Forest Service Cave and Karst Managers: Summer Field Season 2009

Johanna L. Kovarik
Karst Resource Specialist, Tongass National Forest

Forest Service cave and karst managers were busy this past summer and fall, getting out of the office through mentoring Geological Society of America (GSA) Geocorp Interns and attending and presenting at conferences around the country. At least four of the Geocorp positions in the National Forests from 2009 were cave and karst related – two of those interns have written articles for this issue! Forest Service cave and karst employees attended meetings and presented technical papers at the International Congress of Speleology in Kerrville, Texas, in July as well as more recently at the Geological Society of America Annual Meeting in Portland, Oregon. At GSA, there was a special Forest Service session as well as several sessions dedicated to cave and karst resource related issues in which Forest Service employees presented. Our next issue will be out in May – the deadline for articles is April 9, 2010. Enjoy the issue – see you in the spring!

Cave Significance in the Pryor Mountains of Montana

Drew Downs
Geological Society of America GeoCorps Intern 2009
Custer National forest

During the Mississippian Period, 359 to 318 million years ago, much of the western United States was covered by a tropical, shallow sea. Today, limestone strata containing coral, brachiopod, bryozoan, and gastropod fossils from the Madison Limestone give us the clues we need to interpret this history. The Madison Limestone presently outcrops in many parts of Montana and Wyoming. This is in large part because of the uplift that created the Beartooth, Bighorn, Pryor, and Wind River mountain ranges from 80 to 55 million years ago, known as the Laramide Orogeny.

As the uplift occurred, many faults and fractures were created within the 1,100 foot thick Madison Limestone, which is an important factor controlling water circulation. The Madison Limestone also happens to be comprised of a very pure form of the mineral calcite.

Inside This Issue

Cave Significance in the Pryor Mountains
Evaluating Forested Karst Topography with LiDAR
Karst Ecology Rises to the Surface
Partners Conduct Sinkhole Clean Up on the Mark Twain NF
“On Rope!” with the Boy Scouts in Southeast Alaska
Old Timer’s Reunion and the Monongahela NF Team Up
GeoCorps Interns Take on the Tongass National Forest
Forest Service Cave Cartography

Cover Image: Deanna Younger evaluates a speleothem in the Lincoln National Forest. Image: P. Cicero
Evaluating Forested Karst Topography with LiDAR

A. E. Edwards
Hydrotech,
Forest Service Center for Forested Wetlands Research

D.M. Amatya
Research Hydrologist,
Forest Service Center for Forested Wetlands Research

Acquisition of recent Light Detection and Ranging (LiDAR) data for a Forest Service watershed modeling project located near Lake Marion, South Carolina is proving helpful in further understanding the complex relationship between karst surface topography and surface and ground water hydrology. One major area of interest in the project watershed is located in a forested nature preserve within Santee State Park with caves, sinkholes, and disappearing streams. This area contains over 300 m of mapped cave (Holler, 2000), composed mostly of stream passages draining ground water to the cave spring. The spring’s nearly constant base flow is a large contributor to the headwaters of a large water body downstream, making this area a vital monitoring location for the USDA - Agricultural Research Station (ARS) - Soil and Water Assessment Tool (SWAT) model used in this project.

More information on this area was needed to locate and identify additional karst features indicative of flow pathways on the surface and underground, but time allotted to field work was limited. Several digital maps were obtained for use with ESRI ArcGIS versions 9.2 and 9.3. A U.S. Geological Survey 1:24,000 5 foot (~1.5m) contour interval topographic map of the Vance Quadrangle in digital raster format was downloaded from the South Carolina Department of Natural Resources GIS Clearinghouse website (2008). The topographic map raster was enhanced with US Army Corps of Engineers digital topographic lines and converted into a Digital Elevation Model (DEM) by Dr. Tom Williams of Clemson University, a cooperator in the Forest Service project.

