Beneath the Forest

Volume 4, Issue 1 Spring 2011

"Beneath the Forest" is a biannual newsletter published by the Forest Service of the U.S. Department of Agriculture.

Edited by Johanna L. Kovarik, Tongass National Forest

Inside this Issue…and more **Page**

Cave and Karst Calendar of Events

Karst Hydrogeology and Ecosystems

June 8th – 10th 2011

Bowling Green, Kentucky

For More Information:

http://hoffman.wku.edu/k2011.html

National Speleological Society Convention

July 18th – 22nd 2011

Glenwood Springs, Colorado

For More Information:

http://www.nss2010.com/default.php

USDA Forest Service Cave and Karst Training

June 20th – 24th 2011

Elkins, West Virginia

For More Information:

See the registration form and schedule in this issue of "Beneath the Forest"

National Cave and Karst Management Symposium

October 3rd – 7th 2011

Midway, Utah

Abstract Deadline: August 15th 2011

For More Information:

See the flyer in this issue of "Beneath the Forest"

Editor's Notes:

I'd like to thank all the contributors for this issue as well as Melody Holm, Randy Gould, and Kara Chadwick for assistance, support, and editing. Thanks go to Sonja Beavers in the National Publications Office for assistance with creating the external version of this newsletter released September 2011. The original version was issued internally in the spring of 2011. Our next issue will be the fall issue. Articles for the Fall 2011 issue are due a bit earlier than normal on October 1st, 2011, in order for the issue to be out in November 2011. Please encourage resource managers, cavers, karst scientists, and other speleological enthusiasts who do work on your forest to submit articles for the next exciting issue!

Cover art: Image top, left – Ice stalagmite and entrance platform in the upper room. Image: Dan Seifert.

Contributors and Entities represented in this issue:

Aaron Bird
National Speleological Society

Paul Burger
Alaska Region Hydrologist,
National Park Service

Andrea Croskrey
Geologist, National Park Service

Jennifer Foote
Volunteer, Lincoln National Forest

Val Hildreth-Werker
National Speleological Society

Patricia Kambesis
Hoffman Environmental Research Institute

David Kempworth
U.S. Fish and Wildlife Service

Cynthia Sandeno
USFS National Cave and Karst Coordinator

Dan Seifert
Assistant Forest Geologist, Custer National Forest

Julie York
Wildlife Biologist, Deschutes National Forest

Virgin Cave Survey Project

Paul Burger
Alaska Region Hydrologist
National Park Service

Virgin Cave is a multi-mile cave located in the Lincoln National Forest in New Mexico. Though explored and largely mapped in the 1970s, the available cave resource data was inadequate for the Forest Service to manage the resource. Since 2001, specially-trained volunteers have been working to re-map the cave and collect detailed cave resource data. Knowing that every trip into a cave causes some impact, the Forest Service carefully weighed resource degradation against the need for information.

A volunteer gazes at a forest of soda straw columns in Virgin Cave, Lincoln National Forest, New Mexico.
Image: Stephan Reames

One of the keys to successful resource management is an accurate map. The wide availability of accurate satellite imagery and topographic scanning has revolutionized mapping, and the use of these data in Geographic Information Systems (GIS) has changed the face of resource management.

Paul Burger assesses speleothems decorating Virgin Cave on the Lincoln National Forest, New Mexico.
Image: Stephen Reames

One of the major limitations of these modern imaging systems is that they cannot view beneath the surface. The Forest Service manages thousands of caves and lands that contribute to the long-term health of cave systems. Mapping and inventory are vitally important to the protection of the natural, cultural, and recreational resources the caves contain. Since mapping of these caves cannot be done remotely, teams of primarily volunteer cavers, must use hand-held compass and distance-measuring techniques.

Traditionally, mappers used fiberglass measuring tapes to map distance, but the availability and dropping costs of laser range finders have led to widespread use of these lower impact devices. In the past, simple geographic data was recorded: distance, compass direction, and inclination to build the linear framework and a plan-view sketch to graphically represent the cave passage and what was found in the cave. Today, standards have greatly improved, largely owing to the need for more sophisticated data analysis and more use of the data as a management tool. Supplementing the basic geographical information, modern mapping involves collection of inventory data including

(Virgin continued on page 4)

(Virgin continued from page 3)

information on geology, hydrology, paleontology, biology, sensitivity to impact, and passage geomorphology. Modern maps are generally done at a smaller scale so more detail can be included. Above is a comparison of two different maps of the same passage in a cave on the Lincoln National Forest. The left map was done in the early 1970s, and the map on the right is part of the current mapping and inventory project. It is easy to see the difference in the amount of cave information that can be gained by a short glance at the more detailed map. Traditional cave maps were drawn using pen and ink on paper or mylar and then reproduced using blueprint-style equipment.

Most modern cave maps are done using a variety of digital drafting software. Digital cave maps are much easier to keep up-to-date as new passages are surveyed and are easily integrated into traditional GIS software where they can be combined with inventory databases into a cave GIS to help manage the resources.

For resource managers, cave GIS has aided in the development of detailed rescue plans and has informed specific management plans that minimize adverse impacts to the resources. These systems have been used to identify restoration areas and to guide volunteer groups to areas where their work would be most effective. These data have been used to direct researchers to areas for further study and have revealed a great deal about the geology and how the cave was formed. As resource professionals strive to make more informed decisions about use and management of caves and karst area, the role of cave GIS will become more important. Creating more detailed, digital cave maps and collecting inventory data are vital to this goal. The current project in Virgin Cave has already provided much-needed information to forest staff and will provide a scientific basis for future decisions. ▪

Disinfection—Just a Way of Life

Cynthia Sandeno
National Cave and Karst Coordinator
Forest Service

David Kampwerth
Cave and Karst Specialist
U.S. Fish and Wildlife Service

Aaron Bird
U.S. Safety and Techniques Chairman
National Speleological Society

Val Hildreth-Werker
Conservation Division Chief
National Speleological Society

A volunteer cleans vertical gear at the White Nose Syndrome decontamination station at the 2010 National Speleological Society (NSS) Convention in Vermont.
Image: NSS Safety and Techniques Committee

David Kampwerth's Clean Start

During a class field trip with my dad in the 1970s, I used our car's flashlight to explore a cave in north- central Florida. That day I discovered an amazing recreational opportunity that morphed into a passion for karst landscapes. Dad wasn't interested in crawling around underground, but he recognized my interest and introduced a colleague who agreed to allow 15-year-old me on a few cave trips. I showed up in mud-coated coveralls.

