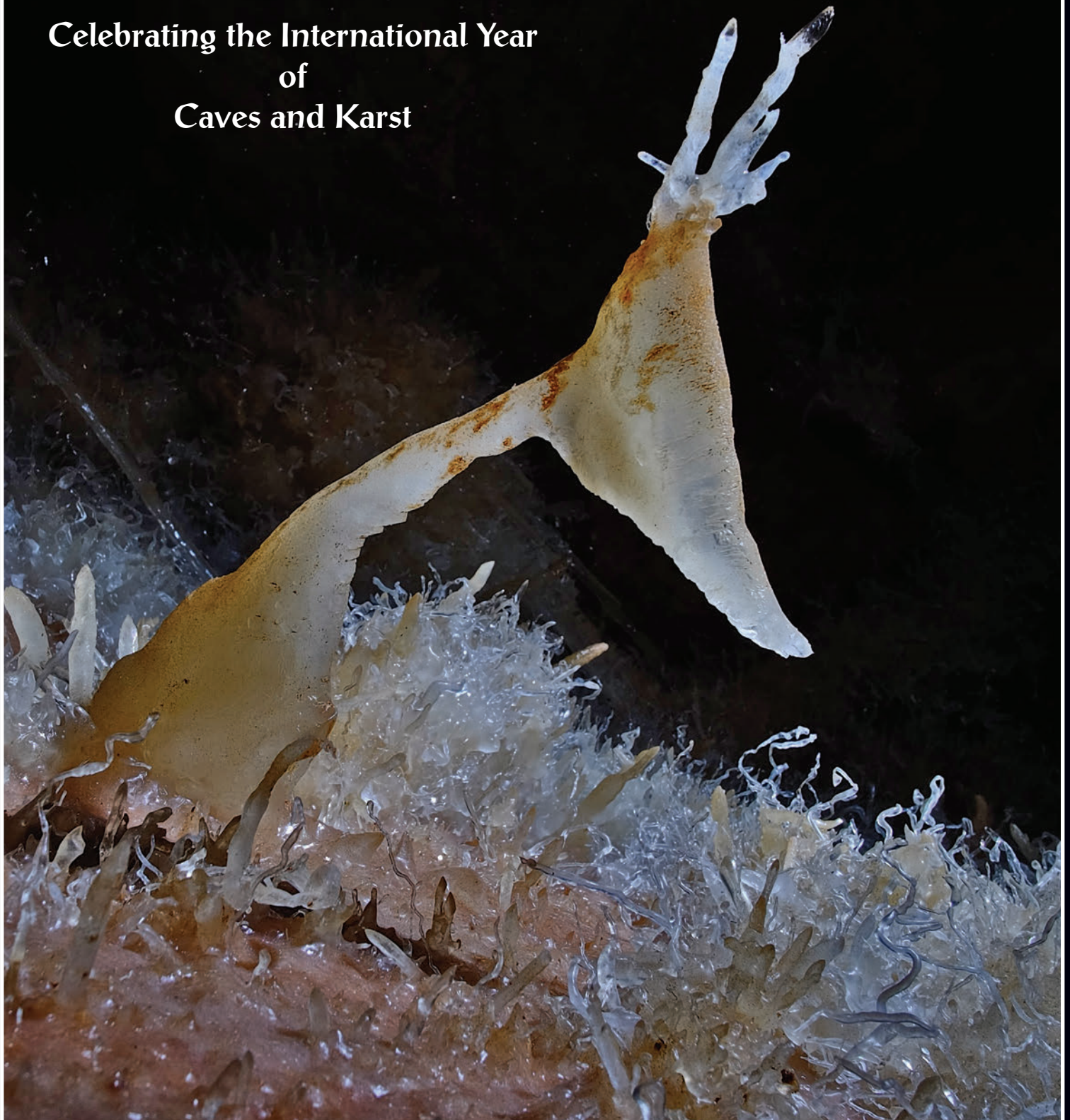


NSS NEWS

April 2021

Annual Conservation Issue

**Celebrating the International Year
of
Caves and Karst**



CALENDAR

USA

Feb-May, 2021—NSS Virtual Cave Rescue Series. Second and Fourth Wednesdays of the month through the end of May, 2021. 8-10 pm (Eastern) on the NSS Zoom channel. Topics include patient perspectives, rescue pre-planning and operations, patient management, hazardous atmospheres, rescuer care, and more. To register for these talks, go to: tinyurl.com/4jzmz7et

June 28-July 2, 2021—NSS Convention in Weed, California. <http://nss2021.caves.org/>

August 6-8, 2021—Come to the 68th Annual Indiana Cave Capers 2021 Edition! This year we are back at Crawford County 4H Fairgrounds near Morengo, Indiana, home of the 2007 NSS National Convention. This will be another great Capers hosted by the Central Indiana Grotto featuring access to some of the most rare and beautiful caves in Indiana. Enjoy camping, live music, banquet, speaker, prizes and more! Watch for pre-registration discounts and more info coming soon. For more information, go to www.cigcaves.com.

August 13 - 15, 2021—Karst-O-Rama, at Great Saltpetre Cave Preserve, Mt. Vernon, Kentucky. We're bringing Karst-O-Rama back! Great cave trips and camping, vendors, and a live band with a costume party pair well with our sauna, hot tub, creek splashing, and, of course, feeding your thirst at the Guano Grill for three days of downright speleo-fun! This year's theme has yet to be decided. KOR is hosted by the Greater Cincinnati Grotto with pre-registration discounts and info available soon! For more information, see our website at: karstorama.com/.

November 1-5, 2021—2021 National Cave and Karst Management Symposium (NCKMS 2021) will be held in San Marcos, TX, part of the beautiful Texas Hill Country. Featuring Dale Pate, NPS National Cave and Karst Program Coordinator from 2007 to 2017 and Cave Specialist for Carlsbad Caverns National Park from 1991 to 2002, to speak at the banquet! Learn about "Endangered Species, Endangered Caves, Endangered Aquifers." Field trips to local caves and special access to local show caves! Glass-bottom boat tour of local spring! T-shirt! Online pre-registration is open. Reserve your hotel room for reduced rates in an arranged block of rooms at two hotels. More details at symposium2021.nckms.org

INTERNATIONAL

July 23-29, 2021—18th International Congress of Speleology, (Lyon, France), <http://uis2021.speleos.fr/>

Send items for the calendar to davebunnell@comcast.net at least 4 weeks before desired month of publication (e.g., by April 1 for the May issue).

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Front cover:

"The Reindeer" by Florian Bachmann, from the 2020 NSS Photo Salon

Welcome to the International Year of Caves and Karst! A Guide to Planning Virtual Events

Dr. George Veni,

International Union of Speleology President



For the first time in history, the global speleological community is united in 2021 in one grand project, the International Year of Caves and Karst (IYCK). The main goal of the IYCK is to teach the world about the many benefits of caves and karst. As I write these words, the International Union of Speleology (UIS) and its 55 member countries are joined by over 150 international and national organizations as partners, and more organizations have told me they are planning to join. Several of these partners are not cave organizations, which is a success in itself. Their alliance with the UIS proves that the IYCK is seen as broadly important, and not limited to speleologists.

The greatest alliance came in September, when the UIS was invited by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) to hold the Opening Ceremony of the IYCK at UNESCO Headquarters in Paris. Speleology has never had such a high international stage to reach large numbers of influential national ambassadors and their governments and show them how very important caves and karst are to their countries.

Yet despite this success in partners, we are challenged by the COVID-19 pandemic. Soon after we received the UNESCO invitation, Paris was declared a COVID "red zone"; thus, the Opening Ceremony was held virtually on 26 January 2021. Watch the IYCK Website (www.uis-speleo.org) and UIS Facebook page (<https://www.facebook.com/uiisspeleo>) for announcements about all IYCK events. The UIS is now working with UNESCO to schedule an IYCK celebration sometime later in 2021 as allowed by the virus.

Over the past few months, I have received many messages from people who want to organize activities of the IYCK, but don't know how because of the pandemic. One year ago, the UIS published a Planning Guide to help our members and partners develop IYCK events. Two months later,

the world's activities closed because of COVID-19.

Below, find new directions on how you and your clubs can create virtual IYCK events and conduct other valuable activities safely during the pandemic. If you have your health, a computer or phone, and some free time, you can make important contributions to the advancement of speleology while staying safe at home.

Visit the IYCK Website. The website has a lot of general information about caves and karst. Share it with people so they can learn more. Go to the Download page for the logo, leaflet, posters, and other materials to help you. You do not need special permission. The information is free and open to everyone. Also, remember to share the UIS Facebook page.

Understand the IYCK goals. The purpose of the IYCK is to teach the world about caves and karst. Think about the best ways to reach people who need to know what speleologists understand. If you organize meetings for cave explorers and scientists, that is good, but it is important that they include the public too, or at least some influential people who need to learn about caves and karst. I'll give some examples below but remember to stay focused on the public.

"International" does not always mean "big." Some people think that because this is the International Year, they need to plan big and complicated activities. If you can do that, excellent! But many times, several small activities can be better at reaching the public than one big event. The UIS has said from the start that you should "do what you can." No activity is too small!

Use virtual tools. There are now many ways to connect with people. Use teleconference tools like Zoom to give lectures about caves and karst. Do you know teachers? Offer free lectures for their students about caves. You can do the same for meetings of non-speleological organizations. You can also record your voice in PowerPoint as you give your lecture, then load it on YouTube or social media for download. Go out into the karst with your camera or camera phone and record a field trip that you can share. For a small amount of time and effort, you can reach hundreds or thousands of people this way over the year.

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POSTMASTERS OR MEMBERS:
Send address changes to the National Speleological Society Office, contact information below.

National Speleological Society Office

6001 Pulaski Pike NW, Huntsville, AL 35810

Tel: (256) 852-1300

e-mail: nss@caves.org; Web site: <http://caves.org/>

Please contact the office for address changes or back issues.

NSS EXECUTIVE COMMITTEE

President

Geary Schindel
Bexar Grotto
San Antonio, TX
president@caves.org
(210).326.1576 cell

Operations VP

Maureen Handler
Sewanee Mountain Grotto
Sewanee, TN
(423) 605-5569
ovp@caves.org

Administrative VP

Adam Weaver.
Paha Sapa Grotto
Rapid City, SD
(605) 545-5550
avp@caves.org

Executive VP

Scott Engel
Smoky Mountain Grotto
Knoxville, TN
(225) 281-3914
evp@caves.org

Secretary/Treasurer

Kristine Ebrey
Sewanee Mountain Grotto
South Pittsburg, TN
(423)-991-3034
s-t@caves.org

NSS NEWS EDITOR

Dave Bunnell, Ph.D.
Box 879
Angels Camp, CA 95222
nssnews@caves.org

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<https://caves.org/pub/nssnews/style.shtml>

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DEPARTMENT EDITORS

ASSISTANT COPY EDITOR

Gary Gibula
garygibula@aol.com

CONSERVATION

Jim & Val Hildreth-Werker
PO Box 207
Hillsboro, NM 88042-0207
(575) 895-5050
werks@cunacueva.com

SPELEAN SPOTLIGHT

Gary Gibula
garygibula@aol.com

NEWSLETTER REVIEW

Ian Reuter
5560 Sierra Court
Rapid City, SD 57702
ianreuter@aol.com

CAVE CHRONICLES

Philip Rykwaldner
philip@cavenow.com



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Dare Mighty Things—Steward and Sustain

Val Hildreth-Werker and Jim C. Werker, NSS Conservation Joint Chiefs

We dedicate this 2021 NSSNews Conservation Issue to the honor and memory of those affected by the heart-breaking consequences of the COVID pandemic. May we continue to “dare mighty things” as we honor our caving family and celebrate the International Year of Caves and Karst 2021.

Theodore Roosevelt’s words, from his famous 1899 speech in Chicago, still ring true for 2021:

“Far better it is to dare mighty things, to win glorious triumphs, even though checkered by failure, than to take rank with those poor spirits who neither enjoy much nor suffer much, because they live in the gray twilight that knows not victory nor defeat.”

From March 2020, ‘round the seasons ‘til now, was a year like no other in our living memory. Through the chaotic panoply of societal challenges thrust forward by pathogens and pandemic, several things are clear. Beyond balancing every decision against the threats of getting sick or infecting others, even when we are again freely traveling, caving, and going to speleo-gatherings, the lingering social

tolls of COVID and the puzzling aftermath syndromes and other pathogenesis will never truly return us to a pre-pandemic world. Working together to seize and surmount the challenges ahead, cavers continue to dare mighty things and find new ways to protect and sustain our underEarth.

This is the year to reach out and celebrate caves! Help engage the world in cave awareness throughout this International Year of Caves and Karst 2021. Accomplishments through speleological exploration are progressing side-by-side with space exploration. We explore the mighty frontiers of inner Earth as humankind spans the mighty reach to other planets. We celebrate both as NASA’s Perseverance rover safely begins a new era at Mars’ Jezero Crater to seek signs of ancient life, collect and cache samples of rock and regolith (broken rock and soil) for possible return to Earth, and demonstrate new exploration technologies as we strive toward a future of more sustainable options.

Caving encompasses conservation and sustainability. Spelean systems archive keys to sustaining life on Earth and clues to potential life on other planets. They are the sacred voids of Earth, appointed by nature

to harbor a daunting array of indicator values. Newly discovered spelean assets are explained in an ever-increasing volume of academic information. Caves hold data on past and present climates, extremophile and indicator species, vital karst groundwater quality, historic and prehistoric cultural remains. The fabric and fragments of natural history await discovery, cradled within spelean spaces.

Cave exploration, survey, inventory, and cartography open portals to valuable scientific stories of natural and cultural processes. Surprisingly robust over eons, yet delicately balanced on micro-ecological scales, caves are birthed by the natural interdigitating processes of rock, water, and microbial life. Earth’s cave passages, features, and contents provide planetary models for identifying and perpetuating sustainable practices. We encourage all to stay up-to-date and employ minimum-impact caving protocols—all caves, whether on Earth or beyond, deserve our careful, informed respect and stewardship. Know how to behave in a cave—see page 13, this issue. See <https://caves.org/conservation/cavingcode.shtml>



The International Year of Caves and Karst: Many Partners, Many Events

The International Year of Caves and Karst (IYCK) is designed to teach people around the world about caves and karst. It is an event organized by the International Union of Speleology (UIS), but the UIS can’t reach the world alone, which is why we’re excited to have more than 150 national and international organizations partnering with us.

A growing number of events are scheduled for the International Year of Caves and Karst. Find the full list at <http://iyck2021.org/index.php/events/>. Some are scheduled throughout the year. If you missed our IYCK Opening Ceremonies, already viewed by over 6,500 people, watch them at <https://www.youtube.com/channel/UCzSiErLj5x6viNbvAdehDvA>.

The most important thing is that more partners are joining us and posting events daily, and we ask you to be one of them. This is a unique chance to be part of a team making a global impact to improve knowledge, and from there, appreciation, funding,

and protection for caves and karst. It is simple to join. Just send your logo and website address to the address on the Partners page of the IYCK Website www.iyck2021.org and then send your event announcements as shown on the Events page. No event is too small. It is all important.

When each event is completed, please send a short report to the Event Results page on the website <http://iyck2021.org/index.php/event-results/>. This page provides links to video lectures, news reports, and other information on the results of all IYCK events. At the end of the IYCK, all the results will be compiled into one document that anyone can use to demonstrate the global interest, value, and support for caves and karst, which we believe will help us all find more support and funding for exploration, research, and protection. (See more detailed info starting on inside front cover of this issue).

Join us! <http://iyck2021.org/>. And visit the UIS Facebook page <https://www.facebook.com/uijspeleo>, UIS Twitter account <https://twitter.com/uijspeleo>, and/or the UIS Instagram page <https://www.instagram.com/uijspeleo/>.

George Veni

President, International Union of Speleology and Executive Director, National Cave and Karst Research Institute

New UIS Bulletin: Special International Year of Cave and Karst Issue

You are welcome to visit the UIS Website www.uis-speleo.org and download Volume 62-2 of the UIS Bulletin. Available to all! <http://uis-speleo.org/wp-content/uploads/2021/02/uijs622.pdf>

Nivaldo COLZATO (Brazil),

*Adjunct Secretary / UIS Bulletin Editor
UIS-Union Internationale de Spéléologie*

US Cave Laws Updated on NSS Website!

Excellent, useful reference tools! Check out revised reference materials and pdfs of US Cave Laws at <https://caves.org/conservation/laws.shtml>.

Thanks to Tom Lera’s perseverance, all federal cave protection acts, state cave and archaeology protection statutes, and Puerto Rico cave and archaeology protection statutes are accessible and up-to-date via the NSS Conservation Web Pages. The extensive 2020 research and formatting efforts are recognized with an NSS Certificate of Appreciation to long-time NSS Conservation Team contributor, Thomas Lera. (See Updated Cave Protection Laws in this issue).

Meet Our 2021 USA Cave Animal of the Year

Matthew L. Niemiller and Gretchen M. Baker; photos by Matthew

In 2021, the USA Cave Animal of the Year program enters its second year. The program brings attention to the amazing animals that live underground. Cave animals call caves their homes. As cavers, we are the visitors to these homes, and it's good to get to know our hosts a little better.

What is the focus for 2021? The USA Cave Animal of the Year is the cave ground beetle, specifically cave beetles in the genus *Pseudanophthalmus*. They are found throughout much of the Appalachians and Interior Low Plateau karst regions of the eastern United States.

Cave ground beetles are small beetles in the family Carabidae. Many beetles live and can be found in caves. However, cave ground beetles are troglotic, which means that they are specialized for living in subterranean habitats, including caves.

Pseudanophthalmus is the most diverse group of cave beetles in the United States with over 140 described species and at least 80 species new to science that are awaiting taxonomic description.

Getting to Know Cave Ground Beetles

Cave ground beetles are a diverse group of generally small (3–7.5 mm) beetles that are commonly encountered by cavers. These unique beetles lack eyes and flight wings and are depigmented (generally amber in color). They generally have long, slender bodies and elongate legs and antennae. Most species have converged on a similar set of morphological adaptations for living in the darkness of caves and are exceedingly difficult to identify to species based on their external appearance. Cave ground beetles are one of the top predators in terrestrial cave ecosystems.

Darlingtonia kentuckensis from Fletcher Spring Cave, Rockcastle County, KY



Are all Beetles Found in Caves Considered Troglotic?

With more than 400,000 described species, it is not surprising that many species of beetles can be found in caves. Some species accidentally wander or get washed into cave systems from the surface. Others are common in caves but also are common on the forest floor or in other surface habitats. Some species are guanophiles that feed on the guano of bats, raccoons, and other mammals. However, the truly troglotic species, such as *Pseudanophthalmus* cave beetles, are adapted for a life in complete darkness and are found almost entirely in subterranean habitats.

Where Can I Find Them?

Cave ground beetles are known from caves and other subterranean habitats throughout the Appalachians and Interior Low Plateau karst regions but are also known from the Edwards Plateau and Balcones Escarpment, Ozark Highlands, California, and the Hawaiian Islands.

Pseudanophthalmus cave beetles are known from cave systems in 10 states. Although cave ground beetles are known from karst regions throughout the country, most species have very small ranges and are known from just a few cave systems, including several that have been documented from just a single cave (single-site endemics). However, it is not uncommon to find more than one species in a cave system in parts of Alabama, Georgia, Kentucky, Tennessee, and Virginia.

Cave ground beetles are most often encountered as they move along riparian zones along cave streams or in other areas where organic material and their prey have concentrated. They can be found actively searching for prey on silt and mud banks as well as underneath and within boulder and cobble along cave streams. Cave ground beetles have even been observed on the ceilings of passages with active streams. Cave ground beetles are small and can be difficult to find to the untrained eye.

What Do Cave Ground Beetles Eat?

All cave ground beetles, like most other carabid beetles, are predatory. They likely feed on the eggs of other insects as well as spring-



Pseudanophthalmus alabamae from DeKalb County, Alabama

tails, millipedes, and other arthropods, as well as small annelid worms that live in the silt and mud along the banks of cave streams. Cave ground beetles also have been observed scavenging on the carcass of a dead crayfish.

Protecting Cave Ground Beetles

Because many cave ground beetle species have exceptionally small ranges (for example, single-site endemics) they are at an increased risk of extinction. Like other small invertebrates that occur in caves, they are vulnerable to any threats that result in the degradation or loss of critical habitat, such as pollution, mining, and flooding of caves associated with impoundments.