Aerial Photography in digital format with 1 meter resolution was obtained from the US Department of Agriculture 2005 National Agricultural Imagery Program (NAIP). The raw LiDAR data was collected in 2007 with data accuracy equivalent to less than 2 foot (approximately 0.6m) contours. The dataset used in this project is the terrain (bare earth) Triangulated Irregular Network (TIN), made from processed raw data. The raw data is currently being processed into a DEM for future analysis, which will show much greater detail in topography.

To demonstrate the finer detail extracted from the LiDAR data, views of the same map area with well-developed karst topography are compared (Figure 1). This figure shows the topographic map, digital elevation model (DEM), aerial photography, and LiDAR map. All data are displayed in the same datum and projection in ArcGIS 9.3, including a GPS point representing the cave spring. These three media showed little topographic detail in this karst region. Each map even failed to display the known, obvious features in the nature preserve, such as sinkholes, disappearing streams, and the cave spring. The only map with enough fine detail to demarcate karst features in the topography was found to be LiDAR.

(LiDAR continued on page 5)
Beneath the Forest 4

The faults, fractures, and pure calcite help control cave formation processes in the Pryor Mountains of south-central Montana. Every year people travel great distances to the Pryor Mountains to observe the wild horses. Unbeknownst to most people is that the Pryor Mountains have one of the highest concentrations of caves in the United States. Big Ice Cave is the only developed and regularly visited of the many known caves, and hundreds more are waiting to be discovered.

In late July 2009, a group from the Custer National Forest visited the Pryor Mountains to locate and describe some of the caves in the area. While describing the caves, many criteria are used in characterizing cave significance. These include archeological, historical, biological, geological, speleological, paleontological, and any other unique features that are present. In two days time, two groups discovered 20 new caves and found two previously discovered sinkholes that could not be located from previous location descriptions. These caves ranged in size, shape, and defining criteria listed above. The two teams worked down different creek drainages, which are lined by cliffs made up of the Madison Limestone. With the many drainages running through the Pryors, caves will keep being found far into the future.

Several of the caves appear to have archeological or historical significance. Chive Cave was excavated for archeological looting in what may have been an old fire pit. Further evidence of fires in the cave is present in the form of smoke stains on the ceiling. Buffalo Horn Cave is aptly named for a buffalo horn that was found beneath a ledge near the entrance of the cave. It is not a place a buffalo could get to and any natural process would not likely move the horn under the very narrow ledge. A helping hand, likely from a Native American, seems the most likely way for the buffalo horn to find its way under the very narrow ledge. Double Decker Cave had what appeared to be rock art on a slab of limestone near the cave entrance. The piece is broken and it is hard to tell exactly what it is, but there is definitely scratching on the rock.

Also, near the back of the cave in a second chamber are bones and rocks that have the appearance of being arranged in a pattern. Most of the biological evidence left over in the caves is in the form of pack rat scat and other objects the pack rats have dragged in. Pack rat evidence was found in Chive Cave, Clematis Cave, Tight Spot Cave, and Crackhead Cave. Chive Cave also contained fresh horse scat, which must have been brought in by a pack rat because even an infant horse would not fit in the cave. Kobe Cave, CW Cave, and Eliza Cave contained animal dens, but the type of animals could not be determined by our team.
The excellent accuracy and detail in elevation with the map from the LiDAR data is advantageous for locating topographic features missed in other visual media, particularly in karst landscapes. Analysis is further enhanced by adding other layers in GIS, such as the digitized cave survey on top of the LiDAR (Figure 2). Sinkholes and depressions on the surface clearly follow main ground water passages, indicating a strong relationship between conduit location within the bedrock and surface topography directly above. The conduits that may potentially exist in other parts of the watershed could be found by inspection of surface topography in the LiDAR map, and verified by field techniques such as dye tracing or microgravity.

The more surface and ground water hydrology information that can be garnered from this karst region, the better the calibration of the watershed flow and pathways. This will improve the accuracy of the project watershed modeling, especially since SWAT is a distributed hydrologic model which partitions a watershed into sub basins and reaches. Results from this modeling can then be used for watershed management with respect to nutrient and sediment loading, sensitivity and vulnerability analysis of the landscape for best management practices, and protection of the fragile cave ecosystem.