The guy took one look at me and launched into a stern recommendation that cave gear should be cleaned between trips (at least hosed off in our simple view of clean back then). I thought dirty gear was like a badge of honor, so I asked the guy, "Why the extra hassle?" He presented several reasons, but the one that stuck with me was that "things" lived in Florida that don't live anywhere else.

Thirty years later, it's unclear to me how he made this point so clear to a 15-year-old boy or how he knew so much about the potential for transferring organisms to new environments. Whatever this mentor verbalized, it left me with the impression that I ought to cave clean because organisms that didn't belong in a particular cave system would be getting a free ride inside – on me. Besides, I couldn't go caving with him if I showed up with old mud. As my interest and knowledge in karst landscapes become my profession, it became apparent that dad's colleague had unusual insight for that era. Maintaining clean gear was proper. For years prior to the invasion of White-Nose Syndrome (WNS), my team members and I have encouraged clean cave gear.

Invasive Species

Within the past decade, interest in preventing the spread of nonnative invasive species has increased. Plants, animals, and other invasive organisms

(Decon continued on page 6)

(Decon continued from page 5)

(i.e., microbes) are among the most serious and pervasive threats to our Nation's karst resources, wildlife, and ecosystems. On the surface, nonnative species such as Asian longhorned beetles, zebra mussels, spotted knapweed, and water milfoil are easy to see. Caves, however, are relatively remote and pose a unique challenge to researchers investigating the presence of invasive non-natives. For example, research has shown that non-indigenous bird populations have been observed in the proximity of discontinuous locations of bat roosts and hibernacula.[1]

This may suggest the decline of these bat populations due to the ever-expanding, nonindigenous bird species whose populations continue to grow. Certain species of crayfish, which could become apex predators in a cave system, are considered invasive threats to karst areas in the Eastern United States.[2] Speleologists, microbiologists, and karst scientists are finding microscopic invasive species in caves.[3] The significance of invasive microbial impacts can sometimes only be speculated, but is unlikely to be positive.

Native Residents Versus Non-native Transients

Since the 1970s, cavers have learned a lot about the microscopic life that resides in caves, including native and nonnative species. Simply put, there are two types of microbes in caves: those that are resident or native (often endemic) to the cave and those that are transient or nonnative. Transient microbes enter caves by flowing water, gravity, or on air currents, traveling through fractures and voids in geologic strata. Transient microbes are also carried by animals and on humans and their gear.

Conversely, resident microbes occur as native inhabitants of a cave. Native microbes depend solely on resources within the cave for survival, whereas transient microbes tend to thrive where abundant organic materials are available.

Ecological Balance in Cave Systems

Human activities can impact the introduction and growth of microbes. We introduce foreign microbes as we explore caves. These transient species may outcompete the native species, establish strongholds, and encourage declines in the cave's native microbial communities. Humans also bring additional organic matter into the cave in the form of skin, hair, food, lint, and so on. Native cave microbes are often adapted to very low-nutrient environments and may not be able to survive in these richer conditions. If we introduce too much organic matter, cave habitat will cease to be a good place for native cave microbes to live and will become, instead, a good place for transient microbes to thrive. This can cause problems for the entire cave ecosystem since microbes often form the basis of cave food chains.

A volunteer pressure washes caving boots at the decontamination station, 2010 NSS Convention, Vermont.
Image: NSS Safety and Techniques Committee

Why Cave Clean?

Just like other conservation-minded recreationists, we need to take steps to make sure we aren't helping

(Decon continued on page 7)

(Decon continued from page 6)

A volunteer scrubs a helmet at the decontamination station, 2010 NSS Convention, Vermont.
Image: NSS Safety and Techniques Committee

spread nonnative species into places they don't belong. By using low-impact caving techniques, such as wearing clean caving clothes and packing out all wastes, we can greatly minimize the introduction of foreign substances into cave systems.

In fact, one of the most effective things we can do to make sure that we aren't introducing transient organisms from one cave into another is cleaning and disinfecting our caving gear. Take a look at the peer-reviewed volume published by the National Speleological Society (NSS) in 2006, "Cave Conservation and Restoration," for well-established concepts on clean caving protocols.[3]

Anglers, hikers, and hunters have been following clean activity guidelines (above ground) for years.
For example, anglers follow four basic steps to make sure that their boats, trailers, waders, and other fishing equipment don't spread invasive species from one water body into another. Anglers take the following precautions prescribed by the U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS) and adopted by other agencies.

-First, anglers *inspect* boating and fishing equipment for invasive species. Outboard motor props, depth finder transducers, and even fishing lures are great places for invasive species to attach.

-Next, anglers *remove* any visible mud, plants, fish or animals before transporting equipment, and discard items in one of the invasive species disposal stations that have been installed at many boat launch sites for convenience.

-Anglers *clean and dry* anything that comes into contact with water including boats, trailers, waders, bait buckets, and other boating and fishing equipment. Boaters should be particularly aware of baitwells, livewells, and bilge areas that are difficult to dry.

-Finally, anglers *disinfect* boating and fishing equipment with a disinfecting solution (often bleach in this case) if it cannot be dried before it is used in another body of water.

Sound familiar? Unfortunately, human-assisted spread of invasive species and diseases are occurring more frequently throughout the United States. We must take steps to ensure that we can continue visiting, exploring, and studying our Nation's resources, while minimizing our impact. It's just a way of life in the 21st century.

Clean Strategy

Using the approach of *inspect, remove, clean, dry, and disinfect* helps to ensure that endemic species remain a valuable part of our karst systems and that we can continue to visit the caves we love to explore.

(Decon continued on page 8)

(Decon continued from page 7)

The four basic steps of cleaning and disinfecting boating equipment are also applied to caving.