Cave Animals Of The Year From Other Countries

Countries that celebrate Cave Animal of the Year agreed to feature cave beetles to celebrate the International Year of Cave and Karst 2021. If you'd like to learn about some additional cave beetles, you can find links on our website for Germany (Cave Rove Beetle), Italy (Stammer's italdytes), Australia (cave beetles in general), Switzerland (cave beetle), Austria (Arctaphaenops angulipennis), and Greece.

How You Can Participate

We need your help spreading the word about Cave Animal of the Year. First, visit the website: <https://caves.org/conservation/caveanimaloftheyear> where you'll find even more information about caves as animal habitats, cave beetles, and last year's Cave Animal of the Year, pseudoscorpions. Please share the website address with friends and on your Grotto social media. If you're lucky enough to find a cave beetle while caving, help others see it and learn about these cave species. We invite you to make a photo of it and post it on the USA Cave Animal of the Year Facebook page. Have another great year of learning about and helping to conserve habitat for the fascinating animals that make caves their homes!

San Antonio Zoo's Center for Conservation and Research

Andrew Gluesenkamp and Danté Fenolio; photos by Danté Fenolio

San Antonio Zoo, 3908 N St. Mary's Street, San Antonio, Texas 78212

andy.gluesenkamp@sazoo.org

Overview

San Antonio Zoo's Center for Conservation and Research (SAZ CCR) was established to further the San Antonio Zoological Society's mission to secure a place for wildlife by actively engaging in boots-on-the-ground research. This is accomplished by providing guidance on conservation issues to policy makers; information dissemination in the form of peer-reviewed papers, books, technical reports, public outreach, education, and popular media; as well as providing research opportunities, training, and guidance for both students and accomplished researchers.

Research and conservation projects span three continents and include field and laboratory studies; captive breeding and husbandry of rare or imperiled species; collaboration with academic researchers, members of the private sector, local, state, tribal governments, and federal agencies.

Our work is funded primarily by research grants, contracts, and private donations. We are fortunate to have recently received NSS sponsorship of our efforts. In celebration of the International Year of Caves and Karst <http://iyck2021.org>, the NSS has pledged to cover the cost of feeding our laboratory populations of cave organisms for one year. We are immensely grateful for this thoughtful and generous gesture and we look forward to thanking y'all in person at the National Cave and Karst Symposium, to be held in San Marcus, Texas on November 1-5, 2021 <https://symposium2021.nckms.org>.

The knowledge, experience, and dedication of SAZ CCR staff are core to achieving our mission. Senior staff (Danté Fenolio, VP and Andy Gluesenkamp, Director) both have extensive experience in ecology and evolutionary biology, taxonomy and phylogenetic

systematics, development and morphology, and conservation management. Research and management projects cover a diversity of organisms including fish, amphibians, reptiles, crustaceans, and bats, as well as imperiled ecosystems including the Amazon rainforest, the deep ocean, caves, and karst. A team of four staff (a conservation manager and three conservation technicians) are responsible for day-to-day operations, animal care, and laboratory management, in addition to assisting with project design, data collection, field work, and outreach efforts.

Importantly, conservation staff develop species-specific care and husbandry protocols for rare and endangered organisms. Most of these are obscure subterranean species for which there are no established husbandry or captive reproduction protocols.

Selected Programs and Projects

Subterranean bioinventory work in China – Chinese Cavefish Working Group

Project Partners: Chinese Academy of Sciences, University of Alabama - Huntsville, New Jersey Institute of Technology, and Louisiana State University

The goals of this effort are to survey historic and new localities, formulate conservation strategies, and clarify the systematics and taxonomy of critically endangered Chinese cavefish and cave species new to science. One reason for the decline of Chinese cave fauna is overuse and abuse of aquifers throughout southern China, a problem we can relate to in San Antonio. This project has resulted in the discovery of several species new to science, and several peer-reviewed papers have been published or are pending.

Texas Tetra Project

Project Partner: *University of Minnesota*

The Mexican tetra (*Astyanax mexicanus*) is native to the Rio Grande and Nueces River drainages in South Texas. This species is widespread in spring fed rivers and streams in central Texas, likely as the result of "bait bucket" introductions beginning in the middle of the last century. Although Texas populations are derived from surface stock, this species occurs in several cave and spring systems. The Texas Tetra Project seeks to explore the evolutionary history of this species in Texas. Ongoing efforts include documentation of subterranean populations and comparison of gene expression, morphology, physiology, and behavior among cave and surface populations.

Cooperative study and conservation of groundwater species in Texas

Project Partners: *University of Texas at Arlington, University of Texas at Austin, Texas State University at San Marcos, the University of Texas Rio Grande Valley, United States Fish and Wildlife Service*

The San Antonio Zoo Center for Conservation and Research is developing husbandry guidelines and reproduction protocols for rare endangered species that inhabit the Edwards Aquifer. Labs have been built from repurposed shipping containers on zoo grounds. These are used to keep and breed federally listed species including the Texas blind salamander (*Eurycea rathbuni*), Salado salamander (*E. chisholmensis*), groundwater amphipods, and spring-inhabiting riffle beetles. These organisms live nowhere else on earth and, in addition to threats to their habitat in the form of reductions in the qual-



Sinocyclocheilus furcodorsalis, Guangxi, China



Right: *Triplophysa huanjiangensis*, Guangxi Huanjiang, China



Adult Grotto Salamander
(*Eurycea spelaea*)



Georgia Blind Salamander
(*Eurycea wallacei*)

ity and quantity of groundwater, they suffer from a syndrome known as “out-of-sight, out-of-mind.” In addition to our work with laboratory populations and field studies, we are working with researchers from UT Austin on eDNA surveys for rare and listed groundwater species. We are also collaborating with researchers from UT Arlington on a genetic study of the Texas blind salamander (*E. rathbuni*) and recently received funding to pursue rediscovery of the rarest salamander in the world, the Blanco blind salamander (*E. robusta*). Finally, we are collaborating on descriptions of two new species of salamanders from the Edwards Aquifer.

Mexican Blindcat Project – Blindcat Working Group

Project Partners: *National Park Service, University of Texas at Austin Biodiversity Collections, Zara Environmental LLC.*

The Mexican blindcat (*Prietella phreatophila*) is a rare subterranean catfish known from twelve sites in Coahuila, Mexico. Our team recently documented two populations in Val Verde County, Texas, marking the first US occurrences of this species. This project seeks to determine the distribution, ecology, and conservation status of this species by conducting fieldwork in the US and Mexico. We maintain the only labora-

tory population of this species and efforts are underway to establish husbandry and breeding protocols. Surveys for suitable habitat are underway at Amistad National Recreation Area and at sites along the Devil’s River. Fieldwork in Mexico includes revisiting known sites and documenting new sites via cave and spring surveys as well as eDNA sampling. We are also collaborating on efforts to document the distribution and collect additional material of the toothless blindcat (*Trogloglanis pattersoni*) and the widemouth blindcat (*Satan eurystomus*) from the Edwards Aquifer in and around San Antonio using drift nets, bottle traps, and eDNA metabarcoding.

Development of husbandry and captive reproduction protocols for Floridan Aquifer species

Project Partners: *University of Alabama - Huntsville, Florida Fish and Wildlife Conservation Commission, Georgia Department of Natural Resources*

This effort involved developing a research colony of the Georgia Blind Salamander (*Eurycea wallacei*) and the Dougherty Plain Cave Crayfish (*Cambarus cryptodytes*) at SAZ CCR. Goals of this project include development of captive husbandry and breeding protocols before

they are critically necessary. The quality of the groundwater where these species exist is declining and wildlife authorities anticipate the decline of the salamander owing to anthropogenic influences. Our program was the first to breed both species in captivity. The husbandry and breeding protocols have been published for the crayfish and are in preparation for the salamander.

Development of husbandry and captive reproduction protocols for the Ozark Cavefish

Project Partners: *University of Alabama - Huntsville, United States Fish and Wildlife Service, The Nature Conservancy*

This effort involved developing a research colony of the Ozark Cavefish (*Troglichthys rosae*) at SAZ CCR. The effort started with the incidental take of several individual fishes by way of road work in Arkansas and quickly turned into this partnering program with TNC and USFWS. Goals of this project include development of captive husbandry and breeding protocols for this federally listed species. The long-term quality of the groundwater where this species exists is in question. Our program was the first to work with this species in captivity. Husbandry protocols are being developed now.



Mexican Blindcats,
Prietella phreatophila



Female *Cambarus cryptodytes* in berry,
the Dougherty Plain Cave Crayfish



Ozark cavefish, *Troglichthys rosae* juvenile



Caecidotea macropopoda, an isopod from an Oklahoma cave

Cave bioinventory work and monitoring of imperiled groundwater species in the Ozarks and Appalachians

Project Partners: *University of Alabama - Huntsville, United States Fish and Wildlife Service, Nature Conservancy, Roger's State University, New Jersey Institute of Technology, Oklahoma Department of Wildlife Conservation, Arkansas Game and Fish Commission, Missouri Department of Conservation, Georgia Department of Natural Resources, Tennessee Wildlife Resources Agency, Kentucky Department of Fish and Wildlife, Alabama Department of Conservation and Natural Resources*

This 20-year-old project seeks to confirm historic localities, formulate conservation strategies, and clarify systematics of critically endangered species and species new to science. We survey known as well as unsurveyed cave systems and conduct bioinventories on behalf of state and federal wildlife agencies. This project also performs annual surveys of several federally endangered cave species.

Population ecology of the grotto salamander

Project Partners: *University of Alabama - Huntsville, United States Fish and Wildlife Service, New Jersey Institute of Technology, Oklahoma Department of Wildlife Conservation, The Nature Conservancy*

SAZ CCR is conducting long-term population ecology studies of the grotto salamander (*Eurycea spelaea*) in the Ozarks of Oklahoma. In the past, we have marked individuals with acrylic elastomer and conducted stable isotope analysis to decipher the food webs in the cave streams where larval salamanders live. Populations are being monitored for change in abundance relative to the decrease in bat numbers because of infection with White Nose Syndrome. The species is listed as a species of concern in all states where it occurs. The project was initiated in 2001.

**National Speleological Society
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For more information, please visit us online at nss2021.caves.org

Celebrating the International Year of Caves and Karst: Driftless Area Karst Conservation Task Force

Dawn Ryan, DARK CTF Coordinator*

The Driftless Area is one of the most interesting geologic regions in the Midwest and covers nearly 10,000 square miles in parts of Minnesota, Illinois, Iowa, and Wisconsin. This karst terrain includes deep river valleys such as the Mississippi, sinkholes, caves and limestone bluffs providing scenic and recreational opportunities. It is also an important agricultural area where land use on karst can create a whole gamut of water quality problems. With this understanding and looking toward the International Year of Caves and Karst, we created the Driftless Area Karst (DARK) Conservation Task Force.

We borrowed the concept from the Virginia Cave and Karst Trail (<https://www.dcr.virginia.gov/natural-heritage/vacavetrail>), a feature that we visited during the 2019 National Cave and Karst Management Symposium in Virginia. The “trail” is promoted as a public outreach tool to educate the public on caves and karst features, with stops along the driving route at fee-based show caves, scenic views, and self-guided hikes.

Representatives from the four states decided on approximately 10 existing karst resources for each state, designating sites of public interest that could include show caves, hikes to sinkholes, springs, overlooks, and museums that exemplify karst in their region. Criteria for the sites require that they are open to the public, provide safe parking, and have a relationship to the Driftless Area karst. Grouped into “Discovery Areas” based on geographic location, these karst areas are featured on the DARK website and Flyover Country App.

Collaborators and DARK Partnerships

With help from our colleagues, Minnesota Department of Natural Resources hydrologist Jeff Green and Whitewater State Park Interpreter, Sara Holger, we were able to create Driftless Area Karst



Turquoise Lake in Mystery Cave. Photo courtesy MNDR

Conservation (DARK) partnerships with the National Speleological Society, National Park Service, Northeast Iowa Resource Conservation & Development (RC&D), League of Women Voters of Jo Daviess County, Illinois State Geological Survey, Meredith Hall Weberg from the Virginia Cave and Karst Trail, several state organizations, and citizen scientists from Minnesota, Iowa, Illinois, and Wisconsin.

This is truly a collaborative project with several organizations providing support and resources integral to the effort.

The NSS is providing webhosting for the DARK Conservation Task Force. DARK’s website address is: driftless.caves.org.

The NPS Rivers, Trails, & Conservation Assistance Program is providing an intern to develop the interactive website that will provide site interpretation and information such as, ease and time needed to visit, acces-

sibility, free or fee based, dog friendly, and maps and photos of each site.

The University of Minnesota is providing free use of their Flyover Country App (<https://flyovercountry.io/>). The mobile app is designed for geoscience outreach and links users with interesting landscape features. The user chooses which DARK Discovery Area to visit and downloads information from the website about the discovery feature along with GPS directions to their phone, and the App works even if there is no cell service. An example of a discovery area includes a self-guided hike to Big Spring in Forestville/Mystery Cave State Park, a tour of Mystery Cave, and a self-guided hike to Cherry Grove Blind Valley Scientific and Natural Area, which is the origin of the water flowing from Big Spring in Forestville.

Driftless Area Karst Discovery Routes 2021 and Beyond

The Website and App are scheduled to be active in March or April 2021. Once everything is activated, we plan to keep the Website and App available even after the end of IYCK2021 (See <http://iyck2021.org>).

*** About the author: Dawn Ryan is a Life Member and Fellow of the National Speleological Society (NSS#50407) and Fellow of the Cave Research Foundation. Ryan manages Mystery Cave in Forestville/Mystery Cave State Park, Preston, Minnesota.**



Big Spring in Forestville/Mystery Cave State Park. Photo courtesy MNDR

Puliamo il Buio 2020 – Let's Clean Up the Dark in Pertosa-Auletta Caves

Rosangela Adesso, Simona Cafaro, Ferdinando Didonna, Francesco Maurano

The Pertosa-Auletta complex is a karst show cave system located near the villages of Pertosa and Auletta, in the province of Salerno, Campania, Italy. This important karst site in southern Italy is protected within a national park, Parco Nazionale del Cilento, Vallo di Diano e Alburni. Pertosa-Auletta is included in the European Geoparks Network for its important geological and cultural heritage. In 1998, the park and several ancient Greek towns became a UNESCO World Heritage Site.

Although the cave receives routine maintenance, its management body, Fondazione MIdA (Musei Integrati dell' Ambiente), dedicated a day to evaluate conservation concerns that had escaped attention during the usual cleaning activities in cave. The goal was to identify new strategies and actions to enhance sustainable management of the show cave. Activities focused on mitigating trash left along the cave pathways and exploring methods to decrease future littering in the cave. The over-arching objective of this ongoing project is to safeguard and conserve the cave ecosystem.

Thanks to the help of twenty-eight speleologists (Fig. 1) from three different regions in the south of Italy (Campania, Basilicata, and Puglia) and seven speleological groups (Gruppo Speleo Alpinistico Vallo di Diano, Gruppo Speleo Melandro, Gruppo Speleologico Natura Esplora, Gruppo Speleo Archeologico Vespertilio, Centro Altamurano Ricerche Speleologiche, Gruppo Speleologico Castel di Lepre, Gruppo Speleologico CAI Napoli), together with MIdA staff, we were able to identify, document, and remove many objects left in the cave due to tourist activities. We accomplished meticulous trash retrieval and cleanup outside of trail boundaries and from the ravine where tourists pitched their unwanted items.

Background

Puliamo il Buio— Let's Clean Up the Dark, organized by the Italian Speleological Society every year since 2005, is an initiative dedicated to the cleaning of underground environments throughout Italy. We provide documentation as evidence of the offenses, assess the danger and degree of damage, propose possible remedies to the public and local administrations, and coordinate the cave clean up events. Clean up the Dark follows the footsteps of international "Clean up the World" events, which are coordinated in Italy by the Legambiente Associazione (League for the Environment, a not-for-profit environmental association).

The Site

Pertosa-Auletta is among the most important karst springs in southern Italy. Aspects of scientific importance include the karst phenomenon, hydrogeology, archeology, and speleo-biology. Pertosa-Auletta also constitutes a significant economic reality in the territory, being a tourist site since the middle of the last century. The main entrance to the karst cavity, located in the left bank of the Tanagro River, opens at 263 meters above mean sea level along the western slope of the Alburni Mountains.

Thanks to the efforts of many speleologists engaged in various exploratory campaigns, both the cave survey and the surface topographical survey are well defined. Initial exploration of the cavity and a first survey was carried out in 1924 by SME (Società Meridionale di Eletticità) to enable exploitation of water resources. In 1952, the IGM (Istituto Geografico Militare) did a precision survey of the entire cavity, with a first relief published by Lieutenant Dutto. Various survey and exploration expeditions conducted by the GS-CAI Napoli (Gruppo Speleo Club Alpino Italiano Napoli) acquired more details over time.

Grotte di Pertosa-Auletta extend for a total length of 3000 meters and are divided into three main branches (Fig. 2). The middle and southern branches are decorated with abundant speleothems and respectively show both paleo (fossil) and active (spring) sites. In the middle branch there is a short path open to the public.

Our cleaning activities took place in the tourist branch, represented on the plan map from point 1 to 5 (Fig. 2). About 800 meters long, this section is characterized by a succession of large rooms adorned with imposing speleothems and morphologies that cover the ground almost completely.

The Program

The event was organized in five phases:

1. Present cave descriptions and guidelines for cleaning activities in the show cave.
2. Organize work groups and distribute forms to complete during cleaning activities (document typology, quantity, and collecting area of objects).
3. Conduct small group conversations on Sustainable Development Goals in Italian Speleology.
4. Perform cave cleaning activities in work groups.
5. Discuss data collections and final reports from each group.

The Guidelines for Cleaning Activities in the Show Cave

- Collect all solid and liquid waste dispersed in the cave environment, especially those of organic origin (for example paper, cloth, etc.).
- Separate waste, if possible.
- Remember to thoroughly look in the ravine and niches of the rock.
- Always move with caution. Avoid damaging speleothems and surfaces.
- Always operate with safety first in mind.
- Use clean gloves and clothing.
- Catalog, photograph, and define quantities of all the found objects.
- Communicate with the managers and suggest solutions to minimize the phenomenon of the abandonment of materials (tourist trash) in the cave.
- Before the in-cave activity, reread the "Protocol for Minimum-Impact Speleology" by Val-Hildreth Werker and Jim C. Werker. See Minimum-Impact Caving Guidelines (<https://caves.org/conservation/cavingcode.shtml>).



Figure 1: 28 cavers who participated in the cleanup

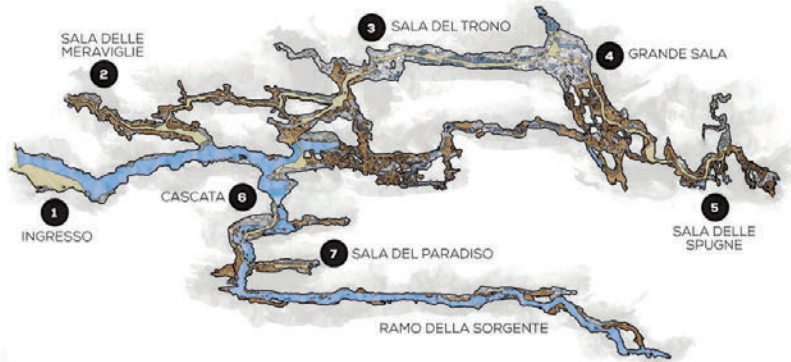


Figure 2: map showing the 3 branches of the cave

Take with you:

- gloves
- bags
- brush and dustpan
- bubbish pick-up stick, a tool with extension to reach off trail
- hammer, chisel, trowel (tools for carefully removing objects calcified into cave surfaces, after thoughtful inspection and do-no-harm evaluation)
- mini vacuum cleaner
- spray bottles with water, brushes with soft bristles, and sponges to catch excess water (when cleaning human impacts from cave surfaces)

What Did We Find in the Cave?

In all cave areas, we found remains of electrical cables, especially near the electrical and monitoring stations; some of these were calcited into cave surfaces (Fig. 3).

Numerous plastic objects were collected, in some cases covered by calcite (Fig. 4).