Acknowledgments
The authors would like to thank Jim Scurry, South Carolina Department of Natural Resources Technology Development Program Director, for Orangeburg County LiDAR data. This data was collected by the South Carolina Consortium, SC Department of Natural Resources, and South Carolina Department of Commerce.

References


South Carolina Department of Natural Resources. GIS Data Resources [Internet]. 2009. Available from: https://www.dnr.sc.gov/GISlidar.html

Figure 2: A digitized cave survey (purple line) over LiDAR relates cave passages to surface topography. The paper survey map (Holler, 2000) was georeferenced with GPS points and digitized in another GIS layer. The pink dot is the cave spring.

Little Brush Creek flows into the entrance of Little Brush Creek Cave on the Ashley National Forest.
Image: D. Herron
Karst Ecology Rises to the Surface

Cynthia M. Sandeno
Ecologist, Monongahela National Forest

The Monongahela National Forest brought karst education to the forefront by hosting an educational booth at the 79th Mountain State Forest Festival held in early October in Elkins, West Virginia. This festival is dedicated to the preservation and conservation of the state's natural resources, and it annually attracts around 150,000 visitors depending upon the weather. The Mountain State Forest Festival is one of the longest standing traditions for Elkins, Randolph County, and West Virginia making it a perfect venue for presenting the importance of protecting karst resources to our community.

The Monongahela invited partners from the West Virginia Division of Natural Resources, U.S. Fish and Wildlife Service, AmeriCorps team members, and local cavers to help staff a 20 by 70 foot area with information and activities about bats, White Nose syndrome, and karst ecology. This educational initiative was geared at educating and engaging children, as well as adults about the singular life forms that exist in the remarkable karst topography that stretches across the United States, and about the connection of these ecosystems to the surface. By engaging the public, the Monongahela hopes to instill in them an appreciation for caves and cave species. There tends to be a direct relationship - the more folks become informed, the more likely their stewardship will increase.

The booth centered around a 60 foot inflatable cave that included stalactites, stalagmites, columns, bats, and cave salamanders. Young cavers were given hardhats with headlamps and a handheld flashlight to use as an alternate light source. They proceeded to crawl into the entrance of the cave down a tight passageway and eventually into a large room.

Staff members guided the cave tours which focused on the importance of cave ecosystems, wildlife species that depend on these ecosystems, how caves are formed, caving softly, the threat of white-nose syndrome, and the link between surface management and caves. Over 2,600 children and adults made their way through the inflatable cave making this a successful day for karst education.
Editor’s Notes:

I’d like to thank all the contributors for this issue as well as Courtney Cloyd for assistance, support, and editing. Please feel free to submit your questions or comments to the editor or to the individual authors. This version of this issue was reproduced for external publication. There are slight modifications from the original layout throughout the issue.

Contributors and Entities represented in this issue:

D.M. Amatya, Ph.D.
Center for Forested Wetlands Research

Drew Downs
Custer National Forest

Amy E. Edwards
Center for Forested Wetlands Research

Gwen Herrewig
The Glacier Grotto

David A. Herron
Ashley National Forest

Klaus Leidenfrost
Mark Twain National Forest

Rebecca Roberts
Tongass National Forest

Cynthia M. Sandeno
Monongahela National Forest

Deanna G. Younger
Lincoln National Forest

Cave and Karst
Calendar of Events

National Cave Rescue Commission
Cave Rescue Operations and Management Seminar

May 15 – 22, 2010
Mentone, Alabama

For More Information:

The Fourth International Symposium on Karst

Malaga, Spain: April 27 – 30, 2010

For More Information:
http://www.cehiuma.uma.es

National Speleological Society Convention

August 2 – 6, 2010
In Essex Junction, Vermont

For More Information:
Abstract due date coming soon!