1. Inspect caving equipment for dirt, mud, minerals, and organic matter where invasive species may be present.

2. Remove or Contain any visible dirt, mud, plants, or other organic matter before transporting equipment. Easily removable materials can be knocked or scraped off while in the cave or immediately upon exiting. Initial field cleaning can take place at the cars after the cave trip using buckets of water and a scrub brush (see Deirdra Hahn's excellent article on field decon in the July 2010 NSS News[4]). Any gear that is still dirty or muddy should be contained in plastic bags and plastic tubs.

3. Clean and Dry all caving equipment when you return home or get back to the caving function. Remove all mud, dirt, minerals, and organic matter. Note that most caving functions have designated areas for cleaning and disinfecting gear. These stations are provided by the organizers of the caving events so you can clean your equipment after every trip.

4. Disinfect your caving equipment according to the recommendations from the USFWS. Stay current. Check updated protocol on the NSS Web site, http://www.caves.org and on the USFWS Web site, http://www.fws.gov.

Cave Responsibly

By making clean caving a way of life, we can slow the spread of invasive species and foreign substances, minimize our impact on microbes, and help conserve our cave and karst resources. Clean caving is a broad-spectrum conservation measure, not just a band-aid for WNS. Please join in the effort to cave responsibly by embracing clean caving protocols.

References

1. Allen, C.R.; Forys, E.A.; Holling, C.S. 1999. Body mass patterns predict invasions and extinctions in transforming landscapes. Ecosystems. 2: 114-121.

2. Finlay, J.B.; Buhay, J.E.; Crandall, K.A. 2006. Surface to subsurface freshwater connections: phylogeographic and habitat analyses of Cambarus tenebrosus, a facultative cave-dwelling crayfish. Animal Conservation. 9(4): 375-387.

3. Hildreth-Werker, V.; Werker, J.C. ed. 2006. Cave conservation and restoration. ISBN 1-879961-15. Huntsville, AL: National Speleological Society. 600+ p.

4. Hahn, D. 2010. WNS-Decon: something wicked this way comes. NSS News. July. pg. 4. ▪

Val with the volcano inside Three Fingers Cave, Lincoln National Forest, New Mexico. Image: Peter Jones, Shot in the Dark

Renewing Our Partnership With the Cave Research Foundation

Cynthia Sandeno
National Cave and Karst Coordinator,
Forest Service

The Forest Service has re-established its partnership with the Cave Research Foundation (CRF) through a national memorandum of understanding (MOU). This agreement acknowledges CRF's many efforts in cave conservation and management and will assist the Forest Service in further implementing the Federal Cave Resources Protection Act. The agreement also encourages joint participation in developing cave management plans and scientific research.

The CRF is a private, nonprofit organization dedicated to facilitating research, management, and interpretation of caves and karst resources; forming partnerships to study, protect, and preserve cave resources and karst areas; and promoting the long- term conservation of caves and karst ecosystems. This partnership will increase the number of volunteers contributing to the management and study of caves located on National Forest System lands. Cooperation and coordination may involve a wide range of activities including, but not limited to, education, inventory, research, monitoring, protection, restoration, and other activities necessary to conserve these resources.

Concerns surrounding White-Nose Syndrome may require restrictions or special equipment for projects. As per directions from Forest Service Chief Thomas Tidwell (letter of 28 July 2010), all employees, volunteers, contractors, and permittees must apply decontamination protocols at all National Forest System. ▪

Deschutes National Forest Law Enforcement Officer Eddy Cartaya (left) and Forest Geologist Bart Willis (right) with recovered lavacicles from Lavacicle Cave. Image: Dan Smith

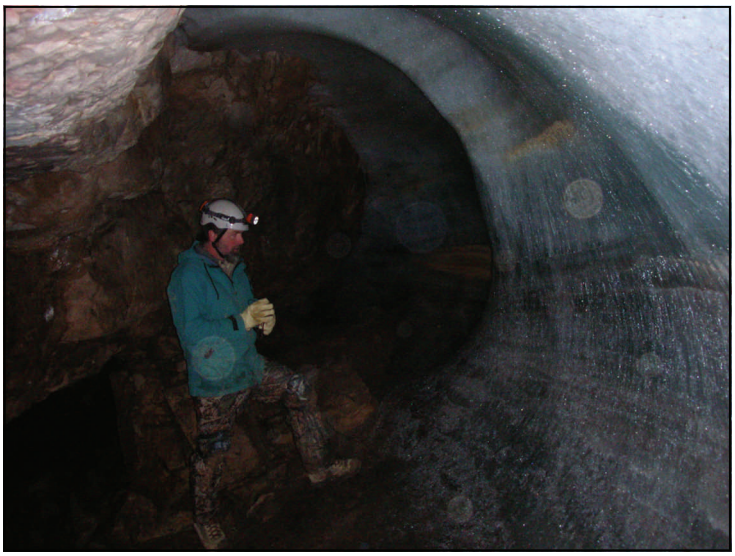
Missing Lavacicles Returned to Deschutes National Forest

Julie York
Wildlife Biologist
Deschutes National Forest, Sisters Ranger District

When Eddy Cartaya, a caver and law enforcement officer new to the Deschutes National Forest, attended a meeting of the Oregon High Desert Grotto chapter of the National Speleological Society last fall, he heard a rumor that someone had possession of lavacicles previously stolen from Lavacicle Cave. After learning that Lavacicle Cave was known worldwide for its unique lava formations, Cartaya went to work to see if he could track down the missing lavacicles.

Lavacicle Cave was discovered during the Aspen Flat fire of 1959 by Forest Service firefighter Max Stenkamp, who noticed a strong draft of air ascending through the smoke. Stenkamp and his firefighter team followed the draft, but went in only as far as the first

(Lava continued on page 10)



Robert Grosvenor examines a wall of ice in the second room of Big Ice Cave. Image: Dan Seifert

The Attractive Nuisance at Big Ice Cave

Dan Seifert
Assistant Forest Geologist
Custer National Forest

Big Ice Cave is a limestone solution cave in the Pryor Mountains on the Custer National Forests Beartooth Ranger District in Montana. Big Ice Cave's entrance opens into a 150-foot-long room with ice covered floors and ice stalagmites. A second room is reached by descending into a small vertical hole at the back of the first chamber. The second room is covered with ice and contains numerous ice crystal and dogtooth spar formations. Unique hoar frost crystals are formed in the second room by the combination of high humidity and low temperature, and crystals four inches across are not unusual.