Other objects found: coins, clothing, light bulbs, corrugated pipes, nails, iron, chewing gum, electrical tape residues, old flashes ... (Fig. 5)

Suggestions for Show Cave Management

- Sensitize tourists (at the entrance!) about the abandonment of waste in the cave.
- The cave guides must collect waste along the walking paths.
- Plan at least two events per year for cleaning the underground environment.
- It is necessary to schedule reconnaissance of the lighting system. Verify the functioning of the lamps and remove or replace worn or degraded appliances.
- All waste produced from cave maintenance works must be transported outside of the cave environment.
- If work in the cave is carried out by external companies, it is necessary to remind the workers and supervisors of the absolute prohibition of abandoning waste.



Figure 3: electrical cable remnants calcited into surfaces

The Sustainable Development Goals in Italian Speleology

During the “Clean Up the Dark” day at Pertosa-Auletta, the Italian Speleological Society (SSI) organized a workshop to explore and understand global development issues, and to help us prepare for widespread promotion during the International Year of Caves and Karst 2021. We specifically discussed the relationships between show caves, speleology, and sustainable development goals.

The Sustainable Development Goals (SDGs) are 17 goals agreed upon by 150 international leaders from the United Nations Organization in September 2015. Each goal fits three overarching categories: to contribute to global development; to promote human well-being; and to protect the environment. The 2030 Agenda for



Figure 4: Plastic objects collected were often covered in calcite.



Figure 5: an old flashcube covered in calcite

Sustainable Development was approved with the definition of the 17 sustainable development goals and the 169 sub-goals, aimed at ending poverty, fighting inequality, social and economic development, and nature conservation.

Achieving the SDGs requires collaborations among governments, institutions, the private business sector, civil society, and citizens to ensure a better planet for future generations.

Based on 131 available indicators that allow coverage of 105 of the 169 SDG sub-objectives, Italy has currently achieved 12 of the 2030 objectives and our nation is close to accomplishing other objectives. For example, throughout Italy we have already achieved the targets for sanitation, access to clean electricity and fuels, and percentage of land area covered by trees (targets 6.3, 7.1 and 15.1). However, some challenges remain; Italy is still a long way off with objectives relating to teacher training, violence against women, and the national percentage of young people not in education, employment, or training programs (objectives 4.c, 5.2 and 8.6). However, the really big challenge is a knowledge-based transition to sustainable development.

The workshop was based on these 5 discussion points:

1. Formulate the way in which Italian Speleology contributes to the SDGs;
2. Identify common contributions to institutions and to the public;
3. Increase the visibility of the importance of karst and caves;
4. Improve the involvement of speleologists and increase the possibilities of support for protection actions;
5. Present the results on the occasions of the 70th Anniversary of the SSI and at events of the International Year of Caves and Karst 2021.

In particular, we identify the following goals within the SDGs to aid in formulating the ways in which Italian Speleology and caves contribute to the international Sustainable Development Goals.

SDG 3: To ensure health and well-being for all ages;

Our focus group identifies that caves and speleology contribute to the goal through: speleotherapy, thermal baths in caves (Grotta Giusti <https://www.grottagiustispa.com>). Cave visits also can enhance physical health and mental balance for all ages.

SDG 4. Provide quality, equitable, and inclusive education and learning opportunities for all;

Speleology contributes constantly to general public educational outreach and, in some cases, caving groups include education as part of their established objectives. Examples include: speleology courses (I-II-III level); guided excursions; museum collaborations; conferences/conventions; events (including speleo diversity events for people with disabilities); outreach campaigns, such as “The water we will drink” (<http://www.acquacheberremo.it/>); project planning (PON, POR, LIFE), schools/didactics projects, documentation and scientific study; cave cadaster/library/publications; stewardship outreach; participation in exhibitions/fairs; training events; all with total respect for gender equality.

SDG 6. Ensure the availability and sustainable management of water and sanitation facilities for all;

Speleologists and cavers contribute constantly to: monitoring, surface and cave exploration; cave diving exploration and survey, hydrogeology studies; “Clean Up the Dark” actions (<https://www.puliamoilbuio.it/>). In many areas, cavers are the guardians of the underground and of the karst waters.

SDG 8. Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all;

Caves are also an important economic resource for tourism and valorization of the territory. Speleology assists this economic process and enhances balance in the sustainable conservation of natural and cultural resources. Moreover, speleology offers training for job opportunities in multiple disciplines including rope access integrated services, tree-climbing, internships in speleological sciences and resource management, work-study jobs, educational cave tour innovations in the outdoor sector, as well as tours to mines and museums.

SDG 13. Take urgent action to combat climate change and its impacts;

Speleology contributes to monitoring climate changes. The speleological community is very sensible in promoting plastic-free, sustainable product use. Speleologists come

together from many scientific disciplines to cooperate in studies of the impacts of climate change in cave environments, fluctuations in spelean microclimates, documenting biodiversity variations, and investigating paleoclimatic and paleoenvironmental reconstructions from cave concretions.

SDG 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development;

Speleologists investigate the importance of marine caves and coast monitoring, study marine bio-speleology, and promote citizen science contributions on marine caves and groundwaters (<https://phreatic.org/>).

SDG 15. Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss;

Caves are ecosystems with relevant genetic diversity. Speleology contributes to the conservation of biodiversity through appropriate cave protection measures, regular monitoring, and official descriptions of new species. The bio-speleological research of the Italian speleological community and SSI advance the study of biodiversity in underground habitats (<https://animalidigrotta.speleo.it/>). SSI maintains a catalogue of the fauna in natural and artificial caves throughout Italy. As well, SSI supports the monitoring and protection of bat colonies, and advocates specific cave access protocols in collaboration with bat specialists.

For SSI, it is important to protect caves and cave life by including underground habitats in the environmental conservation laws of the European Community. Supporting the protection of these biotopes is often fundamentally based on the presence of bats that use cavities for hibernation; in fact, they are protected in accordance with Directive 92/43 / EEC of 21 May 1992 on the conservation of natural habitats and wild fauna and flora (Directive Habitat). If the caves are identified as HABITAT of Community Interest (tourist caves are excluded), and the species living in the caves are safeguarded based on their presence or absence in the Annexes of the Directive as species of community interest, the cave and its fauna are considered protected ecosystems.

SSI supports these protection initiatives by structuring regional cave registers that report protection status. These registers are a fundamental tool that competent authorities use in land and resource management of the territory (<https://speleo.it/catastogrotte/>).

SDG 17. Strengthen the means of implementing the objectives and renew the global partnership for sustainable development;

In reading this document, we are contributing to the goals of partnerships for sustainable development. As SSI and the speleological community, we believe in meetings (national and international), relationships/partnerships with other speleological organizations, touristic cave associations, schools, public education services, national and regional Parks, and local authorities. An important moment for sharing these goals will be Speleo Kamaraton 2021 International Meeting of Speleology (<http://www.speleokamaraton.eu/>).

Advancing the United Nations Sustainable Development Goals

The strength of the Italian speleological community vision is enabled by:

- The interconnected speleological community;
- Excellent experience and local knowledge;
- Trust and common goals.

These strengths must be used to promote the conservation of caves and karst in the broader perspective of the Sustainable Development Goals.

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Minimum-Impact Caving Guidelines (How to Behave in a Cave)

Val Hildreth-Werker and Jim C. Werker (Revised Feb 2021)

These guidelines encourage practices that minimize negative impacts to caves. As more is learned about cave environments, cavers evaluate and redefine caving conduct. Compiled from the experiences and contributions of many cavers, these guidelines describe safe, low-impact caving techniques. Avoid damaging cave resources—esthetic, cultural, paleontological, geological, hydrological, mineralogical, meteorological, biological, as well as microbial. Move gently and be good stewards. Think safety—take care of yourself and your team. Take care of the caves!

- Each caver wears a helmet with a light attached. Each caver carries water, food, a bottle for urine, and three sources of light with extra batteries.
- Use **freshly washed** cave packs, vertical gear, boots, gloves, knee-pads, helmets, and lint-free clothing to avoid transfer of mud, dust, and microbes between cave environments.
- Follow current **WNS decon protocols** at <https://caves.org/WNS/> or <https://www.whitenosesyndrome.org>
- Use footwear with **nonmarring/nonmarking soles**.
- Use soft or padded cave packs. **Avoid hard-edged boxes**. Choose gear that is smaller, lighter, and more compact.
- **Protect cave location data**. Never post or publish coordinates or instructions for finding cave entrances. Intentional vandalism and unintentional ignorance destroy many cave resources. Unauthorized sharing of cave locations can be a prosecutable federal or state offense.
- **Never disturb bats** or other cave-dwelling creatures. Watch for insects and avoid crushing them underfoot.
- **Avoid touching microbial mats**. Do not disturb geomicrobial communities living in a cave.
- **No smoking** or use of tobacco in caves. **No campfires** in caves or near cave entrances. Smoke and fumes can kill bats, invertebrates, and other cave-dwelling animals.
- **No recreational drugs or alcohol** while caving. Mental and physical impairment puts the cave and the team at risk.
- **Wear gloves**. Check gloves for mud, dirt, and holes.
- Don't enter pristine areas with muddy or dusty garments and gear. Know which areas require clean clothes, shoes, and gear.
- **Avoid isolated pools**.
- Limit scratching skin and hair. Tens of thousands of skin fragments and debris fall from each human body every hour. Reduce introductions of new matter into cave systems.
- **Remove all solid and liquid wastes**. Carry an emergency **pee bottle** and burrito kit. Carry out all urine, feces, spit, vomit, and other waste.
- Avoid dropping crumbs and food particles. **Eat over a plastic bag**. Carry out crumbs and debris. Don't eat on the move.
- If you light a candle, catch the wax drips on a suitable base such as heavy foil.
- If carbide is allowed, carry the spent carbide out of the cave in sturdy plastic bottles with threaded lids.
- **Stay on established trails**. Sit inside the trails. Keep packs and other items within the path. Don't stray off the most impacted pathways.
- Move carefully and gently through the entire cave—**avoid kicking up dust**.
- Spot each other on climbs. Safety first—maintain three points of contact.
- Always **spot each other** in fragile areas. Especially watch heads, backs, hands, feet, and packs. In areas of low hanging formations, ask spotters to watch. Remove helmet to improve body control. Move gently.
- Maintain **special care** and gentle control of movements when lingering in a fragile area for survey, science, or photography.
- **Touch as little as possible**. Avoid leaning on walls, ceilings, or speleothems. Don't sit on formations. Look and avoid trampling floor deposits.
- When movement requires handholds, **look first** to avoid delicate features and use small points of contact for balance (knuckles or fingertips) rather than dirty open palms.
- During survey and exploration, establish pathways on **durable surfaces** to minimize future impacts.
- **Point out unsafe or damaging behavior**. It's every caver's responsibility to ensure that cave environments remain as pristine as possible and that every team member is safe and aware of conservation ethics. It's okay to speak up and say, "Keep still, don't move, or stay away."
- **Take nothing from caves**. Removal of natural or historical items is unethical and illegal unless you have a collection permit for authorized research. (Recently deposited trash usually should be removed—always carry extra plastic bags, and employ safety precautions. First check with cave managers, archaeologists, biologists, and historians before making decisions about large items or cultural materials.)
- **Leave nothing in caves**. Never leave your mark on cave walls. No graffiti. No signatures or drawings. No trash. No waste. Leave no evidence of your visit.
- **Cave safely ... Cave softly ...** and leave no trace.

Permission is granted to share, repost, reprint, or use these bullet points to build protocols for specific caves or cave regions. Access updated guidelines on Conservation Division pages of the NSS Website at <https://caves.org/conservation/cavingcode.shtml>



Honorable Mention
2020 Photo Salon
Florian Bachmann

Updated Cave Protection Laws on NSS Webpages

Thomas M. Lera

The pandemic has increased our time at home allowing us to complete projects once started but put aside for various reasons. A project I had undertaken was updating the cave protection laws section on the NSS Conservation Pages of the NSS Website. In 2000, I posted "A Summary of Legislation and Organizations Involved in the Preservation of Caves and Bats" which included a summary and the actual text of Federal and State laws instrumental in protecting caves and bats.

A lot has changed in the last 20 years. There has always been a wide and growing variety of laws at all levels of government protecting caves and karst. Now there are countless city and county ordinances with regulations in force protecting surface and ground waters as well as endangered species. They also include codes or statutes that establish parks, as well as prehistoric and historic sites.

U.S. Cave Protection Laws, Statutes, Regulations

After five plus weeks of detailed research, I have revised and updated the section on cave protection laws, <https://caves.org/conservation/laws.shtml>. It now includes almost 250 pages of up-to-date Federal, State, and Puerto Rico cave resource protection acts along with their archaeology protection statutes. Each State and Puerto Rico has a link to their current laws and/or statutes.

Statutes are basically laws passed by legislatures and often outline general guidelines authorizing agencies to develop the specifics of process and enforcement. Agencies and their departments are part of the executive branch of state and federal governments and are tasked with the execution of the law. They have expertise in their field and are expected to be better equipped to develop the details of how a law will operate.

Regulations can be enforced by citations, fines, and other forms of discipline just as easily as statutes. They can have a bigger effect on organizations than statutes because they are more detailed.

There are valid reasons for laws, statutes, and regulations restricting access to some information, such as locations of caves and archaeological sites. Caves contain valuable mineral specimens, fragile important ecosystems, and can be dangerous if visitors are inexperienced or unprepared. Karst areas, which are landscapes associated with caves, are also important sources of drinking water in many areas of the United States.

Location Information is Protected by Law

Some states' cave protection and open record laws do not contain specific language exempting the site locations from open records requests. Instead, they include vague statements indicating information protected by law is confidential. Of the twenty-eight states with cave protection statutes, Hawaii, Maryland, and Virginia are the only three states that currently specifically protect cave location information. In Hawaii, the Cave Protection Law requires confidentiality of cave locations. The Freedom of Information laws in Maryland and Virginia specifically exempt cave locations from public release.

Archaeological sites are protected by law and contain artifacts that can be used to interpret and reconstruct the culture and history of an area's past inhabitants as well as its natural history. In addition, some archaeological sites located on private property, especially earthwork mounds built by America's indigenous peoples, are protected by trespassing laws.

While archaeological sites are protected in all states, the laws vary from state to state. Some archaeological protection laws include a clause protecting site locations (for example, West Virginia and Wisconsin), while others exempt

release of information on archaeological sites in their public record, or Freedom of Information (FOIA) laws. In cases where confidentiality of archaeological sites is not mentioned in either the state archaeological protection law or the open records law, the FOIA laws contain clauses saying information protected by Federal or other statutes is exempt from public release.

The Cave Laws Webpages list the state statutes but not the individual state regulations promulgated by the responsible department, such as the Department of Conservation and Natural Resources, Department of Historic Resources, and so on. Should you need these resources, contact the appropriate office. I hope you find this information useful in your research.

Editor's note: Excellent, useful reference tools. Thanks to Tom Lera's perseverance, all federal cave protection acts, state cave and archaeology protection statutes, and Puerto Rico cave and archaeology protection statutes are accessible and up-to-date via the NSS Conservation Webpages. The extensive 2020 research and formatting efforts are recognized with an NSS Certificate of Appreciation to long-time NSS Conservation Team contributor, Thomas Lera.

NSS Cave Vandalism Deterrence Commission

The National Speleological Society, Inc. offers a reward for information that leads to the legal conviction of cave vandals anywhere in the United States.

Anyone who visits a cave assumes responsibility for its protection and preservation. Reward potential or not, the NSS strongly encourages everyone to report any suspected act of vandalism immediately, with as much detail as possible (date, description of offense, offending person(s), and other details).

The NSS will consider a reward of \$250 to \$1,000 for information leading to a local, state, or federal conviction of any person (or persons) for acts of cave vandalism.

Breaking, breaking off, cracking, carving upon, writing on, burning, or otherwise marking upon, removing or in any manner destroying, disturbing, defacing, marring, or harming the surfaces of any cave or any natural material which may be found therein, whether attached or broken, including speleothems, speleogens, and sedimentary deposits.

Breaking, forcing, tampering with, or otherwise disturbing a lock, gate, door, or other obstruction designed to control or

prevent access to any cave.

Dumping, littering, disposing of, or otherwise placing any refuse, garbage, dead animals, sewage, or toxic substances harmful to cave life or humans in any cave or sinkhole.

Removing, killing, harming or otherwise disturbing any naturally occurring organisms within any cave.

Excavating, removing, destroying, injuring, defacing, or in any manner disturbing any burial grounds, historic or prehistoric resources, archeological or paleontological site or any part thereof, including relics, inscriptions, saltpeter workings, fossils, bones, remains of historical human activity, or any other such features which may be found in any cave.

Application for this reward must be made within three months of such conviction.

The NSS Cave Vandalism Deterrence Commission can help guide you in addressing cave vandalism situations:

Sarah Richards, Chairman
NSS Cave Vandalism Deterrence Reward Commission

Email: vandalismdeterrence@caves.org

For more information, see <https://caves.org/conservation/> and click on Help Stop Vandalism.

Shocking Sale of “Calming” Calcite Speleothems

Carlos Artiguez, Puerto Rico



Julissa Zoé Corporán

Formations for sale at a department store in Mayaguez, Puerto Rico



Julissa Zoé Corporán

Years ago on a visit to the Dominican Republic, I was shocked to see sculptures made from stalactites offered for sale by a street vendor. Upon seeing my curiosity the vendor approached me hoping for a possible sale, but I gently refused and I explained to him that I explore caves and was involved in cave conservation. As I walked away, I hoped that my explanation would help him seek out a different way to express his obvious talent, one that would not result in cave destruction.

I remembered that encounter, when recently Julissa Zoé Corporán caused an uproar on social media among local cavers and conservationists. She shared photos of the sales pitch for fragments of calcite cave formations on display at Marshall's department store in Mayaguez. There are several Marshall's outlets here in Puerto Rico.

Corporán documented the visit with photos and video, and she registered a complaint with the Natural Resources Environmental Protection Agency, which promptly initiated an investigation into the



Three images by Salvador Lugo show some of the underground treasures of Puerto Rico.

legality of having such items for sale. The governmental agency quickly ordered the withdrawal, prohibiting their sales display of speleothems and cave calcite.

The eventual withdrawal was also influenced by two letters that were quickly delivered to Marshall's by the Speleological Society of Puerto Rico (SEPRI) and collectively by all the local caving organizations united as The Speleological Federation of Puerto Rico (FEPUR). The letters expressed concern that sale of these calcite fragments of cave formations might incite destruction and vandalism of local caves.

All the fragments were labeled by their distributors as “cave calcite” and attributed misleading mystical qualities to the offending pieces on display, claiming the calcite has the ability to reduce “fear and stress.”

As cavers, we all know about the emotional, physical, and psychological benefits of caving. You forget about your problems. We enjoy present-moment-awareness. You forget about the past and your anxiety about the future disappears. You have a great workout, enjoy the challenges, and bond with friends. But you can't enjoy these benefits by bringing home chunks of cave calcite and destroying a beautiful cave in the process.

So we want to thank everyone involved in this mission that helped create awareness of the need to protect our caves and our environment. This success in rapid response

is also an encouraging example of the need to take immediate action when faced with similar challenging situations that involve cave conservation.



Central Oregon Caves Graffiti Project: 2021 Update

Neil Marchington



Garrett Hampton

Problem: layers of painted graffiti

In 2013, I got an e-mail about a grant opportunity. I'd been contemplating putting together a sandblasting trailer similar to Ray Keeler's rig used in Arizona and Utah for a few years. I witnessed first-hand how sandblasting removed graffiti in Peppersauce Cave (AZ) and in Bloomington Caves (UT). The results are impressive. These party caves coated in unfortunate graffiti were brought back to an amazingly clean state by volunteers. I wanted to see similar work done in the Northwest and beyond. This grant, from a private foundation in Oregon, seemed like a start. I put together a budget based on the equipment list Ray sent me, and started down a long road. The Oregon High Desert Grotto and Western Cave Conservancy were partners in a big new project!

Grant Funding for a Graffiti Mitigation Rig

The initial grant was awarded for \$850—a great start, but not enough money for the equipment. I started raising funds from many other sources. The Western Region, Western Cave Conservancy, Mother Lode Grotto, and many individuals donated to the project. I talked Grainger Industrial into selling me all the major equipment at just over their cost. I paid \$3100 for a gas compressor and equipment which sells for over \$6000. I borrowed Brent McGregor's goat trailer (complete with a "goat crossing" sign) to haul the equipment.

Around September 2013 we did our first workday at Redmond Caves. The protective equipment I bought fogged up immediately in the cave and blinded us. The sandblasting was slow hard work. The results were good, but slow. Over several trial runs, I refined and improved the protective equipment and upgraded to much better sandblasters. A few trips in, our operations were much faster. We managed to get all the graffiti out of one of the Redmond Caves and start on the second cave.