Look for more information on the next National Cave and Karst Management Symposium which will be held in 2011!
Partners Work Together to Clean Up Conical Sink on the Mark Twain National Forest

Klaus Leidenfrost
Wildlife Biologist, Rolla/Houston/Cedar Creek District

Conical Sink is a 100-foot deep sinkhole located in Phelps County, Missouri. This sink is located immediately adjacent to a county road. Prior to being acquired by the Forest Service approximately 30 years ago, the sinkhole was utilized as a dump. However, even after the dump was closed it was still being utilized as an illegal dumpsite as recently as the spring of 2008. The Meramec Regional Planning Commission (MRPC) received a grant from the Ozark Rivers Solid Waste Management District and Missouri Department of Natural Resources, to pay for the expense of cleaning up Conical Sink. A 75 ton crane with a 202 foot long boom was rented on three days for a total cost of over $9,150. The grant funds also paid for transfer station disposal costs, safety equipment, fence installation, food and drinks for volunteers, some heavy duty trash bags, and other supplies.

Clean-up work began in November 2007 and was finally completed in November 2008 with the construction of a fence between the county road and Conical Sink. Implementation of the project took about one year because of numerous weather delays. Another reason that this project took so long is that many pieces of trash had to be handled numerous different times. First the trash was bagged up, after that the trash bags were moved and stockpiled at the bottom of the sinkhole. During the three different crane days, the trash bags were loaded by hand into cargo nets and the crane would lift the cargo nets out of the sinkhole.

These cargo nets had to be unloaded by hand. Then the trash bags were placed into waiting dump trucks or a backhoe bucket (which emptied the trash bags into waiting trucks). The South Central Correctional Center (SCCC) in Licking Missouri provided the vast majority of the labor for this project. They contributed 177 work days (including Inmates and Correctional Officers). Volunteers worked a total of 33 days. The volunteers included employees of Walmart, students from Missouri University of Science and Technology, educators, cavers, employees of both the Missouri Department of Conservation and Missouri Department of Natural Resources, and other interested individuals. Walmart Distribution Center 6069 donated $1,000 and the Missouri Cave and Karst Conservancy donated $500 to help with the overall expenses of this project. In addition, Walmart supplied over 2,250 heavy duty trash bags and numerous cases of bottled drinking water.

The Phelps County Highway Department (PCHD) also provided help for the project. They hauled all the trash to the transfer station in Rolla, Missouri and all the metal to a metal recycling location. In addition, they hauled a truckload of tires from the sinkhole and provided over 1,000 trash bags. The PCHD also supplied the material and constructed a berm between the county road and Conical Sink.

(Sinkhole clean up continued on page 8)
Workers assist trash removal from the bottom of Conical Sinkhole. Image: R. Long

Full bags of trash waiting pick up via crane out of the bottom of Conical Sinkhole. Image: N. Tunyavanich

County dump trucks wait in line to haul away metal and trash. Image: R. Long

The Crane lifts a full cargo net of trash from Conical Sinkhole. Image: R. Long

Bags of trash from Conical Sinkhole are emptied into county dump trucks. Image: N. Tunyavanich

A berm and fence were constructed to discourage future dumping in Conical Sinkhole. Image: K. Leidenfrost

(Sinkhole clean up continued from page 7)
Bones were found in Wilson Cave (jaw bone and wood), Tom’s Pit (four jaw bones found by a previous group), and Double Decker Cave (unknown bone). It is not known if these bones are from animals crawling in the caves and dying, or from being brought into the caves by a predator or Native Americans. Eliza Cave and Double Decker Cave also contained moth wings on the floor, evidence that bats inhabit the caves at times. A side trip to Little Ice Cave revealed that bats inhabit this cave as well through the sighting of two bats roosting in the cave.

The geological significance of the caves was in the form of calcite crystal growing in various areas of the caves. Most of the calcite crystals have been exposed to the atmosphere long enough to be strongly weathered. However, some of the crystals are fresh and were found in Chive Cave, CW Cave, Wilson Cave, and Eliza Cave. Speleothems were only identified in two of the caves. Clabaugh Cave contained some flowstone, and Tight Spot Cave had popcorn structures on the ceiling. Fossils are found throughout the Madison Limestone and the Pryor Mountains in particular. Paleontological specimens were found at many of the cave entrances. Brachiopod, horn coral, and bryozoan fossils were found at Raspberry Cave, Panther Cave, and Double Decker Cave. Wilson Cave contained only brachiopod fossils. The side trip inside Little Ice Cave also revealed a previously known room that contains brachiopod, horn coral, and bryozoan fossils in abundance.