Big Ice Cave is the closest thing the Northern Region has to a "show-cave" and is one of the two developed recreation sites in the Pryor Mountains.

(Big Ice continued on page 11)

(Lava continued from page 9)

lavacicles. Subsequent cave trips revealed extensive lavacicle formations and a river otter skull dated more than 6,000 years old. The Forest Service gated the opening of the cave in December 1959 to protect these unique formations. A few visitors were so angry they left their strong (and sometimes colorful) opinions nailed to the Forest Service interpretive sign at the cave site. Others reacted more violently, tearing the gate off and entering the cave. Many lavacicles were kicked over and stolen, including the largest and most beautiful formation named the "Horse Head."

Cartaya worked methodically−talking to people throughout the caving community, reviewing piles of newspaper articles, and analyzing emails. While sifting through the formidable pile of emails, he found evidence to support the rumor that someone was in possession of some of the lavacicles. Backed by Forest Service Geologist Barton Wills and a helpful special agent, Cartaya visited the home of an individual, who did, indeed, have several formations, and was willing to donate all of them to the forest. The recovered formations will eventually be on display in the Deschutes National Forest Lava Lands Visitor Center, part of the Newberry National Volcanic Monument, south of Bend, OR.

Recovered lavacicles from Lavacicle Cave.

(Big Ice continued from page 10)

Over the years, there have been numerous attempts at providing visitor facilities at the cave and managing visitor use and abuse. A parking lot, picnic area, paved trail, entrance fence with gate, boardwalks, platforms, and a spiral staircase into the second room were installed in 1972.

From 1973 to 1981, the Forest Service offered guided summer weekend tours into the cave, with a peak of 3,700 attendees in 1978. According to Custer Minerals and Geology program manager, Pat Pierson, who began his career guiding cave tours and fighting fires on the Beartooth District, tours were well received and it was not uncommon to guide 100 people per day through the cave. Tours ended in 1982, primarily due to the cost per visitor ($2 with volunteer guides and $4-$5 with Forest Service guides). Pierson notes that when the Forest Service presence and services ceased, the void was quickly filled with self-guided (or misguided) people who damaged the caves. The cave entrance gate and fence were routinely breached. A barrier constructed across the entrance to the spiral staircase was promptly torn out. Calcite crystals were regularly chipped out of the cave walls and boardwalks were vandalized. According to a 1988 environmental analysis, "It is presumed that we have created an attractive nuisance, and invited people to come and use the Big Ice Cave facility."

A 1988 decision authorized removing the fence and gate across the entrance and allowed unrestricted public entry onto a viewing platform in the upper room. Portions of the boardwalk and the spiral staircase into the second room were removed. A metal grate was installed to preclude entrance into the second room. Since 1988, the grate has been regularly vandalized to allow entry into the second room by climbing a log jammed into the entrance.

Image top, right – Burned "Enter at Own Risk" embedded in ice. Image: Dan Seifert.

Image middle, right – Jason Ringenberger cutting out the old gate. Image: Dan Seifert.

Image bottom, right – The final gate installed in 2010. Image: Jason Ringenberger.

(Big Ice continued on page 12)

(Big Ice continued from page 11)

Dogtooth Spar in Big Ice Cave, Deschutes National Forest. Image: Dan Seifert

Hoarfrost crystals in the second room. Image: Dan Seifert

Evidence of crystal chipping and graffiti are regularly noted. Little to no maintenance has occurred at the actual cave facilities between 1988 and 2008. Through a combination of geology and recreation funding, the Custer National Forest has been working at repairing and revitalizing the Big Ice Cave site. Much of the wood boardwalk was replaced and repaired in 2008 by Beartooth District crews.

In 2009, the asphalt trail was repaired and several bags of trash were removed from the second room. Interpretive signs were installed in 2010. Temperature and humidity data loggers were also installed in the cave and outside the entrance. In August 2010, Jason Ringenberg, with the Forest Service's Abandoned Mine Lands closure crew, fabricated a new metal grate across the entrance to the second room. This required packing metal, a generator, a welder, and various other supplies down the trail, wooden stairs, and boardwalk to the cave entrance. While Ringenberg has closed hundreds of abandoned mine entrances across the country, this was his first cave grate and his first time installing a grate in a mix of ice and rock. Ringenberg's custom grate is anchored into the rock with large pieces of rebar and includes a removable bar with a lock. Overall costs for the personnel time, travel, and grate materials are estimated at $3,500. After the grate was installed, the Custer National Forest issued a special order prohibiting entry into the second room except by permit. Permits and a key are issued to people who agree to numerous terms and conditions and have vertical caving abilities. One party has utilized this permit process to enter the second room and reported a great experience.

While no bats have ever been noted in Big Ice Cave during multiple inventories, there are rumors circulating about a pending White Nose Syndrome (WNS) regionwide closure order for all caves and abandoned mines in effect for summer 2011. With a heavily used picnic area adjacent to the cave, enforcement of a WNS order will be the next challenge in managing the "attractive nuisance" at Big Ice Cave. ▪

The Three Fingers Cave Survey Project

Andrea Croskrey
Geologist,
National Park Service

Jennifer Foote
Volunteer
Lincoln National Forest

Patricia Kambesis
Assistant Director
Hoffman Environmental Research Institute

Volunteers hike through the Lincoln National Forest to Three Fingers Cave. Image: Brian Kendrick

Introduction

Three Fingers Cave stands out as one of the most spectacular caves that inhabits the High Guadalupe Mountains, or the High Guads, in the Lincoln National Forest of New Mexico. The cave is known for its complex, three-dimensional maze with a vertical span of over 150 meters. A variety of speleothems, unusual mineralogies, and paleontological resources abound throughout the cave system. Three Fingers got its name from a distinctive rock formation on the top of a nearby limestone fin that resembles three boney fingers when viewed from the streambed below.

