cave Radon History

In January of 1976 the department of Mining Enforcement and Safety Administration conducted a radon survey in Wind Cave at the request of the National Park Service. Six sites were sampled along the tour routes. The radon level averaged 0.19 working levels and it was determined that the higher levels were occurring during the summer months (*Rapp and Rathbun 1976*). It was concluded that the radon level was safe for the visitors as well as the employees. In August of 1976 the National Institute for Occupational Safety and Health conducted a hazard and medical evaluation on NPS cave employees. At Wind Cave nine employees participated in the study. Sputum samples were taken

from each individual and tested for respiratory irregularities. All nine participants produced negative results (*Gunter and Meyer 1978*).

The park hired a Physical Science Technician in mid-1977 to conduct radon sampling through the end of August 1978. The sampling was conducted weekly along the tour routes including the Caving Tour for a total of 56 sample days. Park employees who worked in the cave were required to keep exposure records. These records included time spent in the cave and where they were in the cave. With this information the park was able to determine each person's radon exposure. A computer program was written to analyze the data, with an emphasis on determining the causes of radon level fluctuations. It incorporated barometric pressure, temperature, and humidity in the hopes of discovering some correlation. The results were inconclusive. The Candlelight Tour had the highest radon with an average of 0.42 working levels. The three other tour routes had a combined average of 0.20 working levels (*Chord, Farrell, and Finney 1978*).

Starting in 1990 the park's Cave Resource Management staff monitored radon in the cave sporadically through 1997. The



sampling was done with a portable pump and was conducted along the tour routes. During this time period the radon level averaged 0.19 working levels (*Nepstad and Allison 1997*).

## Radon Today

In the spring of 2002, to continue monitoring Wind Cave's radon levels, ten RadTrak monitors were purchased from Landauer. The RadTrak is an alpha-track radon gas detector designed to monitor radon exposure for three months to a year. The ten monitors were placed in ten different locations throughout the cave. A monitor was placed on each of the five tour routes, one in an elevator air-lock and the remaining four were placed in off-trail locations along flagged travel routes used by surveyors and researchers. This was the first radon monitoring ever conducted off of the tour routes in Wind Cave. The monitors were left in place for three months. Once the monitors were removed they were sent to Landauer for testing.

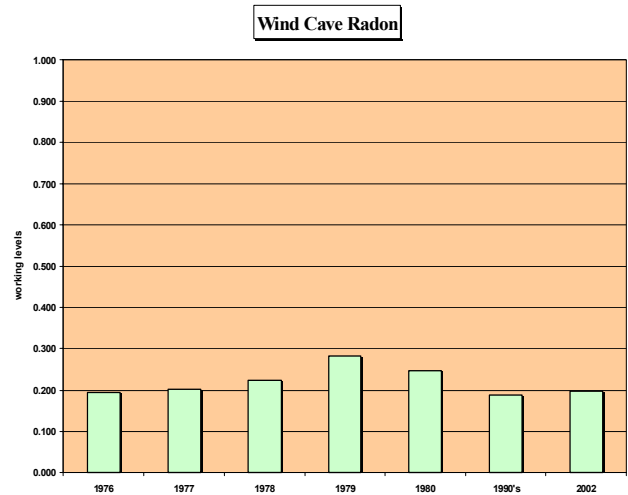
The ten samples had very little variance in the amount of radon as can be seen in figure 1. The upper elevator airlock had the lowest level of radon at 0.13 working levels. This can be attributed to air from the surface entering the airlock via the elevator shaft. The highest level at 0.25 working levels was in the Muddle Room along the Caving Tour route. The average radon level was 0.20 working levels.

There does not appear to be any correlation between the level of radon and the distance from an entrance. Many earlier studies concluded that the radon levels are higher the farther you travel into the cave from the entrance. However, the earlier studies did not sample sites beyond the tour routes therefore only represented a small portion of the known extent of the cave.