With the Madison Limestone making up the bulk of the Pryor Mountains, it is likely that a hundred to possibly thousands more caves await discovery. Native Americans have inhabited the Pryor Mountains for thousands of years and the chance of finding more caves with archeological and historical significance is great. This holds true for the other criteria as well. Many areas with fossils, crystals, and recent animal habitation are known and many more will be discovered in the near future. The more caves discovered the greater our knowledge of the Pryor Mountains geologic and historic past will be enhanced.

Approximately 59,000 pounds of trash was removed from Conical Sink. In addition, 11,500 pounds of metal (which was recycled) and 126 tires were also removed from Conical Sink. After Conical Sink was cleaned out, a berm was built between the county road and the sinkhole. On top of the berm a chain-link fence was installed to discourage any future dumping.

Slaughter Sink (one of the largest sinkholes in the State of Missouri) is located within ¼ mile of Conical Sink. This sinkhole is located approximately 450 feet from the same county road as Conical Sink. Unfortunately, there are over 75 tires in this sinkhole.

This area is typical of the karst topography which is common in the Missouri Ozarks. Both Conical and Slaughter Sinks are located within approximately one half mile of Onyx Cave and ¾ miles from Boiling Spring, one of the larger springs which feeding the Gasconade River. 

Approximately 59,000 pounds of trash was removed from Conical Sink. In addition, 11,500 pounds of metal (which was recycled) and 126 tires were also removed from Conical Sink. After Conical Sink was cleaned out, a berm was built between the county road and the sinkhole. On top of the berm a chain-link fence was installed to discourage any future dumping.

Slaughter Sink (one of the largest sinkholes in the State of Missouri) is located within ¼ mile of Conical Sink. This sinkhole is located approximately 450 feet from the same county road as Conical Sink. Unfortunately, there are over 75 tires in this sinkhole.

This area is typical of the karst topography which is common in the Missouri Ozarks. Both Conical and Slaughter Sinks are located within approximately one half mile of Onyx Cave and ¾ miles from Boiling Spring, one of the larger springs which feeding the Gasconade River.

Forest Service Statement of Nondiscrimination:

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual’s income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA’s TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.
Beneath the Forest 11

On Rope! Boy Scouts of America on the Tongass National Forest

Gwen Herrewig
The Glacier Grotto of the National Speleological Society

Johanna L. Kovarik
Geologist, Karst Resource Specialist, Tongass National Forest

Back in December of 2008, Boy Scouts of America troop leaders Keith Pahlke and Rick Edwards approached Johanna Kovarik in the planning phase of their yearly High Adventure trip to discuss the feasibility of getting the boys ready for an intense caving adventure. Johanna felt that it was in line with the Forest Service’s mission to get “kids out in the woods” to work with the scouts. Also, there were not many opportunities for kids in southeast Alaska to experience the world class cave and karst resources right in their backyard. This provided an excellent opportunity to introduce southeast Alaskan youths to the wild Alaska underground. If all went smoothly, this trip could provide a method for future outings with children and caves.

As a fellow experienced caver, I remember my amusement when Johanna told me that the Juneau Boy Scouts of America Troop # 11 were planning to do a vertical caving trip to POW in June 2009. But with months to prepare and several stipulations and mounds of federal paperwork out of the way, Johanna agreed to help out and recruited the assistance of Alaska’s Glacier Grotto members.

(Scouts continued on page 12)
That's how I got involved, along with Grotto President David Love and fellow members Rachel Myron, Matthew Thompson, and Sarah Cervone. The first item of business was to organize vertical cave training sessions in order to prepare 15 boys and 2 scout leaders for the trip. The first session in Juneau, February 2009 provided an introduction to the equipment and skills that each scout would be required to learn before participating.