The entrance to Three Fingers Cave, located near the bottom of a rugged and remote canyon, was first reported in the early1960s by cavers who sited it with a high-power rifle scope from Pinks Ridge. Viewed from that distance, the cave entrance appeared to be just a terminal cleft in a limestone wall. That very obscure entrance was finally located, in the late 1960s, by Jim Peck and Bob Sarabia while they looked for a known cave in the general vicinity. The cleft turned out to be a narrow entrance that led to the top of a 27-meter -deep broken fissure requiring rope and dropping into a decorated, massive breakdown chamber

Exploration, Survey History

The exploration and survey of Three Fingers Cave has a long history that is reflected in the multiple efforts to document the cave and its features. Earliest exploration and preliminary survey of the cave system was done by Rich Breich, Peter Jones, Andy Komenski, and Tom Meador from 1968 to 1970 but no map was produced.

(Three Fingers continued on page 14)

(Three Fingers continued from page 13)

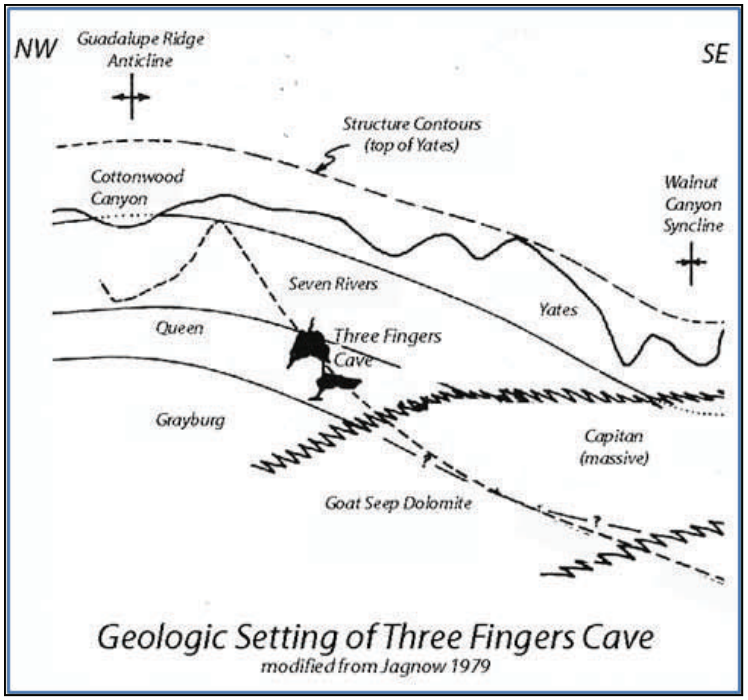
The Guadalupe Cave Survey and Cave Research Foundation attempted more detailed mapping efforts in the mid seventies. They mapped the Bell Room, Temple of the Fiery Cave God and Three Fingers Hall. They did not, however, completely process the data or produce any maps. From the late 1970s through early 1980s Dwayne Whitis and members of the Aggie Speleological Survey picked up the survey torch, setting over 500 stations and mapping 3.5 kilometers of convoluted breakdown-boneyard maze that was occasionally broken up by large chambers. Much of the existing survey had to be redone, and several important new discoveries were made. Whitis et al. produced a solid data set and began producing some of the first maps of the cave, including a vertical profile that began to reveal the three-dimensional complexity of the cave (page 16).

The Aggie survey lost its momentum by the mid-1980s but, once again, another group picked up the task. From the late 1980s through the early 1990s Pat Kambesis from Permian Basin Speleological Survey and Mike Goar from Mesilla Valley Grotto led a project that continued the Aggie survey, adding another kilometer of passage, pushing the depth another 40 meters, and extending the cave's southern reaches under a nearby streambed and into Pink Ridge. As had become the norm for survey efforts, Kambesis and Goar left the area and cave survey efforts languished for almost 16 years.

Geology

Caves are difficult to find in the Guadalupe Mountains because their genesis and development are not directly related to surface processes and, thus, don't leave the characteristic features that cavers typically use to locate potential entrances.

A small representation of the plethora of beautiful speleothems in Three Fingers Cave. Image: Brian Kendrick



Geologic Setting of Three Fingers Cave. Image provided by Patricia Kambesis

(Three Fingers continued on page 15)

(Three fingers continued from page 14)

Val Schmidt examines the Temple of the Fire Cave God in Three Fingers Cave, Lincoln National Forest.