### Conclusions

Decades of data indicate that the radon levels within Wind Cave appear to be stable, as can be seen in figure 2. The levels are low enough not to pose a threat or concern for those working in the cave or the visiting public. Wind Cave averages around 0.20 working levels. This means that 3.4 out of 1000 non-smoking people could get lung cancer if exposed to this level for a lifetime, which is ten times the risk of dying in an airplane crash (*Environmental Protection Agency 2002*). However, this is based on a daily dose of at least eight hours. Since park employees rarely are in the cave for eight hours, and surely not every day, and most of the park's employees do not work in the cave for a lifetime, their risk is greatly reduced. The US Department of Health and Human Services recommends that the annual exposure level for occupational exposures not exceed 1.0 WLM (*Working Level Month = radon working level X time spent in exposure area / 170*). If an interpretative ranger at Wind Cave conducts three tours a day for a total of five hours the exposure would be 0.13 WLM, well below the recommended exposure. Since visitors are in the cave for such a short time period their risk is virtually zero.

The cave should be monitored biannually to ensure that radon is not rising above stable conditions seen in the past and to obtain long-term trends of the radon levels within the cave.



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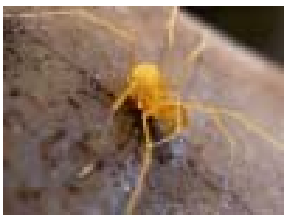
# Great Basin National Park FY 2003 Update

By Krupa Patel

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During the FY2003 field season, fifteen caves were surveyed, mapped, and inventoried. Most of the survey took place in the Baker Creek System where four caves in the system were physically connected through survey to surface datums. Bat surveys were also conducted at these cave entrances, as well as at streams and mine adits in the park.

The Southern Nevada Grotto is conducting a highly accurate Total Station survey of Lehman Cave. The current 1974 map has no recoverable survey stations and lacks survey data. The Total Station survey will give us precise data and points. The 1997-1999 compass and tape survey conducted by Rod Horrocks et al will give us a more detailed map of the cave. The two surveys will be combined to produce a highly accurate and detailed map of Lehman Cave. The resultant map will provide the structural basis for all science and management activities in the cave. Permanent stations in the cave will also be calculated as GPS points so park managers will be able to navigate directly to corresponding survey stations above-ground and manage the surface accordingly.



Harvestman, *Cryptobunus unguulatus unguulatus*



Potential *Conotylidae Tingupa*

Cave invertebrate inventories were conducted this summer by Jean Krejca, University of Texas, and Steve Taylor, University of Illinois in the eight permitted caves within the park. Over a ten-day period they found several potential troglobitic species, including millipedes, harvestmen, and pseudoscorpions. The specimens are being prepared for more specific identification by taxonomic specialists. Ecological information on specific taxa will allow us to implement cave-specific management actions to protect sensitive populations.

This past winter a restoration project was initiated along abandoned tourist trails in Lehman Cave. Many wood and metal structures along these trails were degrading and releasing organic compounds and ferrous oxides as byproducts into the cave environment. To mitigate these impacts, three sets of wooden stairs were removed, along with 1800 ft of metal handrails and a wooden platform used to store broken

speleothems. Invertebrate searches were conducted on all of the wooden structures before removing them from the cave. Restoration efforts will continue this winter with the removal of unused, degrading electrical conduit, and a much needed lint camp.



Pre-Restoration Conditions



Post-Restoration Conditions

Ridgewalking produced four small new caves this season: Rockfall, Chamber Cave, High Hole, and Mystery Cave. Rockfall was found in close proximity to the Baker Creek Cave System, with which it may connect. Mystery Cave may have archeological significance.

GIS models built this season have allowed us to determine distances between cave passages for proximal caves, and infer patterns of cave development through the analysis of surface features. Cave maps are being geolinked to the GIS database along with associated entrance and cave data.

A geologic scoping meeting was also held with the GRD and members of the USGS to establish geoinicators in the park and identify long-term cave and karst monitoring needs. A cave and karst management plan for the park is currently being drafted with cave-specific plans for long-term ecological monitoring of the cave systems within the park.