Partnerships

In 2019, we started a major partnership with a local tour company, Wanderlust Tours. Owner Dave Nissen and his crew provided volunteer staff and additional funding to tackle bigger caves. We purchased better protective equipment and more air hose to work deeper into the passages. Over five grueling days, we removed all the graffiti from 1800 feet of passage at Boyd Cave in Central Oregon. The cave is the third most visited cave in Oregon with thousands of people going through each year. The US Forest Service manages the cave as a recreational site. Much of the cave was painted floor-to-ceiling, up to 8 feet off the ground. In November 2019 we completely finished removing decades of graffiti on top of graffiti. The cave looked amazing. A casual visitor would think they were visiting a pristine cave.

I had big plans to start graffiti removal in additional caves in March of 2020. COVID-19 shutdowns interrupted.

In October 2020, I finally got clearance to start graffiti removal again. Boyd had some new minor graffiti here and there, which a small team removed completely in half-a-day.

Major Graffiti Vandalism Incident

In late December 2020, I got reports that a major graffiti vandalism incident had happened at Boyd Cave. I started investigating what happened (I'm a Deputy Sheriff) and organized a reward fund and media outreach program to get the word out. USFS Law Enforcement Officer Eddy Cartaya and I joined forces with the backing of our agencies to do news interviews seeking tips and conduct the criminal investigation. We are still working on the case at this time. The NSS Cave Vandalism Deterrence Fund is offering a \$1000 reward, and Wanderlust Tours put up an additional \$500 reward for the prosecution of those involved in the December 2020 vandalism.

Back to Graffiti Blasting

In the Spring, once bats are awake again, our volunteers will be back at work cleaning the cave. I hope to get graffiti out of two or three major Bend area caves this year. This project will be ongoing. Maintaining restored caves is much easier than taking off layers of old graffiti. Our crew gets faster and better at this each trip. Cleaning a large graffiti tag often takes our crew less than a minute at this time—this kind of treatment is only effective and safe for the cave on extremely durable bedrock, and it's neces-



Drew Pick

Solution: Careful use of sandblasting, on bedrock lava with no speleothems

sary to give careful attention to removing sandblasting media.

I frequently get asked questions about impacts from the graffiti cleanup. We use a blast media made of crushed rock which is chemically inert and nearly identical to the lava which makes up the cave walls and soil. We also recover most of the blast media and graffiti-paint flecks on tarps. We locate the gas compressor away from the cave entrance so fumes do not go into the cave. The dust produced is substantially the same as the dust which naturally occurs in our dry, high desert caves. We also have site-specific buffer zones around bats, designated in partnership with bat biologists. We don't work in close proximity to bats or wildlife. Sandblasting does have impacts that result from how the work is done and what is being blasted. Our methods work well in lava tubes, but would not be good in all places.

Anybody considering such a project is welcome to come to Bend and learn about our methods and equipment. The sandblaster can be used for other projects in the region. Ideally, you will need a crew of 4-10 people to run the blasters and prepare areas. Ray Keeler also has a similar trailer located in Arizona for regional projects further south. If you would like to contribute to this project, please visit <http://ohdgrotto.caves.org/> to make a tax deductible donation.

Media Coverage of the Project:

<https://centraloregondaily.com/%e2%96%b6%ef%b8%8f-the-great-outdoors-cleaning-up-the-boyd-cave-graffiti/>
<https://centraloregondaily.com/the-great-outdoors-cleaning-boyd-cave/>
<https://ktvz.com/news/2021/01/08/boyd-cave-vandalized-law-enforcement-asking-for-communities-help/>

30 Years of Saving Caves

Amber Lehmann, SCCi Board Director

Let's be honest, 2020 was a year that presented more than enough challenges that many of us want to forget. Despite 2020 being a chaotic year, SCCi prevailed and remained steadfast in protecting more caves and karst landscapes than ever before. It was a year we actually want to remember for so many reasons, including THREE new cave acquisitions.

Cyclops Cave (Virginia)

Cyclops Cave in Russell County is our first cave in the state of Virginia, and one that local cavers asked us to protect after they discovered trash, broken formations, disturbed rigging, and graffiti in the cave. With the help of the caving community and many other donors, we were able to raise enough money to purchase the cave. Our SCCi Board helped out with a last-minute decision to put the remaining portion on the credit line and protect the cave immediately. We'd love to see this cave paid off in 2021, so if you are able to contribute at all, please consider giving.

Mayapple—Steve and Nancy Attaway Preserve (Tennessee)

The second significant acquisition came as a gift from long-time caver, John Attaway. In July, he generously donated a 17-acre parcel containing Mayapple and Meander caves. This stunning piece of property is located in Payne Cove in Grundy County, Tennessee. Mayapple Cave has three

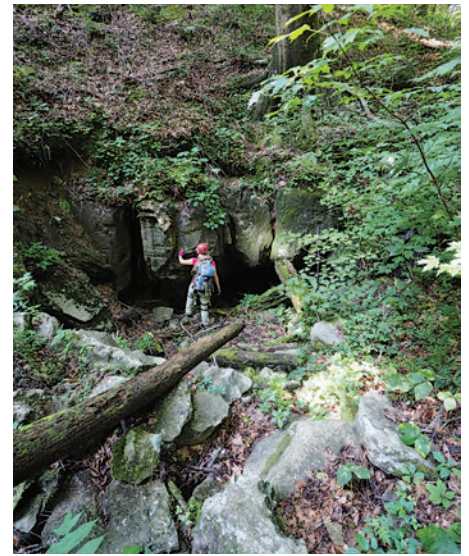
entrances, all located on the property, with more than 6,000 feet of horizontal passage and 154 feet of vertical cave. Meander is a smaller cave with 123 feet of horizontal passage.

We named the preserve the "Mayapple—Steve and Nancy Attaway Preserve" in memory of John's son Steve who passed away a year ago and in honor of Steve's wife Nancy who resides in New Mexico. Steve was an active caver in the Southeast during the 1970s and 1980s and served in cave rescue alongside his father.

SCCi Director Kyle Lassiter said, "John Attaway has been an exemplary caver and landowner for over 45 years. He has always been a very active and engaged member of the caving community. It is not a surprise that his children (Steve and his sister Myrna) followed suit and greatly enriched the caving community in their own right. His generous donation to SCCi will allow the Attaway legacy to be remembered for many generations to come."

Balcony Sink aka Falling Cave (Alabama)

Our final acquisition of the year—our thirty-third overall—was one many cavers have waited on for decades—the iconic Balcony Sink, also known as Falling Cave. Balcony Sink is arguably one of the top 10 classic pits in the Tennessee/Alabama/Georgia (TAG) region of the United States. Like our Valhalla preserve, Balcony Sink is



Bob Biddix

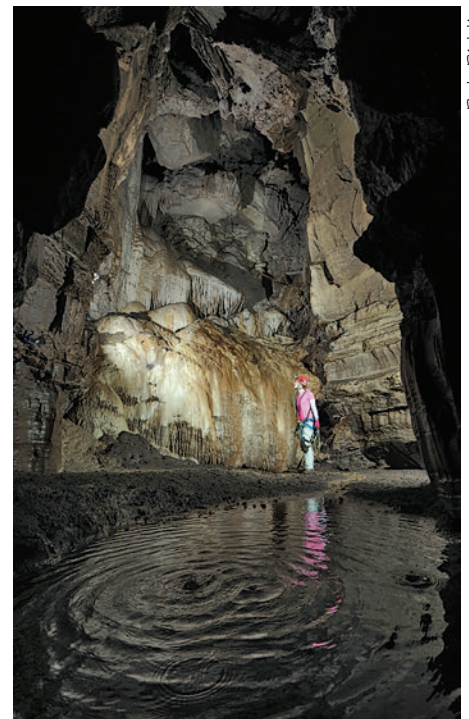
Mayapple Cave

much larger at the bottom than the top, with a pit depth of 135 feet. Beyond the pit is a half-mile of passage that includes a second 34-foot drop.

With its large dramatic entrance and active waterfall, Balcony Sink is considered one of the most beautiful and bio-dense caves in Alabama. Because of the urgency of the opportunity, SCCi placed this purchase on short-term credit. We continue to need your help to support this once-in-a-century acquisition.

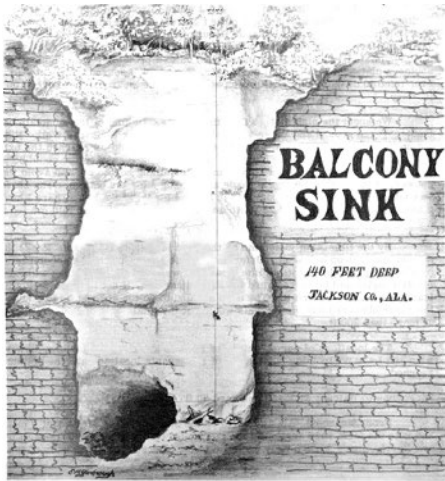


Brian Williams



Bob Biddix

Mayapple Cave



Ed Yarborough

Management Model

While acquisitions are exciting and we love to announce them, it isn't the only aspect of what we do as an organization. Another important success of 2020 was developing an actionable plan to manage our 2,400-acre Henson Preserve. We introduced a management model during our Preserve Management Retreat in March of 2020. This model has been instrumental in developing an action plan for the preserve, and it is providing a foundation on which to base project decisions across the organization. With more than 30 preserves, applying the weighted model can help simplify decisions across preserve boundaries.

30 Years and Growing

In summary, despite a tumultuous year, SCCi had a tremendous year of success. Much of the success revolved around doing a million little things right—day in and day out. From boots-on-the-ground preserve management to educating the public on the importance of cave protection, we know what it takes to protect over 5,000 acres for future generations.

In 2021, we are celebrating our 30th Anniversary of saving wild caves. We have created a path to sustainability that is vital to our future as an organization, AND the future of our preserves. Sustainability includes concepts and actions in financial sustainability, leadership succession planning, adaptability, and strategic planning. Without these principles, there would be no future for SCCi and the caves and land we protect. If you are currently a member, we thank you for your support. If you would like to become a member, you can do so here: saveyourcaves.org/join. We do hope you celebrate with us our important milestone this year and contribute to making the next 30 years as great as our first.

Right, three views of Balcony Sink



Kelly Lewis



Bob Biddix



Sam Moore

Paleoclimatology Sampling in a California Cave

Greg Roemer-Baer



Greg Roemer-Baer

Jessica Leila navigates a climb

After nearly a year's worth of planning, negotiations, permits, and logistics, our team successfully completed the recovery of a stalagmite from the largest-known underground chamber in the state of California, the Mountain Room of Crystal 67, a cave in Mountain Home Demonstration State Forest.

The Proposal

Dr. Isabel Montanez contacted me in 2019 to work out a way that we might be able to assemble a team to identify and collect an ideal stalagmite in a California cave for her paleoclimatology work. This is a fairly uncommon occurrence, permits for such things in California are not often sought, much less granted. Our first phase was to perform reconnaissance and identify either a "dead-and-down" sample, or failing that, an ideal live specimen.

We spent a full day in August of 2019 going over the Mountain Room (it's about 400 feet long, 100 feet wide, and 100 feet high, tilted lengthwise at about a 45-degree angle), and unfortunately we were unable to locate a downed sample. That left us looking for a live speleothem that fit both the parameters needed for the study, and also parameters pertinent to conservation and the overall aesthetics of the cave. We left the cave that day in 2019 with three possibilities for the full speleothem she needed, and Dr. Montanez proceeded to write the application for a collection permit.

The Return

After a six-month hiatus due to the COVID situation, I had reassembled most of the same team, plus a few newcomers, and began to wrap up a project that had started nearly a year ago to the day. Ceth Parker, Morgan Diefenbach, David Lyons, Brian Sakofsky, Vivek Zilpelwar, my wife Cassandra Roemer-Baer, and myself would comprise the team, while Dr. Montanez would be our surface crew.

Like many of California's caves, Crystal 67 cave is in marble bedrock, cold (39 to 41 Fahrenheit, ambient), always wet, and mostly vertical. This one sits at near 7,000 feet of elevation in a grove of Giant Sequoias. The cave consists mostly of a long, winding canyon passage with a culvert entrance in a stream bed with a ladder, four vertical drops, and several free-climbs that land us in a room the size of an underground stadium close to 300 feet below zero datum.

The cave is known for stability issues, and can be a bit of a technical challenge for cavers even as a recreational endeavor. The first roped drop after the culvert entrance has large boulders that are secured with ropes over a vertical pit that's a squeeze entrance. Loose breakdown in passages can give way easily and a good bit of spacing is necessary even in what we'd consider "walking passage" in order to protect cavers lower in the passage, and the entire floor of the Mountain Room itself is made up of similarly loose breakdown on a sharply inclined slope.



Greg Roemer-Baer

Jessica Leila and Eileen Beal in the Mountain Room



Greg Roemer-Baer

Jessica Leila on rope

Removal of the Sample

As for the collection itself, we used a 12-inch hacksaw frame with two different styles of tungsten carbide blade: a flat metal blade with a bead of tungsten carbide on the edge, and a 4-millimeter wire blade that was coated in tungsten carbide. The metal blade allowed for moving a little more quickly through the parts that were more exposed and easy to access, while the wire style allowed a little bit of adaptability in terms of operating the saw at unusual angles without binding in the cut, as a flat blade would. As the base of the stalagmite was butted up against a wall on the back side, this configuration also allowed us to slip the saw over the stalagmite, and effectively operate it backwards, cutting towards us and away from the wall with almost no clearance. We operated the saw mostly wet, by rotating positions from the queue, one person sawing and another trickling water onto the blade. After about ten minutes of sawing, the person operating the water would switch to operating the saw, while a new member would take over water duties. All said and done, the removal took a little over an hour, and five people to rotate through cutting. All of the water used was taken from the cave itself to minimize impact.

The cutting operation produced a significant amount of powdered calcite, which had been carried away with the water and streaked down a flowstone formation about twenty feet long. We now realize we should have captured the rock dust and saw water in a plastic bag. Once our task was completed,



Morgan Diefenbach

Greg Roemer-Baer (Expedition leader-CRF WEST) operating saw. It is rare to take complete speleothems for climate studies. Most studies can be accomplished with small cores taken from the speleothem—the portion containing the surface of the speleothem is often returned to the cave and used to plug the hole where the core was drilled.

I took Ceth's new Swaygo pack and filled it (~15 liters) with water from the stream that enters the Mountain Room on the side opposite our collection site, sealed the roll-top, and traversed the ledges of the room back to our work area. From the top, I emptied the entire pack to wash away all of the dust, all the trickles of white powdered calcite from the sawing. It made an impressive cascade, and all surfaces were washed clean.

From there, the real fun began: transporting the collected specimen to the surface. This stalagmite weighed an estimated 25 pounds, and in the pelican case, a bit over 30 pounds. Considering the importance of the data that will be taken from the stalagmite, the extreme difficulty in obtaining a permit, and the fact that it was a living piece of this beautiful cave, failure simply wasn't an option. I brought down the large pelican case with all foam inside, and removed the foam to tightly fit the stalagmite on-site. The case was too large to fit inside my 45-liter Petzl cave pack, and so I made a strap system with webbing that could be



Greg Roemer-Baer

Stal, ready for transport in a foam lined plastic drybox

used like a pack tether. The bulk and rigidity of the packaging made it a bit of a challenge to maneuver, especially on drops and climbs, but we made it to the surface with the specimen in absolutely perfect condition.

By Dr. Montanez' account, it was one of the best specimens of its kind she had ever seen recovered from California for paleoclimate work. We expect that the data that it yields will go a long way toward refining existing climate models and increasing the accuracy of the predictions. It was an extremely rare opportunity, and something that would be nearly heretical in any other circumstance. It's just not often done, especially in California.

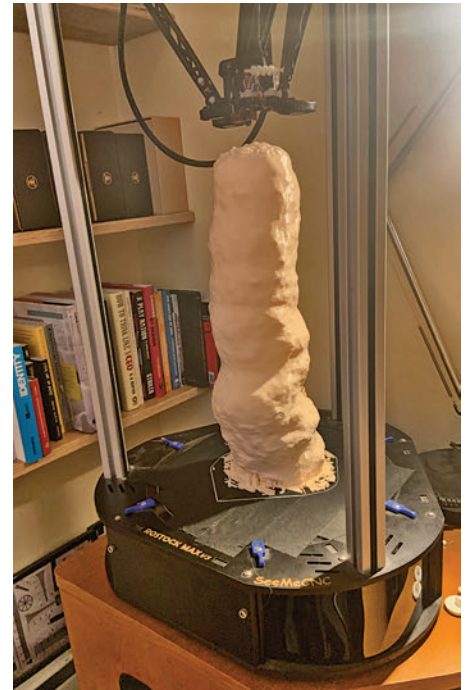
It's a strange experience, certainly, considering how we think about cave conservation in terms of NSS guidelines. As an NPS trustee/expedition leader for several California caves, I'm fairly militant in terms of insisting that any party I lead observe the strictest guidelines for the preservation of the cave. While we believe the value of the data that will be extracted for much larger conservation efforts outweighs the cost of the removal of a single speleothem (even one that we're expending significant resources to restore), it remains that performing the removal itself does come with a certain sense of loss.

As a testament to the level of care and precision we put into the selection and removal of the specimen, I led a second trip the very next week to the cave for two members of the original team who hadn't been able to attend the recovery mission. I took them within ten feet of the sample site, and asked them to find the stalagmite we had removed. They were unable to do so, and I considered that a mark in our favor. There are stalagmites in the mountain room that range from 6 inches to about 4 feet in height, and we had worked to make the remaining base material appear similar to one of the more prolific smaller, stubbier specimens.

Restoration

We were due to complete the restoration component of the project in spring of 2021; but as many of you know, California's forests suffered terribly in the fires in 2020. Many of our iconic giant Sequoias were lost, including some at Mountain Home near Crystal 67, which was near the heart of the Castle Fire/SQF Complex. The forest will remain closed likely all through 2021, reopening late spring of 2022. As soon as it does, we hope to finish our restoration work. While the permit specifies installation of a replica, fully restoring the appearance of the formation we collected, we hope to explore other possibilities.

The project has raised interesting questions about placing untested materials



Dr. Isabel Montanez

Printed replica stal

in caves, the rationale for replacement of a natural speleothem with a replica, and about overall best practices in this scenario. For instance, the installation of a replica wouldn't necessarily be in the best interest of the cave. If anything, the speleothem probably has a better chance of regrowing without the replica in place. It remains that the argument for the installation of the replica centers around human perception of the cave. The fact that the work we performed was done in such a way as to preserve appearance even after the removal speaks to potentially leaving it as is. This cave also sees very few visitors. In recent years, the one or two trips I might run annually account for a large percentage, if not a majority, of the total visitation. Advancements in technology and materials research may lead to better options in future field-proven, cave-safe materials.

With the stalagmite now in the lab, it has been 3D-imaged at high resolution and a perfect replica has been printed. The proposal calls for this 3-D printed replica to be colored and finished by a company that specializes in making casts for museums. However, we continue to evaluate minimum-impact conservation as it applies to our specific case, and we are reconsidering our original plan of using the replica to replace the speleothem.

Cave conservation encompasses more than aesthetics, and we need to carefully understand and test the potential long-term consequences of any of the materials and finishes used. The ethical question remains: to mitigate, or not to mitigate. At the end of the day, this decision rests with the park's management; but we have a good deal of

time to work through the options and make other recommendations if warranted.

It was an excellent team, a fascinating project, and we are all grateful for the opportunity to play a role. Beyond being technically interesting, the paleoclimate work is important, and we are all thrilled to play a part in that piece, as well.

For more information on Dr. Montanez' and Babs Wortham's paleoclimatology work, please see the following article published about the work we did at Crystal 67, and also our ongoing work at Lilburn Cave with CRF-West:

<https://lettersandscience.ucdavis.edu/crystallized-climate>

Responsible Speleothem Sampling

Sarah Truebe, PhD

Paleoclimate (past climate) studies from caves can be very valuable. Depending on the location of the cave and the quality of the study, the information contained in the minerals in a speleothem will elucidate how the climate system worked—critical information in a modern changing climate. Analyzing samples from speleothems is an increasing trend in research; however some specimens are taken without proper care for the cave, a practice that many speleothem paleoclimate scientists recognize should stop.