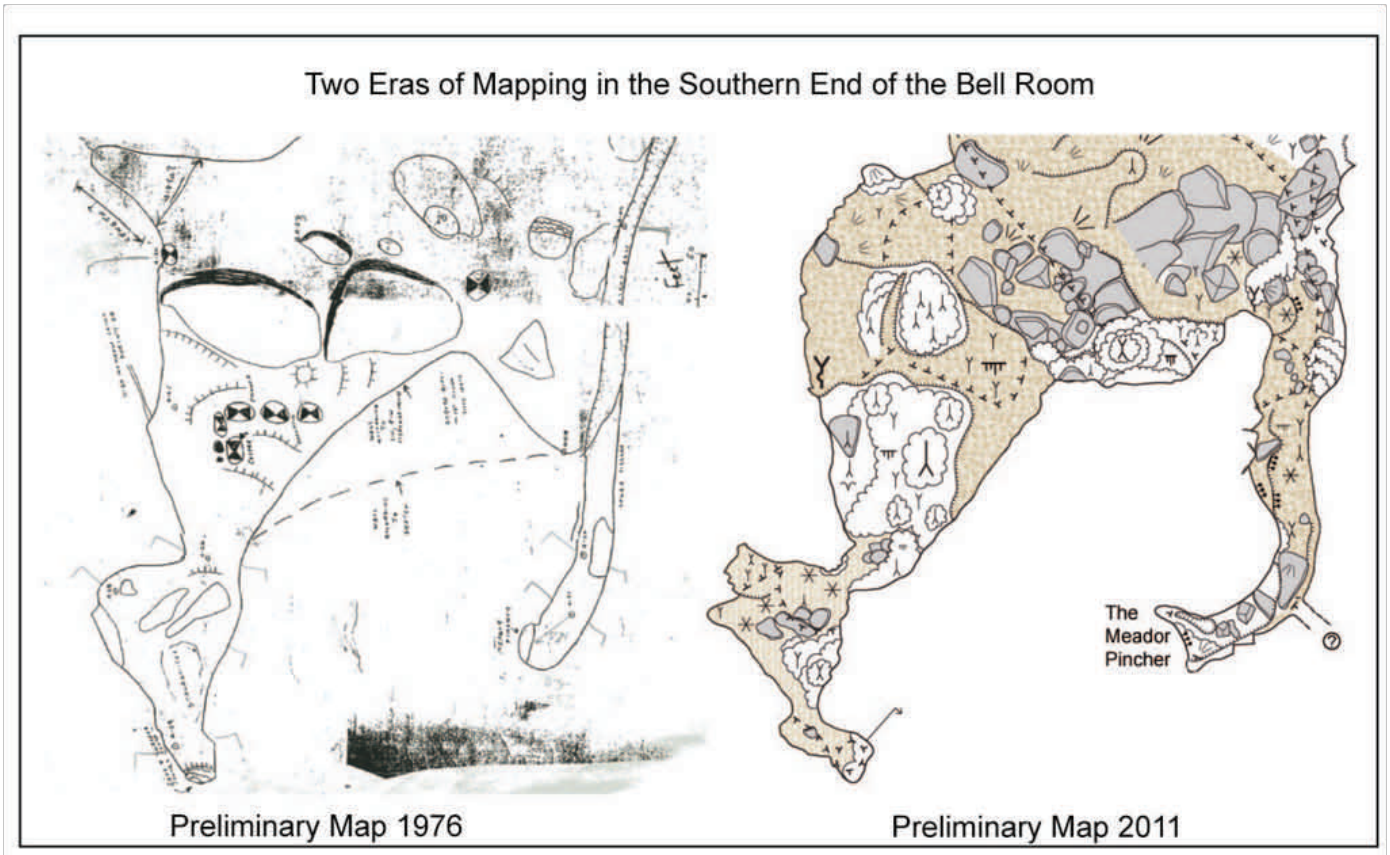
With a few exceptions, Guadalupe Mountain caves (at least most in the High Guads) do not carry underground streams or rivers. The caves are hypogene in nature, which means that they owe their origin to processes beneath the surface. Hypogene caves form without surface entrances and are only exposed due by surface erosion that happens to intersect the existing void.

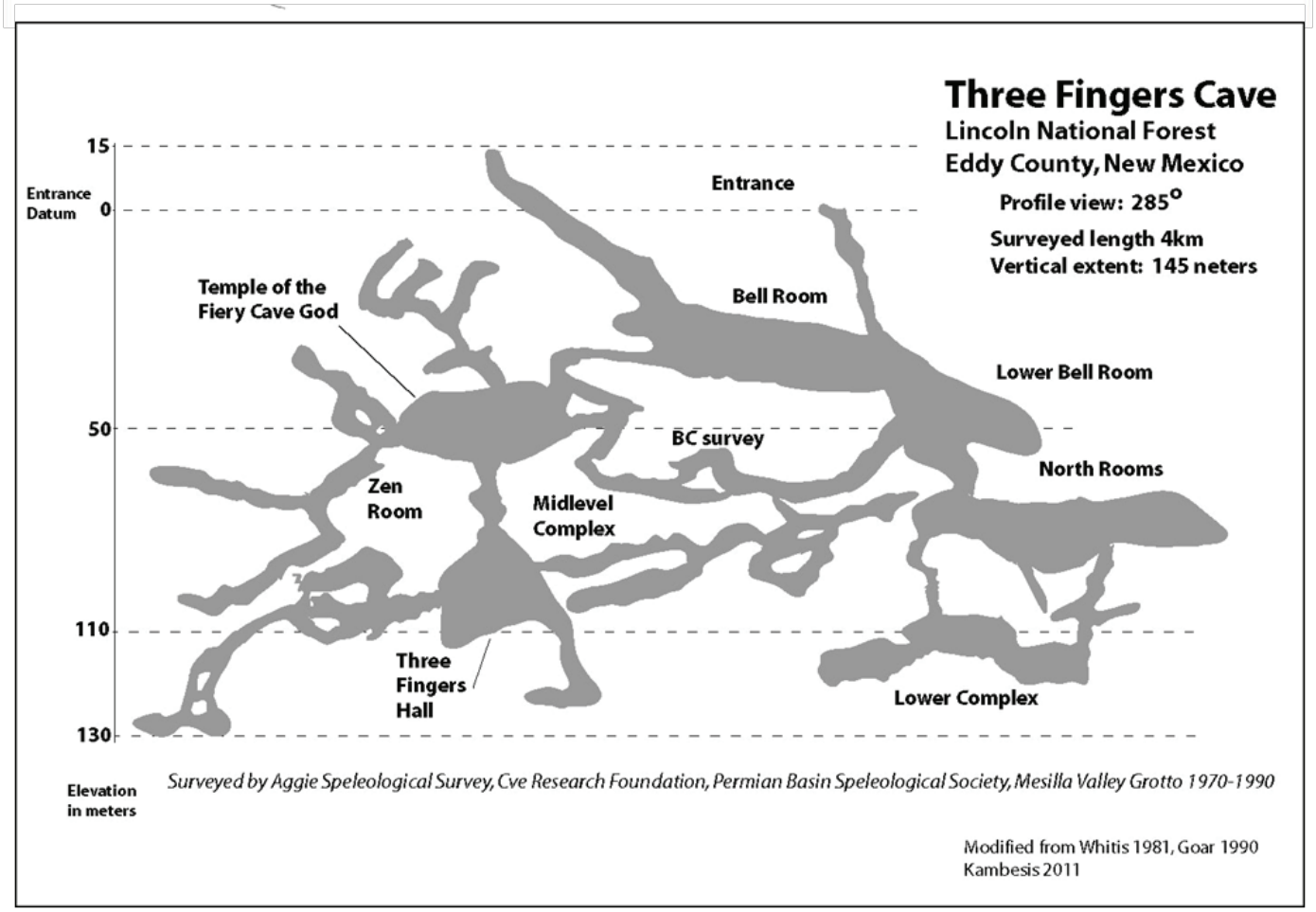
They form by bacterially moderated mixing-zone dissolution, so the caves that exist today are actually relict mixing chambers. Breakdown and secondary mineralizations oftentimes obscure the structure and layout of the original void. Three Fingers Cave is located on the southeast flank of the Guadalupe Ridge Anticline at an elevation of approximately 1,820 meters above sea level. Stratigraphically, the cave is formed in the Artesia Group, which is composed of shallow shelf deposits associated with the Permian-age Capitan Reef complex. The cave entrance is situated within the Seven Rivers Formation and descends into the Queen and possibly the Grayburg Formation, with the southeast side of the cave possibly extending into the Capitan Limestone.