# Carlsbad Caverns National Park Update

By Dale Pate

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## Carlsbad Caverns Resource Protection Plan

It only took four years, but this important plan for the long-term protection of Carlsbad Cavern is finally completed. The comment period for the Environmental Assessment has ended. Less than ten comments were received. A Finding of No Significant Impact (FONSI) was signed by the Acting Regional Director on Wednesday, Sept. 3, 2003. Special thanks to Paul Burger for pushing this plan to completion.

## Loss of a Friend and a Co-Worker

It is with great sadness that we report the death of Dr. Myra Barnes. Myra worked as a wildlife biologist for the park for three years and was in the process of transferring to Organ Pipe Cactus National Monument. Myra worked with bats, ringtails, and other animals that utilized caves and was instrumental in obtaining and developing protocols in the use of Anabat detectors at the park. Her dedication and friendship will be missed.

## New Railings in Left-Hand Tunnel

Thanks goes to Donn Allen, park carpenter, for recently installing some additional handrails on wooden structures in Left-Hand Tunnel, Carlsbad Cavern. These railings were of non-treated wood and are temporary fixes for some safety issues. Long-term goals are to replace all the structures in Left-Hand Tunnel with materials that will not corrode or, in some cases, remove the structure entirely.



New railings have recently been installed on existing wooden structures in Left-Hand Tunnel. (NPS Photo by Tom Bemis)

## New Caves

Four new caves have been surveyed in the backcountry bringing the total number of documented caves in the park to 106.

## Visitor Center Rehabilitation Plan

On May 7, the NPS Development Advisory Board approved this project for the park. On the books for a number of years, the rehabilitation of the Visitor Center will move forward now. Vital projects listed in the Carlsbad Caverns Protection Plan will fall in line after the VC rehab is completed. Construction is slated to begin next fall.

## Cave Pearls Returned to Lower Cave

The following note and 42 cave pearls along with a couple of pieces of cave popcorn were recently returned to the park. The note read as follows:

*Enclosed are the cave pearls that were removed from Carlsbad Caverns back in the 30's. The young man who took them as souvenirs was possibly working there under the CCC program. Anyway, they came into my possession after my Mother went to the nursing home. I put them up and recently ran across them in a drawer.*

*Best Regards, Bob Phillips*

While we will never know exactly where they came from in Carlsbad Cavern, we can make an educated guess that they came from the Rookery in Lower Cave. Over the recent Cave Research Foundation (CRF) Restoration week, Tom Bemis with several other CRF volunteers placed the pearls in a recently restored area. Thanks to Mr. Phillips for returning these long lost cave pearls.

## Ebay Auctions off Pieces of the Park

**Lechuguilla Cave:** On February 19, 2003, Alan Glennon reported that a cave pearl touted as being from Lechuguilla Cave was for sale on Ebay (a very popular internet auction site). Included with the auction item were pictures of the cave pearl and a picture of the cover of the March 1992 issue of the National Geographic that featured Lechuguilla Cave. The cave pearl was removed from the auction before it could be sold. Ebay has agreed to not allow cave formations to be sold on their website. Special agents for the National Park Service were notified and a subsequent investigation found that the cave pearl had originally come from a rock shop in Tennessee. The rock shop owner in Tennessee had the National Geographic article on Lechuguilla Cave next to some cave pearls on sale for information about cave pearls. A discussion with the rock shop owner concluded that the cave pearl was from Tennessee and was not from Lechuguilla Cave. Thanks to Alan Glennon for notifying

the park of this particular sale item on Ebay and thanks to the special agents for their efforts in the investigation.

Carlsbad Cavern - In a separate Ebay auction in August 2003, Rene Ohms informed us that a stalactite advertised to be from Carlsbad Cavern was on sale. After recently going through the process with the cave pearl, the park's Chief Ranger was informed who once again contacted a special agent for the NPS. An investigation found that the stalactite was recently acquired by the seller from an estate purchase. It was marked as being from Carlsbad Cavern and was auctioned as such. The stalactite was pulled from the auction before it was sold and is being returned to the park as a donation. Thanks to Rene for keeping us informed about speleothem sales on Ebay and to Mark and our special NPS agents for their quick and efficient investigations.