When considering whether to remove a speleothem from a cave for science, regardless of the type of study, careful pre-screening of samples is important. Some questions to ask include:

- Is the site actively dripping? Is it actively forming calcite? (Important if recent climate change is of interest; not all dripping sites are forming calcite).
- Will the information gained outweigh permanent damage to the cave? What other collaborators, instrumentation, or proxies, could be used to produce the highest fidelity climate record?
- Could the study be done with dead-and-down speleothems? Could the study use stalagmites that were removed from show caves prior to development?
- Could the study be done similar to “salvage archaeology” where the site will be destroyed due to other conditions (for example, road-building); could relationships be made with state, county, or country agencies to learn about these sites in time to extract information from them?
- If an attached speleothem, or part of the speleothem is deemed necessary, can it be removed with very little damage? Is it possible to capture any runoff, drill dust, saw water, or other potentially harmful byproducts?
- Does the speleothem have to be removed or can it be cored?
- Does the landowner approve of this type of study? Does the landowner understand that it will mean irrevocable damage to the speleothem(s)? Even if the site is restored aesthetically with similar or same materials as are found in caves, it will be fundamentally changed.

If a decision is made to remove a speleothem from a cave, a number of other questions become important:

- Will the speleothem be placed back in its original position in the cave? If so, how will it be repaired and restored to its original appearance? What epoxy is recommended, what materials for color matching will be safe for the cave, how will it be pieced back together?
- Is a replica speleothem really a good solution? Have all materials and pigments been evaluated and proven to be cave-safe in those particular cave conditions? Many materials and colorings result in harmful off-gassing or provide substrates for unwanted microbial growths. Check the end of the book, *Cave Conservation and Restoration* (Hildreth-Werker, Werker 2006), for some lessons learned about cave-unsafe materials.
- Will the speleothem be made available for later study by other labs worldwide? The National Cave and Karst Institute is currently undertaking a project to log archived speleothems (similar to archiving ocean sediment cores that are often acquired at great expense), so other researchers can access speleothems that otherwise would remain archived in a lab basement somewhere.

In the coming months, a handful of paleoclimate scientists are partnering with NSS cave conservation experts to develop Minimum-Impact Guidelines for Sampling Speleothems. The study discussed in Greg Roemer-Baer's article (this NSSNews issue) details a collaboration between cavers and paleoclimate scientists, throughout which many of the best questions for undertaking this kind of study are asked and analyzed. Hopefully more and more scientists will incorporate the views and values of cave stakeholders and cave managers as speleothem paleoclimate studies expand into the 21st century.

Conservation Notes

Support Cave Conservation — Donate to Save-the-Caves Fund

- Caves, cavers, and the NSS appreciate your financial support!
- Our Save-the-Caves Fund supports NSS Conservation Grants.
- Contributions are tax deductible, of course!

The Save-the-Caves Fund is used to support the conservation goals of the National Speleological Society. It supports conservation programs and funds a number of conservation grants for restoring and protecting caves around the United States. You may choose to donate in Honor or in Memory of a friend or loved one, and notice will be sent to whomever you designate. <https://learnmore.caves.org/index.php/donate/>

Conservation Task Forces: Making a Difference

NSS Conservation Task Forces (CTFs) make a difference in karst areas around the United States. Since passing of the Federal Cave Resources Protection Act of 1988, many CTFs are recognized by local federal agencies as primary representatives of the caving community on conservation issues in their areas. NSS members of CTFs are helping to manage caves on behalf of public and private landowners.

A CTF is a great way to gather like-minded people and make good things happen in cave and karst conservation. Some CTFs have a specific project that may take a year or two to complete. Other CTFs lead ongoing projects that continue for many years. A CTF may tackle a significant cave vandalism problem, or it may work alongside landowners and civic leaders to clean up a groundwater pollution source. Due to the ongoing efforts of CTFs, caves are mapped and inventoried; management plans are written and implemented; restoration and cleanups are accomplished: cave habitats are restored. Any cave/karst conservation, management, outreach, restoration, or protection concern fits.

Join an existing CTF: <http://caves.org/conservation/CTFS.shtml>

Establish a New CTF: Create an NSS Conservation Task Force to focus on local, regional, national, or international cave and karst conservation issues. If your work would benefit from CTF designation, contact the NSS Conservation Division, Val Hildreth-Werker valhildrethwerker@caves.org

Surface Vegetation Needs Conservation, Too: A Case Study of Roots in Lava Caves, El Malpaís National Monument, New Mexico

Kathleen Lavoie, Jessica Snider, Diana Northup

Lava caves form as a result of active volcanic processes and are common in lava flows around the world, on other planets such as Mars, and on the Moon. Lava caves are part of the Shallow Subterranean Habitat (SSH) characterized by Culver & Pipan as dark with no photosynthetic primary productivity, but with connections to surface environments that influence chemical and physical factors, including the availability of nutrients. Lava caves provide entry points to the shallow subsurface, usually having less than 10 meters of overburden, and are within the root zones of many woody plant species. Roots have been reported growing into karst and lava caves worldwide, especially in humid tropical regions. Roots in caves, beneficial for nutrient flow into spelean systems and arthropod diversity, need conservation awareness.

Roots function to anchor the plant, transport nutrients and water from the soil, and store resources. Roots provide fixed carbon from photosynthesis into constantly dark caves. Caves provide access for roots to different depths underground. There is no evidence that plants “sense” underground resources before coming into direct contact, but plants can preferentially take advantage of locally abundant resources by altering growth rate or direction to seek out areas of soil ammonium and nitrate.

Life in all environments is controlled in large part by the availability of water and nutrients. Water percolating down from the surface can bring nutrients into caves and may deposit onto walls and ceilings and collect to form pools. Roots growing into shallow lava caves and water percolating through soil introduce dissolved carbon and nitrogen resulting in a patchy distribution of nutrients which may have a direct effect on the composition and distribution of microbial communities within lava caves.

Two lava caves with active and extensive root growth in the El Malpaís National Monument, New Mexico, were used to test several hypotheses. Six paired areas (Ceiling/Floor) from three zones were selected: Root Zones: with roots and water percolation; Wet Zones: areas with no roots but with water percolation; and Dry Zones: areas with no roots or water percolation. Total percent carbon(C), nitrogen(N), and 16SrRNA gene phylogenetic studies were determined from each zone in both caves.

We hypothesized that zones with roots and water percolation would have higher

amounts of C, N, and microbial community diversity including root-associated and soil bacteria than zones lacking roots and/or water percolation.

Roots and water entering the shallow ELMA lava caves did result in a mosaic of available C and N, with the Root zone having the highest level, the Wet and Dry Floor zones with intermediate levels, and the Wet and Dry Ceiling Zones with the lowest amounts of C and N.

However, there was a similar mosaic of microbial distribution and community composition at the phylum level. All communities shared similar structure and members, suggesting that the roots, both growing into and around the lava cave, may provide a conduit for microorganisms to enter the cave, where the environment would select the best adapted or allow for rapid speciation.

Differences in microbial communities were more evident at the genus level. Caves are not homogeneous environments. There are zones related to distance from the entrance; seasonal variations; three-dimensional geometry; differential cooling and deposition of minerals in lava caves; and microhabitats that may vary at the level of the individual mineral grain, supporting the unique microbial consortium best adapted to those conditions. All zones had a similar mixture of cave-, rhizosphere- or soil-related isolates and all zones had both chemolithotrophs and chemolithotrophs.

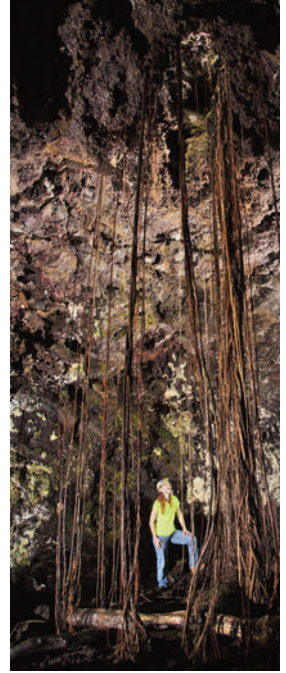
In general, roots are important areas for arthropod diversity and need conservation. Plant roots support specialized invertebrate communities in tropical lava caves. Troglotic planthoppers in lava caves in Hawai'i, the Canary Islands, and Australia feed directly on the phloem and xylem of plant roots. Howarth and colleagues used molecular techniques to identify roots from caves on both Maui and Hawai'i to develop effective management strategies. The roots support 28 species of arthropods, including eight troglonites. They recommend creating protected reserves around biologically significant caves. The arthropod communities surveyed were being supported by the roots of invasive species, but managers need to control and prevent the spread of harmful invasive plant species, and encourage the establishment of native deep-rooted species to maintain the unique arthropod communities associated with plant roots in Hawaiian lava caves.

Our study supports numerous management issues. Roots provide a conduit from the surface into the lava caves, making conservation of the habitat and vegetation above the cave important. It is critical not to interfere with movement of water into the caves. Culver and Pipan have stressed the need for regional or landscape conservation of Shallow Subterranean Habitats, including lava caves. Threats are alterations to the physical habitat, changes in water quality and quantity, and direct changes. Many bacteria found in lava caves, especially members of the Actinobacteria, are a potential source of novel antibiotics and other medications. Our study found many novel bacteria in the lava caves which could be studied for their metabolic potential. All communities shared similar structure and members.

The microbial communities in these lava caves, and possibly all shallow caves, come from the soil and plant roots above and around the cave. Ours is the first study of bacterial communities of roots in lava caves, and contributions of roots and water to the nutritional conditions. Next steps could be to quantify nutrient inputs from the roots and water.

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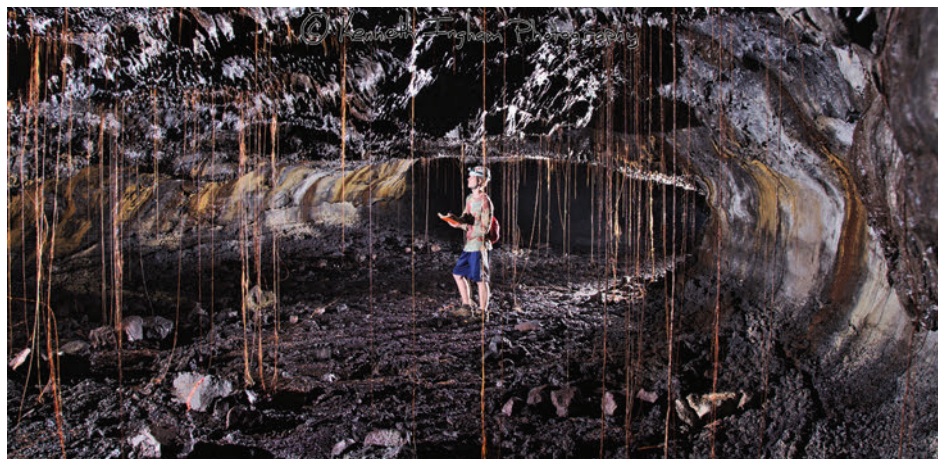
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Roots growing from the ceiling of a small lava cave in El Malpais National Monument, NM. Roots are probably Ponderosa pine, and the white coatings are symbiotic mycorrhizal fungi. Other images show various types of roots found in lava tubes in the U.S. (Photos by Kenneth Ingham.)



Tiny insects such as this planthopper live on roots like this one in Hawai`i.



Cave Preservation Network Spotlight: Bluff Dwellers Cave of Noel, Missouri

Nicole Ridlen, NSS-NCA Liaison

C. Arthur Browning was a busy farmer. He had fields to plow, livestock to tend, and a family to feed, so in 1901 when he found a small hole at the top of a hill along a limestone outcrop with a cool breeze, he thought there might be a cave but had no free time to find out for sure. In 1925 a crew began constructing a highway that would go right down the middle of Arthur's land. Some young men on the highway survey crew spent their spare time exploring area caves and were curious about more caves in the region. Arthur mentioned the small head-sized hole, and they were ready to help him check it out.

Discovery

It was a Sunday morning in April of 1925 when Arthur and the two young men first explored the cave. It turned out to be greater than they could have been imagined, so big that when Arthur and the two young men didn't emerge seven hours later, the family thought they might be trapped and sent for help from the neighbors. It was, after all, only a couple months after the story of Floyd Collins had swept the nation. The neighbors were climbing the hill, lanterns in hand, ready for a potential rescue when Arthur and the men emerged. They certainly had an amazing story to tell and the story quickly spread through town. It wasn't long before a local, self-proclaimed "cave man" heard all about it and showed up.

Family Owned and Operated

Arthur had no interest in opening his cave to the public but the town pressed him. They told Arthur that he was holding back progress for the city. Show caves in the early 1900s were a big deal, were sure to bring more tourism to the area, and a cave like Arthur's? It would surely bring even more visitors. In early 1927 Arthur finally agreed to lease the cave to J.A. Truitt, the self-proclaimed "Cave Man of the Ozarks." During development, they found artifacts like grinding stones, arrowheads, stone tools, layers of ashes, and partial human remains ... and the name "Bluff Dwellers" was declared.

It didn't take long for Arthur to realize why all of Truitt's other show caves had failed. He wasn't so much of a cave lover as he was a seeker of fame. He was always looking for the next news-worthy opportunity. The cave's development was slow and safety issues were abundant, and Truitt had already turned his attention to a new cave. Arthur's new son-in-law and daughter, Hazel, bought out Truitt's lease in the early 1930s

and it became a family-owned-and-operated business.

Perhaps it was the poor management of the cave by Truitt, or maybe the pride Arthur had in his family's land, but he worked hard to make Bluff Dwellers Cave a safe and educational cave tour. Kathleen, who had only been 11 years old when her father found the cave, jumped in feet-first. She traveled to show caves across the country during the late 1930s and early 1940s, and she met with university geologists in Missouri and Arkansas to learn all she could. She went to mines and other areas, collecting rock, mineral, and fossil specimens during her travels.

In 1958 Kathleen officially took over ownership and management of the cave. Kathleen ran a tight ship and kept the cave protected, proudly offering an educational tour, and curating a museum from her extensive collection. Her siblings helped run the cave, including Reita who was 16 years younger and grew up giving tours as a child. Reita later married and moved to Kansas with her husband, where they raised their children and came back to Noel, Missouri to visit the cave whenever they could.

When Kathleen was no longer able to run the cave, Reita and her husband George Bunch moved back to Noel to run the family cave. Today their three children, Mike, Mary, and Ray, own the cave. Ray and his wife, Ann, moved down to Noel to carry on the family tradition. I asked Ray what it was like being able to play in a cave when he was a kid visiting for the holidays. His answer? "Oh, there was no playing in the cave ... Kathleen was very strict about that!"

Focus on Conservation and Education

Bluff Dwellers Cave today works hard to help with cave conservation, preservation, and education. There are actually six known caves on the property and only one is open for cave tours. Bluff Dwellers Cave is of course the biggest of the six and open seven days a week, 362 days a year. The tour is designed to be educational yet fun. The guides lead 15 or fewer visitors through the cave at a time and go over the geologic processes of how caves form, why they are delicate environments, and how important it is to be responsible and ethical when visiting caves. Guides tell visitors about the different show caves they can visit and how to find their closest NSS Grotto to learn how to explore caves responsibly if they are feeling more adventurous.



A theme of Bluff Dwellers Cave's tour is "sacrifice of the few to protect the many." During tours we explain that we try to preserve the cave in as natural a state as possible for the enjoyment of visitors. But a show cave, by its very nature, will never be 100% like it was the day it was discovered. The cave tour allows us to share the amazing cave world with the public. Cave tours are the platforms that help us protect Missouri's 7500+ known caves through education and awareness. People do not want to protect things they don't understand, but by learning about a cave in a controlled environment people can better understand why caves are worth protecting. The public learn that they can volunteer their time to help, vote for laws to protect, fund research to better understand, and donate money to help with the cause.

NSS and the Cave Preservation Network

The Cave Preservation Network (CPN) was a natural decision for the Bluff Dwellers Cave Team. Partnering with the NSS, the CPN allows our visitors to participate in the preservation of other caves out there through rounding up their purchases. Every little bit helps, however small, and allowing customers to be part of the bigger picture really pulls the cave tour and mission together.

Bluff Dwellers Cave also participates in wildlife monitoring programs by Missouri Bat Census to document the effects on cave ecosystems after White Nose Syndrome arrived at the cave in 2017. The cave sells a laminated cave map poster with photos of the cave and wildlife—proceeds benefit the Missouri Speleological Survey, our state organization that documents and maintains a database of all caves statewide.

Cave Gating, Clean Up, Restoration, and Youth Outreach

The other five caves owned by Bluff Dwellers were frequented by trespassers and vandals over the years. In 2018 due to rampant vandalism, our second longest cave was gated by Kansas City Area Grotto, Springfield Plateau Grotto (SPG), Boston Mountain Grotto, and is undergoing restoration. SPG has helped remove trash and spray paint.

Bluff Dwellers Cave management, SPG, and Missouri Bat Census helped sponsor cave cleanups at neighboring privately owned caves. They guided a group of youth from the local SOPE-Discovery Corps class in removing spray paint, cleaning up trash, and educating local youth about the importance of cave conservation. SOPE is a combination of success and hope, because that's what we want to give our kids—and, Discovery Corps is named after Lewis and Clark. Jon Beard, cave restoration specialist of SPG, taught them the importance of checking caves for evidence of historic and archaeological significance before removing modern graffiti.

Keith Jones, the SOPE science teacher says, "As a science teacher, I love seeing the passion on students' faces when they're actively engaged in the inquiry process. My students were able to work with Nicole from Bluff Dwellers to see the impact of visitors on caves. They began by touring Bluff Dwellers then visited several "wild" caves with Nicole Ridlen and Kirsten Alvey-Mudd from Missouri Bat Census. What these students were able to experience was a lesson that will stick with them forever. These students have since moved on to high school, but they still talk about those experiences when I see them around campus! The knowledge they gained from exploring caves and working with these scientists opened their eyes to the issues of bat and cave conservation and will stick with them forever!"

The best way to protect caves? Prevent future damage through public education and awareness, starting with the youth. After spending all those hours scrubbing spray paint from the cave walls and picking up glass shards out of clay and chert, those young people will surely think twice about the consequences of participating in such activity later.

The Bluff Dwellers Cave Family Legacy

As a caver who found herself managing a show cave it may sound like these are programs and events that I brought to fruition, but the truth is I am just continuing the family legacy. I am honored to work with a cave family that has long treasured the natural world they discovered.

From the beginning, Arthur wanted the cave to be a safe and natural cave experience; that is why he started managing the cave even though it was never his intent. Kathleen was so inspired by her father that she took the time to educate herself through traveling and reading books. She raised her sister Reita to appreciate and respect the cave, and Reita raised her children, who now own the cave, with the same sense of love and respect.

Bluff Dwellers Cave owners have been dedicated to the conservation of their cave since long before they even knew the science of how important it was, and we carry on that tradition by staying true to the family. The cave is beautiful and amazing just the way nature made it and we pride ourselves on sharing how amazing it is with anyone willing to listen.



SOPE students and teachers get ready to enter a local cave. Kirsten Alvey-Mudd (purple helmet) gives information about bat habitat disturbance while Jon Beard (orange helmet) describes procedures for checking for archaeological or historic significance before graffiti removal.



Bristly Cave Crayfish (*Cambarus setosus*) is a species of concern living in the stream of Bluff Dwellers.



Archaic-age grinding stones discovered within Bluff Dwellers are still on display in the cave.



Removing spraypaint graffiti with water and a nylon-bristle brush

Nicole Ridlen

Nicole Ridlen

Brandon Van Dalsem

Nicole Ridlen

Reflections of a Conservationist

Ethan Oleson NSS 69922

“Welcome to Rushmore Cave, my name is Ethan....” That’s how my days at Rushmore Cave, in Keystone, South Dakota, began in 2016. Back then, I was a young and unconcerned kid who was trying to get some walking-around money, as working for my grandparents wasn’t cutting it anymore. I didn’t know anything about caves or really care. It was just a job. I was just giving cave tours. Later that summer I was introduced to caving, properly, by a buddy who has become a good friend. After my first cave trip, I was hooked. I spent countless nights after work exploring in the depths of Rushmore Cave and expanding my own comfort zone. I continued to give cave tours for two years until I was a freshman in college.



Ethan Oleson

conservation was a worthwhile investment, I would need to sound like I knew what was going on. I ordered the cave-specific bible and began reading.