The cave morphology (passage layout) can be described as a boneyard maze complicated by breakdown. True walls are difficult to locate because of the breakdown but in the lower levels of the cave, joint-control is evident. Major joint trends reflect the dominant joint trend noted in other caves of the High Guads (330/150 degrees and 60/240 degrees). The joint trends run parallel and perpendicular to the reef escarpment.

Speleothem development has occurred throughout all areas of the cave. The entrance chamber contains columns 3 to 5 meters tall. Walls and ceilings throughout the cave are festooned with stalactites and stalagmites. Shields, helictites, soda straws, drapery, bacon rinds, and cave pearls are common throughout the cave. Popcorn usually abounds in those areas that display a lot of air movement. Unusual mineralogy includes gypsum (both as crust and as massive needles), celestite patches, goethite stalagmites and lots of rock flour (condensation corrosion). Many of the unusual speleothems and mineralogies from world famous Lechuguilla Cave also occur in Three Fingers Cave, but on a smaller scale in terms of size and distribution.

(Three Fingers continued on page 17)





Top Graphic: Andrea Croskrey. Bottom Graphic: Patricia Kambesis

(Three fingers continued from page 15)

Since restarting the Three Fingers Survey Project in September of 2007, the group led by Andrea Croskrey, Jennifer Foote, and Pat Kambesis has had 10 survey trips. These trips have focused on resketching the Bell Room and have moved on to The Dark Side of the Cave. To date, 3,216 feet of the cave have been resketched, this time with cross sections and profile. See the figure on page 16 for an example of the increased detail and flexibility of digital maps. While resketching these areas, the teams have inventoried 107 survey stations. This is the first time inventory has accompanied survey in this cave. These inventories will provide a baseline dataset of the features in Three Fingers Cave.

Volunteers who have contributed their time to this project include Conor Blanchet, Rich Bohman, Phyllis Boneau, Andrea Croskrey, Tom Dotter, Jennifer Foote, Jeff Goben, Gwen Herrewig, Jon Jasper, Pat Kambesis, Brian Kendrick, Mary Klaus, Johanna Kovarik, David Lambert, Srdjan Pajic, Dave Schmidts, Christa Schneider, Barb Smith, Aaron Stockton, and Nick Wagner. In addition to survey work by the Croskrey-Foote-Kambesis team, the High Guads Restoration Project has set trails, stabilized the entrance to the Meador Pincher, and cleaned mud that had historically been tracked onto flowstone areas.

References

Jagnow 1979. Cavern development in the Guadalupe Mountains, Cave Research Foundation. Columbus, OH. 55 p.▪

Forest Service

Cave and Karst Resources Management Training

About the course: The Forest Service, National Speleological Society Conservation Division, and National Cave and Karst Research Institute (NCKRI), have designed this workshop to explain, explore and identify the unique challenges of protecting, restoring, conserving, and interpreting cave and karst resources. This intensive course includes practical instruction in cave management practices. Topics covered will focus on the essentials of cave and karst resources management, including Federal cave laws, cave inventories and monitoring, development of cave management plans, cave conservation and restoration techniques, development of partnerships and agreements, and much more. The class is designed for State and Federal land managers, private preserve managers, and members of cave conservancies.

Objectives: Upon completion of this course, you will be able to:

Describe and implement the Federal Cave Resources Protection Act and other applicable laws, regulations, and policies.

Recognize the importance of integrating pertinent surface and subsurface components of cave and karst systems.

Identify and evaluate the significance of natural, cultural, and social values of cave and karst systems.

Apply appropriate resource inventory and monitoring techniques to cave and karst management.

(Training continued on page 18)

(Training continued from page 17)

Develop and implement specific strategies to protect, conserve, and restore cave and karst resources, in accordance with appropriate laws, policy, regulations, and best management practices.

Who should attend: Recreation planners, biologists, geologists, land managers, and others involved in cave management

How to apply: To apply for this course, please complete the application (available via email) and submit it to Cynthia Sandeno at cmsandeno@fs.fed.us.

You will have the opportunity to experience a day underground complete with all the cave conservation and ethics practices. We will use appropriate equipment and safety standards for visiting caves. The field trip will focus on implementing the information learned the previous days to reinforce lessons learned. Individuals will conduct a variety of inventories and evaluations in a field setting. Specific exercises will include cave significance evaluations, resource assessments and evaluations, and identification of cave conservation and restoration needs.

Personal equipment you will need to bring includes a helmet, three sources of light, gloves, and field clothes (Field trips will return to Elkins around 6:00 pm).

White-Nose Syndrome Information:
Do not bring caving gear that has been used in White-Nose Syndrome (WNS)-affected States. West Virginia is considered a WNS-affected state. All gear will be cleaned and disinfected following the cave trip according to the latest WNS protocols. For more information on WNS, please visit http://www.fws.gov/whitenosesyndrome. ▪

Regional Cave and Karst Coordinators

Provided by Cynthia Sandeno

National Cave and Karst Resource Coordinator

Forest Service

Region 1

Garry Edson,

Regional Trails and

Dispersed Recreation Management Coordinator

Federal Bldg.

200 East Broadway P.O. Box 7669

Missoula, MT 59807-7669

Phone: 406-329-3150

Email: gedson@fs.fed.us

Region 4

Randy Welsh

Congressionally Designated Areas Program

Intermountain Region

Federal Bldg. 324, 25th St.

Ogden, UT 84401-2300

Phone: 801-625-5250

Email: rwelsh@fs.fed.us

Regions 2, 3, 5, 7

Vacant

(Coordinators continued on page 19)

(Coordinators continued from page 18)

Region 6

Jocelyn Biro

Recreation Fee Program & Developed Sites Coordinator

Pacific Northwest Region, 333 SW First Ave.