Johanna and the leaders set a 13-year-old minimum age limit for the vertical cave portion of the trip, however it was decided that horizontal trips would be arranged for those who were too young or not able to do the vertical caving portion of the trip. The boys who wished to continue purchased their own full set of vertical caving gear (Frog systems with micro racks for the caving aficionados in the audience) for the next practice and were soon dangling on rope above the gym floor. This was the official kick-off to multiple weeks of instruction. Johanna told the scouts that each, including the leaders, would have to learn how to use their gear by climbing up, thumbing down, and changing over from ascending to descending gear before going into the caves. If you are new to vertical caving, a changeover is accomplished when a caver switches from ascending to descending gear (or vice versa), while hanging on a rope. It’s not always easy to learn, particularly for the uncoordinated. The scout leaders also drove home to the group that Johanna was in charge – it was her decision which boys were proficient and mature enough to take on the challenge of vertical caving in southeast Alaska.

I suspect teaching cavers the skills necessary for vertical work is easier than teaching a group of young Boy Scouts. Cavers know why they need to learn how to safely drop into a pit. Sometimes I wondered if the boys had any idea what they were getting into - I mean, how could they? A couple boys accomplished the changeover right away without too much grief. A few struggled.

Some couldn’t unhook the croll (chest ascender) no matter how many times they heaved their weight one way or another. Others tried until they burned out three feet off the ground, and then had to be lowered. Each week, however, got better and the scout leaders described how they had purchased ropes, and with the help of the grotto members, learned how to rig them in trees and practice at home between official sessions. Also during this time, the Boy Scouts met with President David Love, who gave the scout group, leaders, and their families a presentation on cave ethics and cave safety. This also provided an excellent question and answer period for all involved in the trip to Prince of Wales. In addition, emails were flying between Johanna, I, the leaders, and the parents.
By the time the boys arrived on POW, the group leaders confirmed that they all achieved the changeover and the scout group was prepared to cave safely and ethically. Trying to predict the unpredictable, we wanted to prepare the boys for the pressure they would be under on rope, 80 feet above the ground. Johanna decided to create a scenario that introduced stress into the equation by giving them a timed changeover test. Hanging off a bridge, each scout and each leader had six minutes to rappel down, changeover, climb up, and then changeover again to rappel the rest of the way down – or they would not be able to drop into the cave the next day. Nerves were high in scout camp that evening. Each scout was allowed two chances. In the end, we had total success with the changeover drill. The group’s desire to learn was impressive along with their ability to show off once they figured it out.

During practices, Johanna and I emphasized to each scout how important independent problem solving and gear management were – since you are basically by yourself on rope! Each scout’s ability to problem solve independently on rope had improved greatly, and they all demonstrated this to the max during this timed drill. The cheers from the group as each scout accomplished the task were raucous as they looked forward to the actual event. It was clear to us that the scouts were ready for the challenge that lay ahead – however, now the boys had to prove it to themselves.

Early the next morning, the group was quiet as we approached Starlight Cave. The massive pit fell away at their feet as they arrived through the clearing in the forest. This was the biggest pit they’ve ever seen and the point of no return. The elephant in the room for the boys was every possible outcome they could think of when dangling over an 80 foot chasm. Sarah Cervone and I assisted Johanna with rope rigging and general trip preparation. Johanna gave the scouts one last bit of instruction and then took her place at the top of the pit on a second rope to assist each boy as he prepared to rappel over the edge for the first time.

Sarah Cervone was already in the pit, offering a bottom belay for anyone who needed it. I held the camera by a third rope rigged in a less scary area, just in case... Their parents were on the other side of the pit, watching in solemn anticipation.

(Scouts continued on page 16)
The Monongahela National Forest Teams Up with the Old Timer’s Reunion for a Sinkhole Cleanup!