By spring break, I was ready with a ten-page proposal fully equipped with a job description, possible projects, and how the “benefits” of this position would lead to an increase in revenue for the cave—or at least break even. I traveled back to South Dakota from Montana for break, and I brought my proposal to a shift at work. Before a tour, I gave the proposal to my manager. By the time I got out of the Cave, the decision was made, they would give me a shot. I would act as a Gift Shop Supervisor for four days a week and on one day of my choosing I would be the cave conservationist.

Season One

By the summer, my new position was defined and we had a project list. Needless to say, I was horrified. I was still in shock that my proposal worked, and I understood that I needed to deliver. To “prove” that I was doing my work and to show what I did on a day-to-day basis, I began keeping a Cave Conservation Coordinator Daily Journal. Every day I would journal a bit about what I did, the problems that occurred, ways to improve, and work patterns that seemed effective to the position. At the end of each month, I would compile my entries into a report that I would submit to the Natural Attractions Manager and to the General Manager.

In about February, an email from Tom Hagen, General Manager at Rushmore Cave, said I was invited back to work as an Adventure Tour Guide—the same job I had a year before. To this day, I don’t know if it was the cave gods, or my desire to not be stuck in the same place, but I began thinking about what Rushmore really needed, and my thoughts landed on conservation. Rushmore Cave needed a conservationist ...

My knowledge of conservation consisted of knowing that oil on skin was damaging to passages and even more so to formations. I turned to the only people I thought would have some knowledge about conservation—the NSS. I landed on what I now refer to as my bible: a 600 page book, *Cave Conservation and Restoration* by Val Hildreth-Werker and Jim Werker. I knew that if I was going to convince my manager that

As projects piled up and interest in the position peaked from staff and visitors, it became clear that one day a week was not enough. After some negotiation and haggling, we landed on three days a week. During this time, I went from someone who knew little about caves and little about conservation to working a full shift and then going home to create tools and processes to streamline my work.

As the summer continued, we completed project after project. Not only did we take a proactive approach to human debris, algae, and graffiti, but we began the long process of restoring our formations. Rushmore Cave contains some very dense speleothem groups in two areas covered by the tour path, the largest being the Big Room. The Big Room extends for two acres with half of the floor and ceiling covered in hundreds of formations—including the Great Column, one of the largest in the Black Hills. The formations of the Big Room had not been restored or looked after with great detail since at least the early 2000s. Speleothems were covered in cave dirt, lint, hair, algae, trash, and even mold. Each formation required a bit of careful attention. For days, I hung from a rope on a flowstone slope cleaning and restoring what I could reach. I learned early on in my caving career that conservation is never finished—some of those formations still require restoration. At the end of the day, I was proudest of the projects where a clear, positive difference had been made.



Travel South Dakota

The Big Room In Rushmore Cave



Rush Mtn Adventure Park

Ethan Oleson removing coins from a cave pool with a homemade 2.5-foot spoon

At the conclusion of the first summer, we decided to tackle our most feared project—our coin pool restoration. I have tried for years to justify in my mind why people have the urge to throw coins in a pool in a cave. This “coin pool” is in fact a fifteen-gallon cave pool that is at the base of our largest known chimney. It took two of us twelve hours to restore this pool. We drained and filtered the water into storage containers that were stored safely off trail. We removed a contractor’s trash bag full of grime, gum, dirt, mud, and coins. To our surprise, the pool was decorated with spar on its banks—a nice feature lost to time, now recovered. As the cave was closing for the day, we reintroduced the water to the pool. It was free of coins and more like nature intended.

Season Two

The first season of conservation at Rushmore Cave was full of success, sleepless nights, massive conservation blunders, unrelenting public outreach, and a whole hell of a lot of fun. The second season for Conservation at Rushmore Cave took place in the summer of 2020. There is no need to go into how difficult 2020 was for everyone, for tourism, and for caving. We decided to upgrade our conservation position to full time to assist with the added precautions that we took in response to the Covid-19 Pandemic.

I consider 2020 a success—we developed a manual for future conservationists, completed large projects, and maintained the infrastructure of the cave on a scale we hadn’t been able to do before. As for most show caves, 2020 was a season of

“next year we’ll do that” or “it’s not in the budget.” I look back on the 2020 season as one of preparation—preparation for a future conservation program, preparation for future wild caving tours, preparation for infrastructure expansion, and preparation for much more to come.

Show Cave Conservation and the NSS

Over my time as a caver and a conservationist, I have been granted a unique perspective into a sport and science I love. I have participated in exploration and survey projects, recreation trips, education, conservation, and outreach. I see my conservation experience as a unique one, as it developed in a privately owned show cave. Like most businesses, we have a goal: to provide a unique and fun experience for all ages by showing them the beauty of caves. We, of course, also aim to turn a profit—if we didn’t, the cave would be visited by users who could possibly vandalize and neglect it. Commercial development of caves, either privately or publicly, has supporters as well as naysayers. Regardless of the words of those who believe that private cave ownership is damaging to the science or liberty of exploration, in many cases, it is irrefutable that private show caves are, in fact, the first exposure the public has to caves. For many, show caves provide their only in-cave experiences.

Moreover, private ownership provides protection for the cave. If we didn’t own it, it could fall into the hands of less responsible ownership. Private caves all over the country, therefore, have a duty to be leaders and models of good conservation and caving ethics. It is appropriate and necessary component of stewardship for organizations such as the NSS to extend time, resources, and outreach to the show cave industry. Programs such as the newly organized NSS Cave Preservation Network are a prime example of the type of collaboration that will pay off for years to come.

Active show caves often fall short of the conversation when we drool over the great caves. However, many of us were introduced to caving through commercial cave tours. Show caves must be conserved not only because they are inherently valuable as ecosystems, spelean resources, and places of irreplaceable culture and history, but also because they tell the public about who we are, they should be reflections of our organized caving community.

Conservation in a show cave provides its own challenges. Not only are show cave conservationists either a one-caver-band, or a group of volunteers, but they often have very constricted resources and budgets with which to conduct the same operations and tasks that federally or state funded caves perform.



Kaden Franke

Ethan Oleson taking pictures of historical graffiti for inventory

Even more difficult—a privately owned show cave has to turn a profit. While it is never ethical to make conservation decisions based on budget alone, conservation-minded decisions are easier to make if they are financially sustainable. It is not as difficult as it sounds—it is indeed possible to turn a profit from a conservation program when sufficient time and energy are committed to public relations, stewardship outreach, and visitor education.

Conservation in a Show Cave, while not always the prominent player on the stage, is as important to responsible management of the cave as is providing a means for the public to responsibly enjoy the world of caves. It is more important than ever to model low-impact cave ethics and preserve the natural world.

Show caves have more roadblocks than most when it comes to committing resources to large scale projects, but they also have the burden of this obligation. As cavers, we should volunteer, consult, and support the conservation efforts in private show caves all over the country. They are the backbone of our passion. Caving has fostered some of our greatest friendships and opportunities—caves continue to provide us with more than we know—I encourage every caver to take up the toothbrush and give something back to our show caves.

What It Means to Be a Member of a High School Cave Conservation Club

Scout Jessop



BHS Cave Club Members on trip to monitor caves in Glacier National Park

To me, the Bigfork High School Cave Club has been the most important experience in my high school career. I have been a part of the club for four years, but it has been active since 2005. At the request of state and federal agencies, the club has worked in over 60 caves throughout the western US. I personally have worked in 15 caves. The work involves bat hibernacula surveys, setting up roost loggers, soil sampling, and establishing mineral, climate, biology, and photomonitoring.

Through the club I have been able to expand my education beyond than the school walls, which not many students have the opportunity to do. It is rare to find a student who has had the chance to explore some of the most remote places on earth and to meet inspiring conservationists along the way. I have had the opportunity to share my knowledge with cavers across the US, and the people I interact with are incredibly interesting and have amazing stories to tell.



BHS Cave Club member finding photos for remonitoring project in a Forest Service cave

The bond you make with someone who spends hours with you in a cave is one that you can't find sitting at a desk all day.

As a cave club member I have responsibility in the caves as well as outside of them. Our work carries back into the classroom where we transfer all information into online services through eCave, which allows other cavers to access

the information and add their own data. Although around 25 students make online maps, typically only five to seven students go on the caving trips.

The difficult work pays off in fun memories along with state and national recognition. The club has been awarded the 2010 President's Environmental Youth Award, NSS certificate of Appreciation in 2018, and the Montana Chapter of the Wildlife Society Wildlife Conservation award in 2019. Besides the awards, the club is a fantastic source of volunteer work—I alone have 600+ hours.

I pity those in my school who pass up the opportunity to join the club, but I don't



BHS Cave Club members establishing monitoring in a Forest Service cave



Trail marking alternative to flagging tape

judge. Stories of bats, spider clusters, deep pits, and lots of wood rat poop scare off the majority of the teen population. But if everyone could look past those uncomfortable details, they would realize the time dedicated to working in the club is well spent.

The work of the cave club is beneficial for the land managing agencies and for the conservation of the caves. However, we are only one club and there are thousands of caves that need attention. Schools around the country could adopt our system and help contribute to the preservation of caves and wildlife, while providing incredible educational experiences for teens.

Volunteer Value Calculations for Cavers

The chapter titled "Documenting Volunteer Value" in the book *Cave Conservation and Restoration* (Hildreth-Werker, Werker 2006) describes the history of determining Volunteer Value for cavers, contains an official document defining what hours count, and field forms for recording and calculating caver Volunteer Value. The chapter includes how to figure the cost/value of caver time and expertise, starting with GS 5 equivalents. When tasks require specialized professional expertise, the cost/value can be assigned according to other GS ratings. Under this system, in addition to in-cave time, Volunteer Value calculations include time and expense for project preparation, travel, equipment, and post-trip documentation. See <https://caves.org/conservation/> and click on Volunteer Value.

Hildreth-Werker V, Werker JC, 2006. Documenting Volunteer Value. In: Hildreth-Werker V, Werker JC, editors. 2006. *Cave Conservation and Restoration*. Huntsville, Alabama: National Speleological Society. [pp 321-328.] Available online at <https://digital.lib.usf.edu/SFS0051033/00001> or through the NSS Bookstore <http://bookstore.caves.org> ISBN 1-879961-15-6

Cave Restoration and Formation Repair Projects in Lechuguilla, Cottonwood, and Fort Stanton Caves

Mike Mansur, NSS#26393RL FE

Lechuguilla Cave Restoration Project

This restoration project addresses caver impact along the upper portion of Lechuguilla Cave in Carlsbad Caverns National Park (CCNP), New Mexico. This area of Lechuguilla must be traveled by every team that goes deeper into the cave, so it receives more impact and requires regular restoration and reflagging.

Planning began in the fall of 2018. Three 2019 trips were approved by the Carlsbad Caverns Cave Resource Office and three for 2020. Due to the 2020 pandemic, we were able to complete only the March trip, and followed Covid-19 protocols.

We began at the bottom of the entrance culvert and continued on into the cave, using water for restoration from the A6 pool. On our first trip we concentrated on reflagging the trail to the Liberty Bell area, and cleaning 20 pools of various sizes and depths surrounded by popcorn formations and flowstone. We restored an area of 190 square feet, spending a total of 56.4 volunteer hours this trip. We used pressurized spray bottles, plastic bladders to remove the dirty water from the cave, and collapsible pails to hold our tools.

On our next trip in July we worked on cleaning the flowstone and cave pearl pools at the bottom of Boulder Falls. Erin Lynch, Physical Science Technician at CCNP, picked up a large number of silica desiccant beads, trash, bits of flagging, and lint off the trail. We removed a large number of footprints from the dirt downslope of the landing zone and placed flagging to protect that zone and encourage travel on the actual trail that leads over to the middle of the Colorado Room. We cleaned a large amount of rock bits from the flowstone that were likely there from drilling new anchors and the rebelay on the rope drop to the room. We used water that had been collected in a Darren drum placed there by Aria Mildice (CRO), which was much preferred to bringing in water from the A6 pool. Pressurized sprayers made it easy to remove caked mud from the flowstone. We also cleaned several beautiful black and white stalagmites that were next to the trail.

On the next trip we worked the trail leading to Sugarlands. There was almost no flagging there to designate the trail, and hundreds of off-trail footprints, some of which occurred during the recent resurveys in the area. We removed four “off-trail trails” and all the footprints. Erin cut 30 feet of

excess off a rope used to access an upper lead. We sprinkled darker dirt over lighter dirt to disguise the footprints in some areas. Our efforts that day yielded 425 square feet of areas restored, 300 feet of new orange trail flagging placed, 65 feet of “off-trail trails” removed, and 30 feet of unneeded old rope removed from the cave.

During our March 2020 trip, we removed off-trail footprints from 22 specific areas along the main trail from the Colorado Room to Glacier Bay. We removed 145 feet of two old scientific trails no longer needed on the top of Glacier Bay, replaced old and damaged flagging with new, and placed red/white flagging around sensitive areas. The total square footage restored so far is 1505; the total in-cave volunteer hours are 225.5. I want to thank everyone for their enthusiastic help on these trips: Mike Mansur (Trip Leader), Erin Lynch, Aria Mildice, and Dave Brumbaugh (Carlsbad Caverns Cave Resource Office), Minori Yoshida, Todd Roberts, Scott Christenson, Carrin Rich, Sam Bensonhaver, Lois Manno, Brandon Lee, and Brandon McKinnon.

Cottonwood Cave Formation Repair Project

This project began in August 2019. Aaron Stockton, at that time the Cave Specialist with the Lincoln National Forest (LNF) in the Guadalupe Mountains, asked me if I could start a formation repair project on two areas in Cottonwood. I had been working on similar projects in other Guads caves since 2018 after visiting with my long-time caving buddies, Jim Werker and Val Hildreth-Werker, to get some pointers on proper cave-safe materials and supplies. Their book, *Cave Conservation and Restoration* (Hildreth-Werker, Werker 2006), has thor-



Coke table in Cottonwood with stainless steel rod installed before repair



Mike and Minori assembling Baby Goliath using the Speleoclamp

ough instructions on cave restoration and repair techniques and materials best suited for caves.

We started in the Coke Table Room. Here was a beautiful room devastated by vandalism, with hundreds of broken formations. For formation repair in this type of area, I designed and created some custom tools: the Stalactijack, a spring-loaded PVC device that supports repairs to stalactites while the epoxy cures; the Speleoclamp, a PVC and stainless steel all thread device, which holds formations in place to drill for in placement of stainless steel stabilizing pins; the Speleocup, a PVC cap with two stainless steel screws, which secure rubber



Coke table repaired

bands to the stub while the epoxy cures; the Speleorake, an extendable PVC shaft with stainless steel wires at the end to retrieve broken formations from the pools; and the Cave Claw, which we use to remove and restore old trail surfaces.

We have retrieved 86 broken formations from the two pools so far, matched all but 11 with their ceiling points of origin, and epoxied them in place. Two coke table formations had been broken off; in one we installed an 8-inch long, 3/8-inch diameter stainless steel pin to mount it back to its base. Aaron gave names to at least 25 formation pieces so they could be identified with their point of origin. This worked well until we passed 100 formations repaired; we then went to a numerical system. Todd Roberts invented a clever way to photograph the ends of each broken piece to scale with an assigned number. He made an attachment for his camera that had a ruler, counter, and scale to better identify each piece by color. Printing 20 per sheet, we could hold up the printed color copies to the ceiling. This made matching formations with their ceiling bases easier than holding a single piece up to compare it with all the hundreds of broken ceiling stubs.

We repaired two lion's tail formations in the room that leads to the Coke Table Room. This was an area that had dozens of broken formations and we were able to make repairs on over 45 of them. A former pool held many once-submerged formations with ceiling connection points as small as soda straws. Pool deposits caused them to have enlarged lower sections. One of the Stalactijacks needed to be 7-feet tall to facilitate the repair. We used drill bits and stainless steel pins as small as 3/16-inch in diameter for some of these repairs.

We were able to repair 7 stalagmites with epoxy and stainless steel all-thread rods. One we named "Michael" in remembrance of the late geologist, Dr. Michael Queen. We also located a pile of broken formations we had not previously noticed off-trail near the climb-down to the room. We found 7 pieces of a very large stalactite we named "Baby Goliath." We installed 1/4-inch stainless steel rods in each of 6 joints we epoxied in that one formation. Unfortunately, we have been unable to locate the ceiling point of origin. We hope we can look through some old photographs to see if it belonged in this room. The total length of "Baby Goliath" so far is 71 inches, and it weighs approximately 55 pounds. We can certainly reattach it to the ceiling if we can locate where it belongs. We have also repaired a broken piece of lily pad shelf stone and removed two old trails.

We then went to the Cantina Room, which was only open until the bat hibernaculum closure period began November 1. We

had three trips there. This is another beautiful area that has been heavily vandalized. There were several piles of formations, and many of the broken pieces were found near their broken stubs. In the Coke Table Room, by contrast, the vandals had thrown most of the formations they broke into the pools.

We have so far matched and epoxied together 71 formations in this room. I designed and built a device to hold the broken formation upright while the epoxy cured, which I called the Speleorack. It is made of 1/2-inch PVC with 3-inch stainless steel screws placed 3 inches apart. We put the epoxied formation into this rack and use rubber bands to keep it vertical. We have had to make two of these to hold all the repairs. We were very fortunate to have Jen Foote, the new Cave Specialist for the LNF, with us to help out and see our work. We also matched 5 formations with their ceiling bases and installed Stalactijacks to support them while curing.

We have to date made repairs to 132 individual formations in the Coke Table Room, and 71 in the Cantina Room, including stalactites, stalagmites, coke tables, lions' tails, and shelfstone. Our trip on December 12, 2020 was the 22nd since we began this project in August 2019. We have logged a total of 559.8 in-cave volunteer hours.

I want to thank everyone who has helped out so far on this rewarding project: Minori Yoshida, Todd Roberts, Ellen Trautner (BLM) Foz Trautner, Angelina Guerra (NPS), Duane Geckler, Kyle Rybacki (BLM), Hunter Klein (NPS), Stephanie and Michael Bouchey, John Cochran, Tim Charleton, Dan Pawlak (NPS), Colin Walfield (NPS), Max Berlin (NPS), Andy Rankin (NPS), Leah Van Vrankin (NPS), Dave Brumbaugh (NPS), Alex Nancarrow (NPS), Erin Lynch (NPS), Scott Christenson, Joe Sandowsky, Jen Foote (USFS), Carrin Rich, and Zach Englebert.

Fort Stanton Cave Formation Repair and Restoration Project

I was asked by Ron Lipinski and Pete Lindsley of the Fort Stanton Cave Study Project to consider repairing formations in Fort Stanton Cave in the Lincoln National Forest. I readily agreed and put together a proposal for the Bureau of Land Management (BLM). It was accepted, and we began preparations for three trips. It had been at least 20 years since I had been in the cave. I was very impressed with the organization, bunkhouse facilities, and decontamination equipment set up by BLM Cave Specialist Knutt Peterson.

The first trip was primarily for reconnaissance and repair. We brought in 8 Stalactijacks, the Speleclamp, Speleorack, Speleocups, and everything we needed to start work. We concentrated our efforts in the

Lake Room, located in the historic section. We found there a pile of broken, mud-caked formations. We began cleaning them off so we might be able to pair them more easily with their ceiling stubs. We found 6, which we epoxied to the ceiling and supported with the Stalactijacks. We cleaned over 100 broken pieces during that trip. This damage was allegedly over 100 years old, with dozens of pieces packed into the cave mud on the floor. We strictly adhered to the BLM Covid-19 and WNS decontamination protocols.

On the next trip we wanted to locate pieces of the dozens of broken stalagmites in the work area. We noticed a 20-foot pit behind the area, and we found dozens more pieces there. We were very excited that most were the stalagmite pieces we had been searching for! We cleaned them and were eager to return to make the repairs. We also removed a 35-foot rock-lined trail to a dead-end passage and restored it to blend in with the off-trail areas there.

We were very fortunate to have Knutt Peterson with us on our third trip. He was a great help and wanted to see how we did our work. He brought a 20-foot cable ladder to drop the small, bell-shaped pit to retrieve broken formation pieces in the bottom. One of our tasks was to survey the unmapped passage behind our work area, and also the small pit. We made repairs to 7 stalagmites and 1 stalactite. One stal had 7 pieces of flowstone crust around its base, and those pieces, now epoxied back together, were scattered over a 50-square-foot area. Our small pit turned out to be virgin! With the two pits and passages was 166.5 feet of new survey for the map. We named the smaller pit "Pool Fingers Pit" due to the beautiful yellow pool fingers we found there, and the other pit passage became the "Mud Fingers Passage."