Tom Bemis carefully places cave pearls in recently restored "nests" in the Rookery, Lower Cave, Carlsbad Cavern. (NPS Photo by Bill Sawyer)

# Sequoia and Kings Canyon National Parks Update

By Shane Fryer

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The latest news at SEKI was a string of vandalism incidents at Crystal, Overhang, and Standup caves. The damage at Crystal was just in-front of the cave gate and the vandals were not able to enter the vast majority of the cave. About a dozen small curtains and stalactites were smashed. At Overhang and Standup more formations were broken throughout the caves including several curtains, stalagmites, stalactites, and even popcorn. These incidents are under investigation, and we are hopeful that we can catch the vandals.

Three recent projects have also been occupying the time of the Cave Resource Management staff. Recently completed was the annual Crystal Cave Restoration Camp which was held October 25 and 26. Nineteen volunteers donated their time and expertise to make the weekend successful. This year we focused on striping and priming the historic Spider Web Gate. The gate is a registered historic landmark and cultural compliance in the form of "XXX" paper work was required to proceed with painting the gate. The paint on the lower half of the gate was blistering badly allowing the metal underneath to oxidize. Up to nine people at a time stripped, scraped, and grinded away multiple layers of paint and rust. The project took a full two days and a lot of effort on behalf from volunteers and park staff. Also, an electrical team moved a poorly placed light switch closer to the trail and away from a delicate calcite floor. A second team helped remove algae

from the entrance passage. Algae are continuing to be an increasing problem at Crystal.

Another on-going project is the replacement of gates on Clough and Soldiers caves and the placement of a new gate on the Red Belly Entrance to Crystal Cave. In 2002 and 2003 both Soldiers and Clough caves were entered illegally on several occasions with heavy damage done to the gates, but thankfully, little to no damage done to the caves. With the recent spate of vandalism this fall, this is a welcome and needed project. Funding for the gates is being provided by the regional office (PMIS # 89680). We will be receiving a \$22,500.00 grant for the gates. The Implementation Plan is now complete and we are preparing to write and place a contract for bid. The new gates are going to be professionally constructed from stainless steel using an ACCA-type design. We have worked and consulted with BCI and Jim Kennedy on secure gate designs that will restore habitat, air flow and nutrients to the caves, decreasing their visual impact on the surrounding landscape, and protect the caves with strong, quality gates. We plan to begin construction in June.

Biologist Jean Krejca and her assistant, Vivian Loftin, from the University of Texas and Zara Environmental were in SEKI November 3 – 20 to sample park caves for invertebrate life on the second of four trips she will make to the SEKI and YOSE. Caves in Mineral King Valley, the South Fork, and Hurricane Crawl



A troglobitic dipluran in Soldiers Cave. This animal was discovered this summer and is likely member of the *Japygidae* family.

were sampled. We expect her second report by the end of the year. On her first trip in May and June, nine caves were inventoried in order study the distribution of known cave adapted invertebrates and identify new species. This study resulted in an impressive list of potentially new species including a cave adapted flatworm (*Sphalloplana?*), japygid dipluran, and homopteran (*fulgomorph*, probably *Cixiidae*). Numerous unknown spiders, beetles, centipedes, millipedes and spring tail were also collected. Included in the collections were high resolution digital photographs and data on populations and habitat.

Winter projects will include work on the park cave files, revisions to the park cave management plan, and two new proposals for grants. Water chemistry will hopefully be studied at Lilburn Cave before during and after fire is restored to the Redwood Creek watershed during the next 10 years. This project is in collaboration with the Cave Research Foundation and the USGS. The park is also seeking money to support an expanded, week-long Crystal Cave Restoration next year.