Portland, OR 97204

Phone: 503-808-2411

Email: jbiro@fs.fed.us

Region 8

Michael Crump

Regional Hydrologist

Region 8 Regional Office, Room 118 North

1720 Peachtree Rd., NW

Atlanta, GA 30309

Phone: 404-347-3872

Email: mcrump@fs.fed.us

Region 9

Leon LaVigne

Eastern Region Program Manager for: Trails; NVUM; Dispersed Recreation; Cave and Karst Formations; and Fishing, Hunting, and Shooting Sports.

626 E. Wisconsin Ave., Suite 800

Milwaukee, WI 53202

Phone: 414-297-1313

Email: llavigne@fs.fed.us

Region 10

Johanna Kovarik

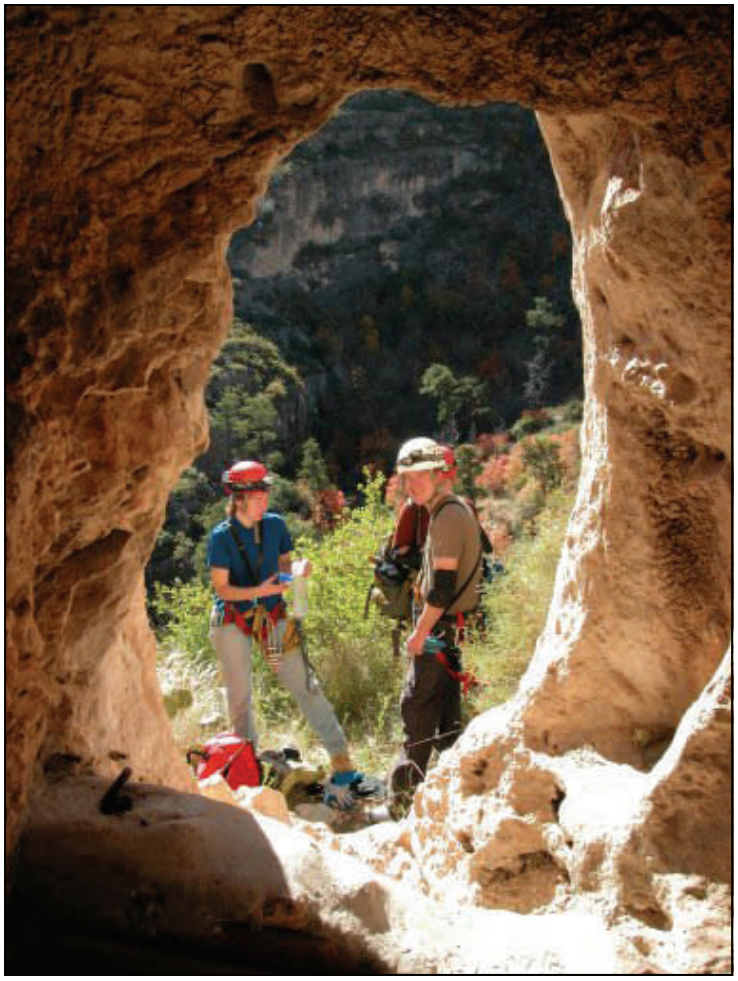
Geologist, Karst Resource Specialist

Tongass National Forest

P.O. Box 19001, Thorne Bay, AK 99919

Phone: 907-828-3224

Email: jkovarik@.fs.fed.us



Andrea Croskrey, Nick Wagner, and David Lambert prepare to survey in Three Fingers Cave, Lincoln National Forest, New Mexico. Image: Srdjan Pajic

NCKMS

KARST ELEVATED

OCT 3-7, 2011 MIDWAY, UTAH

The National Cave and Karst Management Symposium will be held October 3-7, 2011 at the Zermatt Resort in the charming mountain-town of Midway, Utah.

The National Cave and Karst Management Symposium is an important forum for promoting, advancing, and sharing concepts for effective management of cave and karst resources.

It is anticipated that 150 - 200 of North America's elite cave managers and researchers will gather at this event from federal, state, private, non-profit, and academic fields.

Zermatt RESORT

This year's symposium will be held at the award-winning Zermatt Resort. Built in the fashion of the finest luxury hotels and spas of Europe, the Zermatt offers 4-star accommodations, exceptional conference facilities, gourmet dining, our opening social at their geothermal hotsprings, spa facilities, authentic Swiss architecture and stunning views of the Wasatch Mountains and Heber Valley. All at a great rate to ease the strain of travel budgets.

Visit our website at www.nckms.org/2011 for more information and to register, follow us on Facebook
Or visit the venue at www.zermattresort.com

Workshops

Three workshops will be held on the first day of the event.
Bats, Biology, and Karst Science: The Project Underground Education Program. Participants to teach about bats and White-Nose Syndrome, the species and habitats found in caves, and the hydrology of karst systems.
Bat Conservation International will be conducting a Bat Cave Assessment and Management Workshop. This workshop will discuss bats that use caves and cave-like structures, cave assessment, management, and protection, and cave habitat restoration.
Vertical Workshop: This workshop will cover basic knots, ascending, rappelling, SRT system tune-ups, and change-overs.

Sessions

Playing off of the Utah tourism slogan "Life Elevated", the 2011 symposium theme is "Karst Elevated", with a special emphasis on alpine caves and karst. However, papers and presentations on all topics related to cave and karst management are encouraged. This symposium will elevate the importance of all aspects of karst management in the minds of land managers and planners. Abstracts are now being accepted and are required for all presentations and posters. The deadline for submitting abstracts and biographical sketches is August 15, 2011.

Field Trips

The Symposium will offer field trips on Wednesday October 5
Logan Canyon Geology: Join USGS Hydrogeologist Larry Spangler on an all-day trip to Logan Canyon for an overview of the area's alpine karst.
Timpanogos Cave National Monument: This trip will give participants an opportunity to see the beauty of the Timpanogos Cave System while discussing with Resource Managers the alpine location, geology, and size of the cave that has created many unique issues and management challenges.