Cynthia M. Sandeno
Ecologist, Monongahela National Forest

At this year’s Old Timers Reunion, more commonly known as OTR, the Monongahela National Forest joined forces with local cavers to provide activities that would benefit karst without going underground. The Old Timers Reunion is the largest gathering of cavers in the United States meeting annually in West Virginia. The event provides a chance for cavers to get together and visit friends, go caving, and participate in fun above ground activities. Since the Forest Service closed caves in the Eastern Region due to White-nose syndrome, the Monongahela National Forest wanted to provide cavers with other karst related opportunities besides caving. The entrance to Pink Helictite Cave is found at the base of a sinkhole which folks had been using as a dump for many years. The sinkhole is adjacent to a county road making it easily accessible by those looking to unload their trash. Water enters the cave from both a spring that pours over the limestone cliff on one side of the sinkhole and by overland run-off that passes through the household trash-laden sinkhole.

While a pile of trash is not an attractive sight, it can certainly do more than just spoil the natural beauty of a place. Sinkholes are directly related to groundwater quality. Water is naturally purified as it passes slowly through soil. Where soil cover is thin, groundwater may not be filtered sufficiently to remove surface contaminants. Surface water that enters a sinkhole passes immediately into the groundwater reservoir without any filtration. In addition, contaminants that enter a sinkhole are carried away from the sinkhole at a very high rate of speed. And, pollutants leaching from trash can enter drinking water.

Of particular concern are chemicals found in containers of oil, pesticides, herbicides, and fertilizer that have been thrown into these illegal dumps. These were some of the reasons that the Monongahela National Forest was interested in cleaning out the sinkhole. The Monongahela partnered with The Mountain State Grotto to host this important event. This grotto was the first to identify the trash problem. Together, they worked with West Virginia Department of Environmental Protections’ Land Restoration group who provided trash bags, gloves, and waste disposal. While the largest and most obvious trash was removed by a contractor including tires, trash barrels, sofas, and even a kitchen sink; volunteers were needed to remove the household trash that remained buried in the sinkhole. This trash had been covered by sediment carried into the sinkhole over many years resulting in several trash horizons. “Sinkholes are like icebergs. Almost ninety percent of the trash is under the surface,” said Forest Geologist Linda Tracy concerning the condition of Pink Helictite Cave.

Volunteers from several grottos including Eight Rivers, D.C., G.R.O.S.S., Maggoty Cow, Monongahela, and the Mountain State were present to help remove garbage. And, by the end of the day, 54 bags (about one ton) of trash were removed from the sinkhole. The event also resulted in interest from a local non-profit group to host their own cleanup at the site. The Appalachian Forest Heritage Area will be hosting a clean-up at the sinkhole on “Make a Difference Day,” October 24th.

While cleaning up our groundwater is a noble cause, even more important is the educational message the effort sent to the surrounding community. “Karst is important, and it is not okay to use sinkholes for a dumping ground,” said Forest Geologist Linda Tracy. “We look forward to the day when everyone takes their stewardship responsibility seriously and we no longer have anything left to clean up.” With the generosity of our many partners, the Monongahela National Forest is working to protect the water supplies of Pocahontas County while enhancing its natural beauty. Soon, with the help of many hands, we hope to reach clean, natural ground.*
Beneath the Forest 15

Geological Society of America GeoCorps Interns Take On the Tongass National Forest

Rebecca Roberts
Geological Society of America Geocorps Intern 2009
Tongass National Forest

With nearly 17 million acres, the Tongass National Forest in Southeast Alaska is the largest national forest. In this region, the limestone underlying a temperate rainforest generates a karst landscape with extensive cave systems. The karst topography is often in dense forest that is difficult to explore, and caves in the area are typically wet and undeveloped. Some of the caves are not visible until you are standing next to the entrance while others have large pit entrances that are 200 feet in diameter. Proper equipment and a cave ethic for maintaining the fragile environments are necessary for cave exploration in the area.