# Protecting Bats at Death Valley National Park

By John Burghardt  
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A large cupola was constructed over two sinkhole entrances to Devil's Hole Cave November 6-8, 2003, as part of a Bat Gate Builders' Workshop sponsored by Bat Conservation International. These sinkholes not only support a maternity roost of Townsend's big-eared bat (*Corynorhinus townsendii*), but are connected underwater and at depth to another portion of the cave that supports endangered Devil's Hole Pupfish (<http://www.death-valley.us/article107.html>). The new \$20,000 cupola replaces an older structure that was less secure, which also inhibited the bat colony's ingress and egress. Bat Conservation



International's copartners in putting on the workshop that made this project possible included Frontier Environmental Solutions, Inc., U.S. Borax Chemical Corporation, U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, and National Park Service, whose services were offset by a \$10,000 Cooperative Conservation Initiative grant for supplies and materials from the U.S. Department of Interior.

# NCKRI - Workshop Brings Together the Caving Community to Discuss the Future of National Institute

By Roger Scott

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The National Cave and Karst Research Institute (NCKRI) recently hosted a workshop to develop a broad vision for the newly formed Institute. Feedback from a wide range of stakeholders was solicited to help NCKRI move forward through its initial development. Coming from as far away as California and Florida, the more than 25 attendees represented the caving community, the academic world and government agencies charged with cave and karst management.

“It was important to have this diverse group sit down at the same table and tell us what they want the Institute to become,” said Louise D. Hose, the Institute’s Director. “Their views on the Institute’s role in cave/karst research and education, its organizational structure and management, as well as its ability to serve as an informational clearing house are critical to increase the understanding and investment of all parties involved.”

The National Cave and Karst Research Institute was created to further the research, education, and wise management of cave/karst lands throughout the United States and around the world. While a working group composed of cave and karst experts from various federal agencies had provided organizational groundwork, this workshop was the first opportunity for the broader community to be fully involved. The workshop was designed to begin consultation with all the key organizations and integration of their ideas in the Institute’s development and operational plans.

The two-day workshop, sponsored by the National Park Service and New Mexico Tech, was held at a federal training center in Shepherdstown, West Virginia, and attracted high ranking participants including Dr. Mike Soukup, the National Park Service’s Associate Director for Natural Resource Stewardship and Science. Dr. Soukup noted that the Institute had “an important role to play in education, research, resource management, and information integration.” He suggested that it would require a “lightweight and flexible” organization involving people from the academic community and private organizations, as well as government.

Jack Hess, the Executive Director of the Geological Society of America stated, “NCKRI’s future lies in their ability to integrate all that they heard at the workshop and craft a mission, vision and goals and an organizational structure that gives them the flexibility that they need.” From his viewpoint, Hess said he sees

“a number of areas where The Geological Society of America can work with NCKRI to enhance our respective missions.”

Dave Shaver, Chief of the NPS Geologic Resources Division, felt that the workshop was a major step forward in the development of the Institute. He pointed out that, “most of the key organizations that will be critical to NCKRI’s success now have a common understanding and a general consensus on the goals and future direction for the Institute. Now we can move forward together to make this vision a reality.”

Director Hose cited several key suggestions from the group, including the development of a board of directors or governing council and the idea that the Institute should be an umbrella structure that could put forth major grant and project proposals. Another proposal involved the perceived need for a non-profit element that could accept grants and serve as an independent entity, not aligned with any particular government agency or university.

The 1998 Act of Congress that created the Institute placed it under the auspices the National Park Service. That legislation directed the NPS to “jointly administer” the Institute with another “public or private (entity)...as determined by the Secretary” of the Interior. While no formal agreement has yet been reached, the New Mexico Institute of Mining and Technology in Socorro, New Mexico, has expressed interest in that role. Tech, along with the City of Carlsbad, New Mexico and the National Park Service, is already one of the Institute’s three primary partners.

“All the participants were extremely engaged and positive,” reported Director Hose. “Their efforts exceeded my expectations and I feel we can now take the Institute to the next step, where we begin to implement these ideas.” A formal report that will document the details of the workshop is anticipated in the near future.