I want to thank the team participants: Minori Yoshida, Todd Roberts, Carrin Rich, Ellen Trautner (BLM), and Knutt Peterson (BLM).

To date, 15 formations have been repaired, requiring us to epoxy a total of 28 formation joints, with 12 requiring the placement of stainless-steel all-thread pins for reinforcement. We have scrubbed the dirt and caked mud from more than 145 formation pieces. We worked a total of 140 volunteer in-cave hours in Fort Stanton Cave.

Summary of Volunteer Value

In summary for the three projects: the total number of formations repaired is: 206, requiring 264 joints epoxied, with 77 requiring installation of stainless-steel all-thread pins. The total in-cave volunteer hours are: 867.7, not including Knutt and Jen's on-duty time of 18 hours.

Total volunteer travel time and distance (tracked by the BLM and USFS) round-

trip from home to the cave and back is: Cottonwood Cave with 31,577 miles in multiple trips, 657 total caver travel hours; and Fort Stanton Cave with 3480 miles, 72 total caver travel hours. (See sidebar on Volunteer Value).

Folks from the USFS, NPS, and the BLM helped with these projects. I want to give my sincere thanks to every participant.

They all received valuable on-the-job training and would be an asset to any project they work on.

Reference

Hildreth-Werker V, Werker JC, editors. 2006. *Cave Conservation and Restoration*. Huntsville, Alabama: National Speleological Society. xiv+ 600 p. [Honored in the U.S.

and Australia with several awards, the volume contains a wealth of detail from 46 contributors describing tools, methods, and materials for cave conservation management, restoration, speleothem repair, and minimum-impact protocols.] Available online at <https://caves.org/conservation/> and <https://digital.lib.usf.edu/SFS0051033/00001> Purchase through Amazon or the NSS Bookstore <http://bookstore.caves.org> ISBN 1-879961-15-6

Fort Stanton Cave Formation Repair and Restoration Project: The Tools and Techniques We Used *Mike Mansur, Project Leader*

We began our project in August 2020. Our goal was to locate and repair as many broken formations in the historic passages of Ft. Stanton as possible in the three trips that were approved. The location in the cave was the Lake Room, which was identified as a good starting point by Pete Lindsley, Ron Lipinski, and Knutt Peterson.

We created these tools for use in formation repairs in Carlsbad Caverns National Park, Lincoln National Forest, and Bureau of Land Management caves. Below I introduce some of the inventions I created to make our formation repairs easier, but first I want to introduce an invention by Todd Roberts, one of the project participants. Todd created a great method of photographing the broken formation ends, and then making color prints to scale which we hold up to the ceiling to find matches.

Photographic Tools for Finding Matching Pieces

Todd Roberts and Minoru Yoshida have helped on most of my formation repair projects over the last three years. Todd developed a great idea for matching the broken ends with their points of origins. Previously, we tried to locate these matches by holding one piece up to the ceiling and walking or crawling around to try to find the base. His clever idea was to arrange the pieces by number, photograph the ends to scale, and then put 20 photos onto a sheet of colored photographic paper, which could then be held up to the ceiling to compare with the bases. Todd invented a device to mount to his camera that would ensure consistent results with a ruler and a counter for scale.

Stalactijack

My own specialized tools are physical support inventions that stabilize broken formations while the epoxy is curing. The first tool is a support device I named the Stalactijack. This is a spring-loaded PVC jack that is easily set up to support a repaired stalactite. I made it from a 2-foot long, 1-inch

diameter PVC pipe. I drilled six ¼-inch holes 2 inches apart to hold a 2-inch stainless steel bolt with a wing nut to keep the 40-pound test spring in place. I then sit a 2-foot long, ½-inch PVC pipe atop the spring as a piston. I used a variety of sizes of PVC caps, attached with a stainless-steel screw to a ½-inch PVC cap that attaches to the top of the PVC piston. This way, I can easily change the cap to hold a variety of stalactite sizes.

Speleoclamp

My next invention is the Speleoclamp. I made the first one on September 12, 2018. It holds a formation tightly in place while we drill holes for the placement of stainless-steel pins to provide stability to the epoxied joint. I needed a means of supporting the repaired formations while the epoxy set, and for holding the formation tightly while I drilled the holes to place stainless steel pins for joint reinforcement. In fabricating a device that would hold these formations under various cave conditions, I used a ½-inch PVC pipe to make a 24-inch x 24-inch x 18-inch-high clamp. I glued the pieces together at the top tier, but left the lower tiers unglued so I could add height if necessary. I used a ¾-inch PVC "T" and piping to make sliding rails to serve as the clamp. I drilled 3/8-inch holes on these pieces, then installed 3/8-inch all-thread, and used 3/8-inch nuts and wing nuts to allow me to clamp the formation in place. I also added ¾-inch foam pipe insulation to serve as a cushion on the rails to prevent possible damage to the formation.

To mark the drill holes, we had been using Sharpies with the ends cut off (around \$1.50 each) to mark corresponding holes in the formation joint to be drilled. The Sharpie ink wick can be pulled to make multiple small snips, but this seemed expensive for hundreds of repairs. In Ft. Stanton, we started using Q-tips and low-VOC nail polish, to mark the drill-spots on matched pieces. The Q-tips are easily cut to length, and placed in the drill-spot for the lower hole. We then put a drop of nail polish on the Q-tip,

and put the two formation pieces together. Both pieces are marked to center the drill bit.

Speleocup

The third invention is the Speleocup. It is a PVC cap with two stainless steel screws or wire that we connect with rubber bands to a stainless-steel clamp attached to the stalactite base.

Speleorack

The fourth invention is the Speleorack. It is used for firmly holding formations that have been epoxied together in a vertical position. It can hold up to 40 formations at one time. I used ½-inch PVC and 3-inch screws to hold the rubber bands, which in turn secure the epoxied formations to the Speleorack.

Speleorake

The last invention I show here is the Speleorake. It is a tool for retrieving broken formations out of pools. It comes in two varieties.

In conclusion, the special tools described above allow us to more easily do our formation repairs and restoration work. These devices can easily be constructed at little cost by anyone wanting to do take the time to build them. I have purchased all my materials from Home Depot and smaller hardware stores. Since these materials are cave safe, made from clean uncemented Schedule 40 PVC (will out-gas over time), stainless steel bolts, washers, all thread, wing nuts, springs, and screws, we sometimes leave them in the cave for short periods between trips.

If anyone wants to contact me for more information please feel free to e-mail me. mcmansur@zoho.com

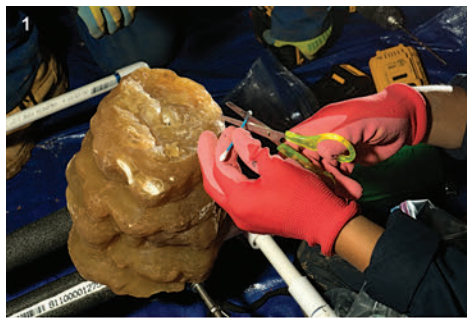
Editor's note: Mike's tools article, with many more photos, is available on the NSS News extensions page as a PDF: <https://caves.org/pub/nssnews/extensions.shtml>

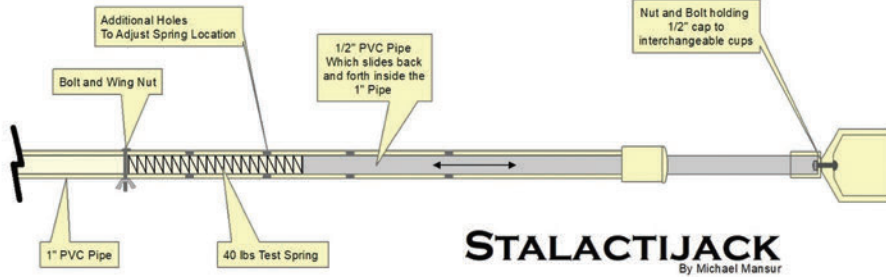
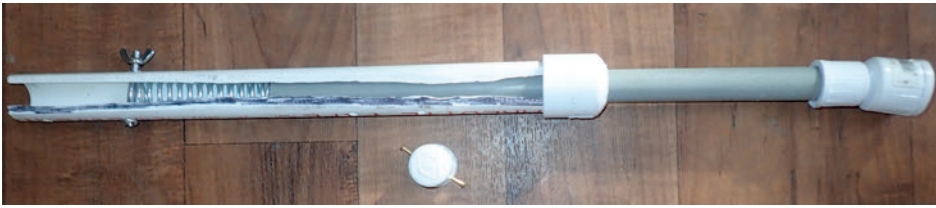


Upper row, three steps in using photographic techniques to help match broken pieces with each other, which can be a daunting task when so many have been broken in a small area.



Above, the middle two leftmost photos depict the Speleclamp, a versatile device that cradles formation pieces while they are epoxied together before attaching to the cave's ceiling or floor. They also offer support during drilling when stainless steel rods are inserted, typically in heavier formations as shown below.





PVC Speleorake for retrieving broken material from pools



Stalactijack device detailed in upper two photos provides support (as shown in photos left and upper right and lower right) while epoxy sets during the repair process.

Speleocup (right) provides support with a pull instead of a push.

Sequence of five photos, left, q-tip method for marking matched pieces to align drill for proper stainless steel pin placement.



Above, three stalactijacks including a different headpiece that provides support in a horizontal plane instead of push from below.



Grand Caverns Spring Restoration Volunteer Value

Meredith Hall Weberg, NSS 21477RL (FE)



VARunteers get ready to go to work at the 2019 restoration at Grand Caverns

Grand Caverns, formerly known as Weyers Cave, was established as a park in Grottoes, Virginia, under the newly formed Upper Valley Regional Park Authority. Perpetually underfunded, the group gladly welcomed caver volunteers from all over the Virginia Region (VAR). October 1983 saw the first cave conservation weekend, ConCave I, focusing on formation repair in Fountain Cave. The project attracted so many volunteers that the cave management recruited the local women’s group to make us sandwiches, which they brought and served to us inside Fountain Cave. The repair of a multi-piece, 20-inch-diameter stalagmite, with an 8-foot-long piece that was hoisted by ropes and pulleys atop its base, was the capstone project of the weekend. I’m not sure how it got knocked off, but we fixed it. Most of the speleothems we fixed in Fountain were much smaller.

Approximately a year later ConCave II was held, and about 1985 the VAR took over and started hosting yearly field restoration camps at Grand Caverns. These camps were held at various times, but after a while they all started being held on Easter weekend and we called them “Easter Restoration at Grand Caverns.” The then-chair of the VAR Conservation Committee, Andy Reeder, organized these annual work weekends. We would camp out on the property, usually next to the pavilion with the giant fireplace. He, his wife Anne Reeder, and friends would provide the workers a sandwich lunch and a gourmet meal for dinner. Andy’s cooking was worth all the gravel hauling that we did during the day!

Carol Tiderman is the liaison with the park management and gets the list of

“chores” they’d like done each year. Some of the chores we VAR cavers do each year are hauling gravel and doing algae abatement in commercial Grand Caverns and speleothem repair in Fountain. We learned quickly not to fill up a bucket with gravel because it’s a heavy, long way to carry it to the Oyster Shell room. We noted each speleothem repair we did and hung bright yellow labels on them. Some years we matched a lot of broken pieces to where they had been broken, some only a few. Over 500 broken formations have been repaired to date.

Often one of the rewards, if you were camping out on Saturday night, was to “tour” the cave after hours. One time, Jim McConkey led us on a candlelight tour so we could see how early tourists viewed the cave. He and Craig Hindman both possess

great knowledge of Grand Caverns’ history. I have spent many enjoyable hours listening to their tales. These annual conservation weekends led to a VAR project to remap Grand, Fountain, and the other five caves that were known at the time on Cave Hill. Starting in 2003, we met monthly for years and increased the known number of caves to 23! This project is ongoing, and Carol Tiderman is the point of contact if you want to join.

In the early years, I don’t recall anyone taking down names or how many hours we spent working in the caves or driving to and from. Around 2011, Andy retired from the Conservation Committee and I took over. That meant I now had to organize the lunch and dinner at each event. I’ve been streamlining it, but nowadays it feels like I spend more time with food procurement and prep than underground doing conservation. The point of this is that we did start keeping track of volunteer value hours in 2012. The next bit concerns itself with these statistics.

I used an average of 6 hours for in-cave time even though some cavers put in more time the night before or day after. Driving time is included when counting volunteer value hours. I used the chart on the Independent Sector website* for the monetary value data. I rounded up to the nearest hour and dollar; our grand total for volunteer value is nearly \$56,000! That averages out to almost \$7,000 per year that VAR cavers are donating to Grand Caverns. Wow! And we think it’s fun!

The stats for the subsequent years are shown in the table below:

Year	Volunteers	Driving Hours	In-cave Hours	Total Hours	Monetary Value (\$)
2012	22	121	132	253	5,601
2013	33	140	198	338	7,622
2014	27	112	162	274	6,321
2015	25	107	150	257	6,055
2016	40	182	240	422	10,187
2017	23	115	138	253	6,247
2018	17	84	102	186	4,730
2019	29	156	174	330	8,976
TOTAL	216	1,017	1,296	2,338	\$55,739

Because of COVID-19, we had to cancel this fun annual event both in 2020 and 2021. Hopefully in 2022 we'll be back doing whatever needs doing and racking up some more volunteer value hours. Anyone is welcome to join us!

Andy Reeder wrote an article about this project in the March 2006 NSS News. If you

want more information about the project's early days, read it. Thanks to Jim McConkey for finding that article and revising my first paragraph. Also, I thank Jim McConkey and Carol Tideman for fact checking me. Like any ongoing conservation project, the Grand Caverns Spring Restoration (renamed in 2019 because we had to move it from

Easter weekend) event cannot be done without many volunteers. I'd like to thank everyone who has ever participated in our conservation efforts—THANK YOU!

*https://independentsector.org/resource/vovt_details/ accessed on January 14, 2021

The Learning Must Go On! Conservation Education during COVID

Dave and Tracy Jackson — CaveSim.com

The past year has been quite challenging for people of all ages. For a moment, put yourself in the shoes of a child. Imagine being a kid in elementary school. Now try to wrap your mind around ever-changing COVID lockdowns and restrictions. Try learning math, science, writing, and reading while constantly switching from in-class to online learning and back again. Can you see that by constantly changing the way that kids attend school, the pandemic has severely disrupted kids' sense of "normal" and seriously impacted their ability to learn? In the face of this educational crisis, CaveSim has stepped up to serve students and teachers at school around the US.

Under normal circumstances, CaveSim teaches pre-K through 12th grade students about science and conservation by bringing educational programs to schools all over the lower 48 states. You may have seen the mobile cave at the NSS Convention each year, but you might not realize that CaveSim is used to get kids excited about learning chemistry, biology, geology, anthropology, and other subjects. You may also have seen the 12-foot vertical caving tower, which we use to teach kids the physics of pulley systems and the karst hydrogeology of sinkholes. We teach microbiology lessons with live cultures and Petri dishes, engineering and math lessons with cave rescue phones, and bat conservation lessons with high-energy, hands-on games. In short, CaveSim has an entire curriculum that is aligned with academic standards for numerous states, and we teach students about many core subjects while helping them learn to love caves and conservation.

When COVID arrived in the US, we rapidly adapted CaveSim programs to an online format. In the past year, we've conducted online classes for over 3000 students at schools across the US, and we teach our lessons via Zoom and other video conferencing platforms. Our work is being supported generously by many

individual NSS members, and also by a grant from the NSS Education Division. This support has allowed us to improve the online programs by purchasing high-quality cameras, microphones, and computer drives (for storing the video content that we create). It has also enabled us to create over a dozen educational videos to help schools that can't use live online classes, including a 40-minute film about bat conservation featuring bat rehabber and NSS member Donna Frazier.

Prior to each online class, teachers receive a short list of simple materials for hands-on experiments that students do during the class. For lessons about bat biology and conservation, students use an extra mask to make a blindfold for an echolocation game. For classes about physics and vertical caving, students gather materials to make a small-scale sinkhole, as well as shoelace and metal fork to learn about friction and the Prusik. By keeping the materials simple, we have found that students are able to find the materials, and that some schools are providing kits of materials to students.

During a typical online program, we join a class via video call for 45 to 90 minutes and the students participate in a mix of exciting educational demos and hands-on labs. During a recent day of online teaching, we did four 1-hour classes for 6th graders

learning about energy and waves. During each class period, 30 to 40 students saw live demonstrations with cave rescue phones and high-tech electronic test equipment to help students visualize electromagnetic waves. We used speakers to push on water, helping students understand that sound is a form of mechanical energy. And each student used a kit of materials to make paper-cup telephones and do exothermic reactions with laundry detergent. We wrapped up with a carbide demonstration and lesson about helictite conservation.

After each program, teachers provide feedback, and 100% of the teachers that we have worked with have said that they would like to continue the program. As one teacher from Austin, Texas wrote, "This is the best thing we've done all year! You were SO engaging! You constantly asked the students questions and they never lost focus because of that." The teachers appreciate how relevant the programs are to their daily lessons, but they also appreciate the conservation content that we share. A teacher in Colorado wrote, "The content was relevant to our state standards and it was fun! The kids will remember what they learned today about bats, caves, and how to build a stalactite."

Having the opportunity to make a positive impact with CaveSim during these challenging times is very rewarding, and we hope that you will contact us if you know of schools that would benefit from free online programs. You can email the authors at jacksondmit@cavesim.com, or visit www.cavesim.com and leave a note. If you're interested in supporting this work, you can do so at www.cavesim.com/support. We hope to be back on the road again soon with in-person CaveSim programs, and we look forward to the day when you can see the new mobile caves that we are building with support from many generous individuals and grottos. Until then, cave softly and stay healthy!



Dave Jackson uses field phones and speakers to teach middle school students about electromagnetics during an online class.

SOCIETY NEWS

Submit Abstracts for Conservation & Management Tuesday — NSS Convention in Weed, California - Summer 2021

Calling for presentations, PowerPoints, workshops, or panel discussions for NSS Conservation & Management Tuesday Talks. Please send Val Hildreth-Werker a quick email of your intent to present: valhildrethwerker@caves.org

Limit abstracts to 250 words or less. Include title of your presentation and the authors' names, professional affiliations, mailing addresses, and e-mail addresses. For later publication in the Journal of Cave and Karst Studies, abstracts must draw a conclusion or explain the upshot of your study or project in a concluding sentence. Equipment will be available for PowerPoint presentations.

Check <http://nss2021.caves.org> for current information on dates and venue due to the Covid-19 pandemic. We invite abstract submissions for any Cave or Karst Conservation or Management talks addressing stewardship, outreach education, cave management, minimum-impact caving, or restoration. Send abstracts by May 1, 2021 to valhildrethwerker@caves.org

Victor A. Schmidt Conservation Award

The annual Victor A. Schmidt Conservation Award is given annually to recognize outstanding dedication to cave conservation. The award may be given to one NSS member or to a pair of members who qualify equally for the award based on work they have done together over time. Nominations for candidates are solicited by the NSS Awards Committee. The recipient will be approved by the Board of Governors upon recommendation of the Awards Committee.

The recipient must have been a member in good standing of the Society for at least two years immediately prior to his/her name being submitted as a candidate. The Awards Committee shall give preference to candidates who have not received the Outstanding Service Award or Honorary Membership.

To nominate a caver for a the Victor A. Schmidt Conservation Award, please send complete resume and nomination letters describing the caver's contributions to cave/karst conservation over many years. Send nominations by November 15 each year to:

Val Hildreth-Werker
award-schmidtconservation@caves.org

Save-the-Caves Conservation Grant

The Conservation Committee is authorized to award up to \$5,000 annually from our NSS Save-the-Caves Fund to make grants of up to \$1000 to Internal Organizations, Grottos, Conservation Task Forces, Conservancies, or to individual NSS members for specific projects that involve cave or karst conservation, restoration, cleanup, or outreach.

The Conservation Committee is responsible for establishing the application, review, and award process. Recipients of these grants shall submit written reports to the Society as stipulated by the Chairman of the Conservation Committee. To be considered for a grant award, applications must include adequate description of one or more of the following:

- scientific investigation of cave or karst conservation problems;
- speleological research that will directly contribute to cave or karst conservation;
- remediation of ecological problems in cave, karst, or pseudokarst areas;
- hands-on, in-cave efforts to restore cave passages to a former ecological state;
- equipment and supplies for conservation or restoration projects that include hands-on participation from cavers;
- or public outreach to inform and raise awareness of cave and karst values.