Out of the estimated thousands of caves in the Tongass, local cavers and the Forest Service have inventoried approximately 650, mainly on north Prince of Wales Island. The objective for the summer was to create a GIS Cave Database for Prince of Wales Island. This task involved going into the field and relocating caves that have been discovered in the last 20 years. Additionally, this job entailed strenuous hikes through all types of terrain to capture images of geologic features and complete inventory sheets at each cave entrance.

Once my field partner and fellow Geological Society of America (GSA) Geocorp Intern Dylan Linet and I found the caves - sometimes a difficult task, we filled out an inventory sheet, which included GPS location, a description of how to reach the cave, a description and sketch of the cave entrance, and any other pertinent comments. Back in the office, we compiled our geological field observations and GPS locations into a master GIS Cave Database.

By starting the project this summer, Dylan and I laid the groundwork for the Cave Database. Nevertheless, we only relocated and completed inventory sheets for close to 100 out of approximately 600 caves on the island.

(Interns continued on page 16)
Each boy stood in line waiting his turn. All were nervous. We were nervous for them, but knew they had the skills to rappel safely. Still, the big, blue elephant was in the shadows below, blinking as each scout dropped over the edge. Considering everyone's stress level, the day was thankfully, uneventful - with the exception of one boy who got the strap from his backpack jammed in his rack in the highest, most exposed area. Luckily with Johanna's direction at his side, he remembered how to free his equipment safely, and continued down once he recovered. At the bottom, the boys explored the cave system. Johanna, Sarah, and I breathed a sigh of relief. We probably should have made them ascend up the full length of the pit, but for the sake of time and our nerves, we suggested they ascend the second, less scary, shorter rope. Sarah guided the boys in the cave below and Johanna worked her way over to meet me at the top of the short climb. I went in and assisted Sarah with the boys, while Johanna prepared to help the boys at the top of the climb with any difficulties. At the end of the day, the light in the boys’ eyes and the smiles evidenced their excitement with exploring the underground world via rope. Many shouts of, “what big pit is next??” were heard the trucks on the way back to camp, mirroring many a vertical caver’s thoughts as they surface.

Day three, with the hard part behind us, we led the scouts deeper into the Forest for a horizontal caving trip. The scouts were given topographic maps with the location of the cave on it, and were taught how to orient to the entrance as part of the trip. The hike to the entrance took about an hour. The cave itself was long enough that we could be inside for an hour or so, but short enough to see all of the areas that were not too delicate for visitation. Speleothems decorated several areas, a few short climbs and interesting maneuvers delighted the adventurous boys. Once back outside the boys were happily covered in mud as they headed back to camp out by the ferry on their way safely home to Juneau.

An undertaking of this size cannot be accomplished without many helping hands. We would like to thank the members of the Glacier Grotto of Alaska: Rachel Myron and Matthew Thompson for their time at rope nights, Sarah Cervone for her assistance in the field, and to President David Love for not only his time and gear in helping out at rope nights, but also for presenting cave ethics and cave safety to the scouts.

Thanks to Forest Service Archaeologist Risa Carlson and her assistant Megan for teaching the scouts about Cave Archaeology in the area and Forest Geologist Jim Baichtal for preparing fossil hunt maps for the boys. Additional thanks go to all the personnel in the USDA Forest Service and the Boy Scouts of America at every level for all the paperwork processed in order for this to take place safely – as well as for patiently listening as we explained why we were taking 15 boy scouts underground, what it involved, and how it could be done safely! ▪

Completing the cave database requires more fieldwork to further relocate and discover caves. The database also serves as a ground for future projects, such as a bio inventory of the caves.

This internship helped to strengthen my life path after college and invigorated my sense of adventure. By figuring out how to solve problems as the project progressed through the summer, I gained self-confidence. I was able to further develop my skills as a geologist, a valuable resource for my future endeavors. Furthermore, the experience was indispensable for my personal and professional growth and prepared me for the future in many ways. I enhanced my ability to be decisive and get things done. I strengthened my personal confidence in geological interpretations.

It was great as my first job out of college and worthwhile to use my knowledge for practical application in the field. I am very fortunate to have found such an opportunity and to be paid for what many would do for enjoyment. ▪