Over the next two years the Institute will further refine and initiate its operational model and develop a long-term strategic plan. New Mexico Tech will fill a Visiting Chief Scientist position in the next six months that will provide science coordination, leadership and scientific direction for the Institute. Hose will also continue to meet and work with the



broader community of stakeholders that seek to be a part of the Institute.

The City of Carlsbad, the State of New Mexico, and the NPS have provided the seed money and funding for a building that

will serve as visitor center, laboratory, library and offices for the Institute. Design work for the approximately \$4.5 million facility is underway with groundbreaking planned for the late 2004.

# NCKRI - October 2003 Update

By Louise Hose

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October proved a very busy and productive month for the Institute, despite a significant computer crash that has delayed correspondence with many of our colleagues and caused this report to be sent out late. The files have now been recovered and I hope to catch up on my tardy correspondences soon.

## PROGRESS MADE BY THE INSTITUTE STAFF AND PARTNERS THIS MONTH:

- Louise Hose (LH) attended the Karst Waters Institute's *Interdisciplinary Workshop on Epikarst* where she presented a poster and had the opportunity to discuss NCKRI with dozens of the world's leading cave and karst researchers. The workshop drew participants from Canada, France, Hungary, New Zealand, Slovenia, Ukraine, and across the United States.
- LH met for 2 hours with Tom Aley of the Ozark Underground Laboratory, a for-profit corporation, for a productive discussion of his ideas, concerns, and potential collaborative efforts between the Lab and the Institute.
- The Institute held a facilitator-run, 2-day meeting with a small but diverse group of cave/karst program representatives on October 5<sup>th</sup> & 6<sup>th</sup> in Shepherdstown, WV, to discuss the Institute's operational & administrative vision. Susan Warner of LEAD Alliance provided professional facilitation for the meeting. LH, Dave Shaver, Ed Kassman, and Lindsay McClellan of NPS-GRD, Associate Director Mike Soukup (NPS-WASO), Penny Boston (NMT), and representatives from 5 other academic institutes, 2 state programs, 5 non-profit organizations, 2 national parks, and 5 other federal agencies (BLM, USFS, USGS, EPA, USFWS) participated.
- Roger Scott (RS) continued follow-up communications with Vision Workshop participants.
- RS drafted, coordinated and sent out a news release for the Vision Workshop.
- *Recommendations and Guidelines for Managing Caves on Protected Lands*, a textbook-style publication prepared as a collaborative project of the Karst Waters Institute (KWI) and the National Cave and Karst Research Institute, was received from the printer. KWI and vendors are now selling the publication and we have been told that the French Ministry for the Environment is already considering a translation of the book for their land managers.
- We now have a banner carrying the full name of the Institute plus the logos of the three primary partners (New Mexico Tech, Carlsbad, & NPS). It will be available and displayed at various events nationwide.
- Larry Coalson of the New Mexico State University's Small Business Development Center in Carlsbad met twice with the Institute staff to provide guidance on structuring and writing a business plan. Colson also shared mid-1990s documents covering NCKRI strategic planning, proposed budgeting, and operating and staffing plans.
- LH gave a presentation about the Institute to the Carlsbad Potash Section of the Society of Mining Engineers.
- LH attended the National Cave and Karst Management Symposium in Gainesville, FL, which the Institute co-sponsored. She provided an oral presentation and took advantage of many opportunities to discuss the Institute and potential future partnerships with federal and non-federal cave and karst programs nationwide, particularly in the Ozarks region, Virginia, Indiana, West Virginia, and Florida. NPS-GRD staff members Ron Kerbo and Lindsay McClelland also attended and talked to participants about the Institute.
- Doug Soroka and Lynn Kleina gave slide presentations to the American Association of University Women in Doylestown, PA, and to a Boy Scouts Venturing Program in the same area on their recent volunteer efforts working with the Japanese Broadcasting Corporation (NHK) on behalf of the Institute.
- The Institute and NPS-GRD staff continued working with Jon Tully of the City of Carlsbad on a General Agreement to allow the transfer of \$1,956,900 to the City for the headquarters building.