Conservation Grants are awarded throughout the year, subject to availability of funds and number of applications received.

Save-the-Caves Conservation Grant Application Process

For relatively uncomplicated grants to NSS members and activities, send an e-mail application that includes the following points. Institutions and foundations should submit the more formal NSS grants application available on the NSS website. Priority is sometimes given to conservation projects that provide quantitative research data. Awards are based on the nature of the project and available funds.

Please specify in your application:

- who the applicant is (name, address, telephone number and other contact information)
- who the official grant recipient is to be (name or organization, title, address, etc.)
- what, specifically, the project and/or research will entail
- what benefits are expected
- when the work is to be done
- dollar amount being requested from the NSS, including how it will be used
- a statement assuring the NSS that an article for publication, video, powerpoint, presentation, and/or other comparable account of the completed project or research will be provided in a form accessible to the membership to account for expenditure of NSS funds.

Please call or e-mail the Conservation Grants contact person and include your phone number if you need more information: valhildrethwerker@caves.org

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Is your Grotto or Region looking for new caves to explore in the Virginia area? RASS can offer your group a complimentary place to camp in Bath County, VA, once the COVID-19 situation has improved. There are more than 100 caves within an hour drive. We support cave conservation and education. Contact Richie Ellison at rellison1120@gmail.com

The Richmond Area Speleological Society (RASS) supports cave conservation, education and research by offering grants to assist projects aligned with these goals. To receive a grant request application please email us at

rass-grants-committee@googlegroups.com. Applications reviewed quarterly. 12

New WV Cave Books: Bulletin 20 Caves & Karst of the Culverson Creek Basin, WV by Lucas, Balfour, and Dasher. 336 pages, 364 caves, 208 photos, 80 maps. Color copy on USB drive. \$35 postpaid; Bulletin 21 Caves and Karst of Mercer & Summers Counties, WV by Schaer and Dasher. 186 pages, 226 caves, 131 photos, 62 maps. \$25 postpaid. WVASS, PO Box 200, Barrackville, WV 26559 WVASS@PrehistoricPlanet.com 12

NEW BOOK: *Caving Alabama with the Huntsville Grotto* by Frances Johnston, assisted by Jim Johnston, NSS 1718F. Early discoveries from 1956 on. Full color, softback only, 8 1/2 x 11 size, 146 pages, view and order direct from Amazon.com to your home, price \$19.98. 6

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PRESIDENT'S MESSAGE

Folks,

I wanted to pass along some Society news that I think will be of interest to the membership.

Under Scott Engel, NSS Executive Vice President, we released two new books in January. These include *The Ballad of Peter Hauer* by Roland Vinyard and *The James Cave Project* book by Catherine Bishop. Both books are available from the NSS Bookstore.

We have a new initiative by Meredith Hall Weberg, Ben Tobin, and Riley Drake to highlight the contents of the *Journal of Cave and Karst Studies* in the *NSS News*. The new feature, which began in last month's *News*, is called Science Spotlight. The journal has a very high impact rating and is an import tool for researchers and is available online to all members.

International Year of Caves and Karst

Many of you have seen that George Veni, President of the International Union of Speleology and Executive Director for the National Cave and Karst Research Institute, has been sending out information on 2021- the International Year of Caves and Karst (IYCK). The IYCK was created to teach people around the world about caves and karst. It is an event organized by the International Union of Speleology (UIS), but the UIS can't reach the world alone. There are now 155 national and international organizations partnering with the UIS. Together there are over 150 events announced around the world and many other events are already completed, most of which you can watch or read about at <http://iyck2021.org/index.php/event-results/>.

More partners join the IYCK and post events daily and Society members and grottos are asked to be one of them. This is your unique chance to be part of the team that is making a global impact to improve knowledge, and from that, appreciation, funding, and protection for caves and karst. To become a partner is simple. Send your logo and website to the address on the Partners page of the IYCK website (www.iyck2021.org), and then send your event announcements as shown on the Events page. No event is too small. It is all important.

Join us! And visit the UIS Facebook page (<https://www.facebook.com/uisspeleo>), UIS Twitter account (<https://twitter.com/uisspeleo>), and/or the UIS Instagram page (<https://www.instagram.com/uisspeleo/>).

Volunteer Opportunities

The NSS has a number of volunteer opportunities. This is a great way to serve the society, advance our goals, get to know cavers from around the country, and stay connected to caving while we're dealing with the Covid outbreak. Chelsea Ballard has stepped up to help coordinate volunteer needs and interests. If you would like to volunteer, and earn the undying gratitude of the society, please contact Chelsea at cballard@caves.org.

Fundraising: NSS Brick Drive

In a previous issue of the *NSS News*, we highlighted the fine work of our volunteers in installing our celebration bricks around the flagpole at the NSS Headquarters. A total of 701 engraved bricks were laid. There is room for an additional 500 bricks and Maureen Handler, our OVP, is planning another brick-laying event in the near future. If you would like to purchase a celebration brick, please contact the NSS Office. Donations are \$100 per brick. The office can fill you in on details.

I'm relaying a short letter I recently received from Dr. Dwight Deal, former Director, Fellow and Luminary Speaker (NSS 3592 FE CM) with a donation for a brick.

"When we bought the first "office" in Huntsville, there was a similar "Buy a Cinder Block" fundraising effort. I remember that Jack Stellmack (former NSS President) and I were talking about it, and we figured out that there was one unclaimed cinderblock behind the commode. Of course, we both wanted THAT particular one.

Considerable discussion ensued, with Sandy and the dogs bearing witness. I think our "discussion" centered around who "gave a sh-t" the most, Jack or myself.

Sandy suggested that since we both had adequate justification for flushing, that we draw lots and see who got to purchase that particular brick. Jack won.

I just realized that I was so pissed (pooped?) at Jack that I never did end up buying a cinder block myself. (I did contribute in other ways, however).

So, in retribution for that long-ago irrational reaction on my part, please accept a measly \$100 donation to the NSS for a brick to add to the underpinning of our "new" office."

Dwight Deal

Mortgage and the Headquarters

As of May 1, 2021, we will owe about \$54,773 on the NSS Headquarters and we expect to retire the mortgage in March 2022. We are in the home stretch. Our payments are \$4959.16 per month and are covered by donations and rental income. I want to thank folks for some recent donations to help pay down the principal of the mortgage. Keep an eye out for a push later this year to pay off the Headquarters and burn the mortgage at the 2022 South Dakota convention.

Until Covid hit the nation in March 2020, we were earning about \$60,000 per year from rental of the facility with potential to earn \$100,000 or more. Most of that income was lost in 2020. As we return to normal (whatever that ends up being), we hope to continue our rentals. Rental income is used to help support the society; pay mortgage, maintenance and utilities; and help service our debt. These are funds we don't have to raise from cavers to support the Society. Combined with donations from Team 404 and many others, we've been able to carry the mortgage for the last six years with retirement of the mortgage next year.

Team 404

Don't forget that Team 404 is an important part of the Headquarters mortgage and you can still contribute to the program. Contact the office if you would like to join or renew.

Donations

I want to thank everyone who has contributed to the NSS. Donations to the Society support our programs to explore, study, and protect caves and karst lands. Without our generous donations, many of our programs would struggle in reaching our goals.

Secretary-Treasurer

Kristine Ebrey, our NSS Secretary-Treasurer, has been working hard on the budget along with the other NSS officers. The books for the 2020 NSS convention have been closed and the society made a profit of \$4,192 for our first virtual convention. Congratulations to Rich Geisler and Meredith Hall Weberg and their staff for all their hard work in switching gears and getting the convention up and running.

Kristine is also preparing the books for a complete audit. We want to thank Ted Kayes for serving on the NSS Insurance Committee for many years and note that Michael Cicherski has now assumed that role.

There are a number of really great new initiatives under Adam Weaver, the NSS Administrative Vice President. Here are some of the highlights:

National Cave Rescue Commission

On February 28th, the NCRC Board of Regional Coordinators (BORC) met and held elections. We are pleased to report that they selected Gretchen Baker as the new National Coordinator. I have accepted this selection and officially appointed her to that position. A special thanks to Anmar Mirza, who has stepped down after serving in the position for more than 12 years.

Cave Preservation Network

The Cave Preservation network has continued to grow, and the fundraising has started to bring in tangible results. Learnmore.caves.org has had several thousand views and educational material downloads. We want to welcome Ruby Falls Cave, located in Chattanooga, to the program.

Devra Heyer, the Education Division Chair, also has a number of new initiatives

which are starting to bear fruit: Teacher resources, International Year and Caves and Karst, Education Grants initiatives.

SpeleoGuest Program

In February, the NSS Speleoguest program presented in front of its 1000th student! The SpeleoGuest program is for schools and other organizations who want a cave expert to speak to their group! The SpeleoGuest program connects educators with enthusiastic cavers and cave specialists via an online platform such as Zoom or in person, depending on location. For any further questions about the program feel free to contact us at speleoguest@caves.org. This program is also looking for an additional volunteer to help with coordination efforts, please contact us if you have interest!

National Cave and Karst Management Symposium (NCKMS)

The 2021 NCKMS staff has determined a venue, are finalizing their website, and have about 20 cavers on the organizing committee. The event will be held November 1-5 in San Marcos, Texas. San Marcos is the

gateway to the Texas Hill Country with the campus of Texas State University and home of San Marcos Springs, the second largest spring in the southwestern US. Jim "Crash" Kennedy is chairing the event and he can be reached at cavecrash@gmail.com.

Zoo Membership Initiative

Amanda Willis, our Public Relations Chair, is working with Leia Hill and Devra Heyer in the Education Division to create a partnership with the San Antonio Zoo to fund food for their cave species collection. The zoo is a designated refugia for nine obligate troglobitic species from the Edwards Aquifer including the Texas blind salamander, one of the first species listed under the Endangered Species Act. Cost of the program is \$900 per year.

Membership

Membership increased slightly (26) in February 2021. As of February 28th, we had 7,327 members. Please consider renewing your membership in the NSS.

Geary Schindel
NSS President



The Potomac Caver

Potomac Speleological Club

November-December 2020, Vol. 63, No. 6

Mark Minton and his friends set out to explore **Coon Cave**, a short blowing cave above **Shoveleater**. The two are likely connected, but the former issues wind from passages that are too tight to traverse at present. After a failed attempt to locate Coon Cave in October, which resulted in the exploration of **Log Pile Cave**, a small vertical cave with moderate wind, Mark and company successfully located Coon Cave during a return trip in November. After updating rigging and reaching the dig face, Minton and his friends decided the dig is worth exploring and plan to return in the future to begin a technical dig.

Camping overnight in **Kimble Pit**, Reilly Blackwell, Corey Hackley and Penelope Vorster accumulated 854 feet of survey. In the process they found deer-sized, calcite-coated bones and stepped over several pit leads that remain undescended for the moment.

Southwestern Cavers

Southwestern Region of the NSS

January-February 2021, Vol. 59, No. 1

Steve Peerman, Jason Banegas, and Rob Wood explored the walls of Percha

Canyon in southwestern New Mexico and located two new shelter caves, which are typical of the surrounding area. **Hawks Nest Shelter** and **Cold Day Shelter** are two large openings in the canyon wall, neither of which extends inward more than 40 feet.

Traveling to the Chamisa Wilderness Study Area in Sandoval County, Jerry Atkinson, Joe Sandusky, and Mary Thiesse explored and mapped the 225-foot-long **Guadalupe Cave System**. The short cave has numerous skylights and is one of the first soil-piping caves to be documented in the area.

Rocky Mountain Caving

Colorado Grottos of the NSS

December 2020, Vol. 38, Number 4

Chasing Google Earth leads in Montrose County, Colorado, Doug Medville has located several piping caves. His latest find is a trio of caves developed along a gully, with multiple sinks and walk-in entrances providing access between the three. The largest of the three is **Midden Cave**, which is cut off from **Coyote Cave** by the short **Coyote Arch Cave**. Collectively the trio caves extend nearly 1,200 feet down the gully, with Midden Cave being the longest at 741 feet.

The recent opening of a bypass to **Twenty Pound Tick's** sump dive has made access to the back section of the cave, where most of the passage development exists, much more feasible. Carl Bern and several other notable Colorado cavers have been surveying the Colorado stream cave. Despite being able to avoid the sump with the new bypass, cavers still must endure chilly 43-degree water and an abundance of ear dippers while traveling to the far reaches of the cave. A working map shows 1.06 miles of passage, with the majority of the main passage having been surveyed.

The Carbide Dump

Blue Ridge Grotto

February 2021, Vol. 56, Number 2

West Virginia cavers are staying busy with their **McClungs Cave** resurvey, making four trips to the cave in the past two months and re-mapping over 6,000 feet of passage.

YCK Planning

Continued from page 2

You can also use your virtual presentations in the ideas below:

Call the news media. Television, newspapers, magazines, radio, and Internet news media are always looking for something different and exciting to report. They like stories of scientific curiosity. Call and tell them about interesting discoveries and caves in your area. Show them your virtual presentation. What may not seem interesting to you could be very interesting to the media. Always connect your story to the International Year to show that caves and karst are internationally important, and that your words stand with a worldwide community that knows caves are important. Through the media, you will reach thousands of people!

Ask for proclamations. Many elected officials make proclamations that say they recognize an important event. Ask the mayor of your town, governor of your region, or other officials to proclaim that your town or region recognizes 2021 as the International Year of Caves and Karst! Be prepared to give a virtual presentation, as above, to explain the importance of the Year. These proclamations will get even more attention from the news media and will help with other outreach ideas below.

Contact policymakers. Who makes the laws in your area that protect your environment, water, ecosystems, and cultural heritage? Are their laws good at protecting caves and karst? If not, call them. Show them what they need to understand and help them develop better and more effective laws.

Contact land managers. Sometimes you have good protection laws, but the managers don't understand caves and karst well enough to properly use them. Some managers don't understand that caves and karst are important. Teach the managers. Make them excited about caves and karst. They will become better at protecting caves and, when the pandemic is over, they may become good partners in helping you find new caves to explore!

Call your show caves and karst parks. The International Show Caves Association (ISCA, <https://www.i-s-c-a.org/>) supports the YCK but not all show caves are ISCA members. Tell show caves in your area about the YCK and ISCA. Also, contact parks in karst areas. Show caves and parks are always looking for new ways to attract tourists. By connecting them to the YCK, they can prove their importance to the regional economy and bring in more tourists when the pandemic is over by showing they are not just local curiosities but parts of a globally recognized valuable natural resource. Also, encourage them to connect with caves and parks in other countries and develop sister-cave or sister-park relationships. If they work on that during the pandemic, it will result in more tourism, media attention, and public education later. In 2019, more than 144 million people visited show caves. Show caves are our best partners at reaching and teaching millions of people about caves and karst. Work with them!



The managers of show caves and karst parks are great partners for the YCK.

Work with partners. Several of the steps above involve developing partnerships for the YCK. Think about other partners who can join you. Of course, you will first think about speleological organizations, but then contact groups that are not involved with caves. Remember that we need to teach others about caves, so tell your local hiking, climbing, water protection, nature, archaeological, or other groups that their area has caves or is karst. Join their virtual meetings and give presentations. Help change them from groups that only use the karst to groups that understand and protect it.

Create virtual conferences. Conferences are usually for specialists, not the general public. If you organize a virtual conference, invite some of the people mentioned above, such as lawmakers, land managers, and others whose work affects caves and karst, but who do not understand it. Give them free registrations to the conference so they can learn and create partnerships. They probably would not join the conference if they had to pay, but their attendance at a virtual conference will cost you nothing and may gain you a lot.

Be creative. You are not limited to the ideas in this guide. Think of other ideas that can engage the public during the pandemic, such as art, video, and music contests for caves and karst. Create fun programs for young people on Tik Tok, Instagram, and other social media. If you are at a university, company, or organization with its own magazine and social media, send articles for posting about your cave and karst work. It will benefit the YCK and will be good for your career. There are many other creative possibilities.

Post your activities to the YCK Website. It is important that you announce your events, no matter how small, on the Events page of the YCK Website. Use the

Contact Us page to send your information in the format shown on the Events page. After your event, send a website or social media link, PowerPoint, PDF, or other report that describes your event's attendance, activities, and results. If you create a video, online story, or are part of a news report, send those links for posting on the Events page too. At the end of the year, we will compile all YCK activities into one report that can be used by anyone in the years ahead to demonstrate the importance of caves and karst. This report will help future speleologists find funding and support for exploration, research, and better management of caves and karst.

Why should you help? I have been exploring and studying caves for 45 years. Every caver and cave scientist I have met has complained about damage to caves, pollution to karst aquifers, and/or loss of rare cave ecosystems and irreplaceable cultural heritage. They all want better protection, cooperation to support exploration, and funding for much needed research. Everyone wishes the public and governments understood the importance of caves and would stop damaging and destroying them. But wishes will not change anything. Action will. The International Year of Caves and Karst will.

Change will not happen quickly or in one year. But the YCK will accelerate the rate of change so in 10-20 years we will see huge changes compared to today. The UIS Bureau has laid the foundation, but the Bureau is only 12 people. We need you to build on our foundation. Together, with the help of our partners, and with good use of virtual tools and news media, we can reach tens of millions of people.

The benefits of the International Year of Caves and Karst can be enormous, but only if you get involved and invite others to help. The theme of the Year is "Explore, Understand, Protect." Explore your communities. Help them understand the incredible value of caves and karst. With that understanding, they will join us to protect these natural treasures on and below the Earth's surface. Please join us and contact me if you have any questions (gveni@nckri.org).



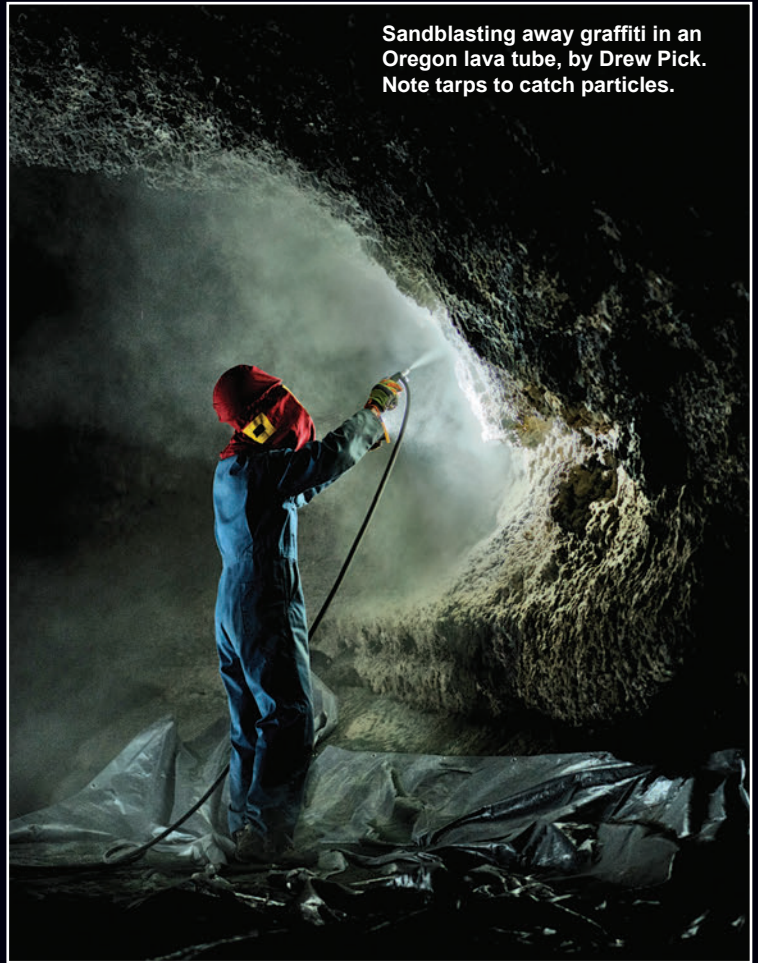
Everyone enjoys field trips. You can create virtual trips easily with a video camera or camera phone, visiting cave entrances and karst features, and adding digital maps later.

April 2021

Texas blind cave salamander, *Eurycea rathbuni*, by Danté Fenolio



Sandblasting away graffiti in an Oregon lava tube, by Drew Pick. Note tarps to catch particles.



Cave Salamander (*Eurycea lucifuga*) in Bluff Dwellers Cave, Missouri
Photo by Nicole Ridlen