- Joel Webb, Director of the Carlsbad Environmental Monitoring and Research Center (which currently houses NCKRI), accepted a position at the University of Nebraska. Webb has been a strong supporter of and advisor to the Institute and we will miss his presence in Carlsbad. Deborah Moir is serving as CEMRC's Interim Director and has continued the Center's vital support of NCKRI.
- LH, Penny Boston, and Lewis Land prepared presentations for the Geological Society of America national meeting.
- RS catalogued books previously donated to the NCKRI Library.
- The Institute compiled an initial NCKRI media contact list
- LH provided a grant proposal review to a non-profit, private field research funding organization.
- Susan Warner of LEAD Alliance provided her summary of the contributions made by Vision Workshop participants. The material was mailed to Workshop participants and the former Federal Working Group. Copies of the Executive Summary and supporting data are available by request sent to [nckri-mail@cemrc.org](mailto:nckri-mail@cemrc.org)
- RS provided logistics for Vision Workshop, hotel, NCTC coordination, information and support for attendees, etc.
- LH and RS began working on NCKRI Business Plan, striving to incorporate the views of the Vision Workshop participants.
- At New Mexico Tech, the Chief Scientist search committee has received the applications from the Human Resources Department and is currently assessing them. A selection of three interviewees is in progress. Interviewing will begin in the first several weeks of November with a decision to be made before the end of the month and an employment offer proffered to the top candidate.
- NCKRI and Tech's Cave and Karst Program played a major role in this year's President's Report that is submitted annually to the New Mexico State Commission on Higher Education. This report reflects the first full year of the NCKRI-associated Cave and Karst Studies Program at the University. In other Tech news, the Hydrology Research Group within which Cave and Karst Studies is housed, was once again ranked 4th in the nation by US News and World Report. New Mexico Tech, as a whole, was ranked 14th this year by Kiplinger Magazine in their "Best Buys in Higher Education" listing.
- Individual research efforts at NM Tech continue with 3 new funded starts within the past 6 weeks, one from the National Science Foundation to study biogenic ferromanganese deposits in caves, and the other 2 from NASA's Institute for

Advanced Concepts to study the possibility of extraterrestrial caves on bodies like Mars and the Moon, and a joint project with the Field and Space Robotics Laboratory at the Massachusetts Institute of Technology to develop concepts for microrobotic access to narrow or chemically hazardous cave passages in Earth caves and for eventual extraterrestrial application.

- Inquiries from prospective graduate students seeking a cave and karst oriented study program continue to come in to Tech. Four new PhD students and one new Master's student are tentatively scheduled for arrival between Spring and Fall 2004. Because of recent successful proposals for funding, there are additional slots available for undergraduate and graduate students in several of the projects.
- Current Master's student, Setsuko Shindo, is working with Carlsbad Caverns hydrologist Paul Burger, on micrometeorological assessment of Carlsbad Cavern. State of the art instrumentation, e.g. ultrasonic anemometers, chilled-mirror hygrometers, etc., are scheduled to be deployed in the cave during the 2003 holiday break period. New Mexico State University Master's student, Morgan Perrone, is actively working on the calcite moonmilk found in abundance within one passage of Spider Cave. Both students are working under the direction of Boston.

**PLANS:** Anticipated activities for the near future include:

- The Institute hopes to move ahead toward writing a business/operations plan by the end of the year. This plan will include a proposal for how the Institute will be jointly administered and how the transition might be accomplished.
- NMT will interview and hopes to hire a Visiting Chief Scientist for the Institute this fall.
- LH and Land will attend the Geological Society of America meeting in early November and present posters. Shaver and other members of the NPS-Geologic Resources Division will also attend and be available to answer questions.
- The City and Institute Director will begin regular meetings with the building design firm immediately after the GSA meeting.

**NCKRI STAFF:**

LH – Louise Hose, National Park Service  
 RS – Roger Scott, National Park Service  
 LL – Lewis Land, New Mexico Bureau of Geology and Mineral Resources (NMBGMR)  
 PB – Penelope Boston, New Mexico Institute of Mining and Technology