July 16, 2016

Dear Friends,

On behalf of cavers in the American West, welcome to Nevada! It is our pleasure to host this convention during the 75th anniversary of the National Speleological Society and we are pleased that you have chosen to join us this week in the Silver State!

Nevada’s motto is “Battle Born” - a tribute to the state’s admission to the union during the Civil War in 1864. Perhaps fitting, NSS cavers are faced with modern versions of our own battles. White Nose Syndrome is now a nation-wide problem; financial constraints on the society loom just under the surface; and our membership levels have been stagnant for some time.

I would like to challenge all of you this week to join together and help find solutions or actions that we may employ as a society to face these challenges. As we move into our next 75 years of exploring, studying and protecting caves it must become our primary mission to advocate on their behalf. To accomplish that, we must have a strong society.

Let’s allow this 75th anniversary to mark a turning point in organized caving in North America. While our present status appears sustainable, let’s take time to look forward and declare where we would like to be 75 years from now. Starting this week, let’s aim for those goals.

Who will be the first NSS member to explore caves on some distant planet? Realistically, given the rapid advance of science, that person could very well be in our JSS program this week! Shall we encourage that evolution of caving or should we just sit back and let things happen around us? As the largest society on Earth dedicated to caves, we must all strive to foster the vision of our own future.

We certainly have the skills amongst us. The talent displayed by the dedicated staff of this convention has renewed my belief that, working as a group, we can accomplish anything - even producing a convention in one of the most remote regions of the country!

So, welcome to the 2016 NSS Convention. Our next 75 years starts today! It is my sincere hope that everyone joins together to answer this single forward-looking question: Who is the NSS?

The answer to that question defines our future.

Best regards,

Matt Bowers, #25863
Chairman, NSS 75th Anniversary Convention
Stanislaus Grotto / Stonewall Grotto / Western Region, NSS
Front cover: The collage, by Tom Madsen, showcases the Great Basin National Park both above and below ground, featuring Wheeler Peak and Lehman Caves. Lehman Cave photo by Rick Bowersox.
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# 2016 NSS Convention

## Staff List

### National Speleological Society
- **President**: Wm. Shrewsbury
- **Administrative VP**: Katherine Crispin
- **Executive VP**: Curt Harler
- **Operations VP**: Dave Haun
- **Secretary-Treasurer**: Gary T. Barnes

### Convention Development
- **Convention Chair**: Matt Bowers
- **Vice-chair of Operations**: Dave Decker
- **Vice-chair of Services**: Kevin Lorms
- **Chief Financial Officer**: Daniel Veelik

### Convention Staff
- **Beverage Manager**: Ron Davis
- **Campground**: Ken Laidlaw
- **Campground Party**: Wendy Shirah
- **Cave Gear**: Rebecca Urbanczyk
- **Cave Rescue**: Gretchen Baker
- **CaveSim**: Dave Jackson
- **Cave Trips**: Neil Marchington
- **Communications**: Steve Deveny
- **Community relations**: Meg Rhoades
- **Consignment / Co-Op**: Terry Chambliss
- **Fire Control & EMS**: Paul Keckley
- **Geology Field Trip**: John Peck
- **Graphic Design**: Tom Madsen
- **Historical Advisor**: Paul Damon
- **International Relations**: Cynthia Walck
- **JSS (Youth program)**: Lisa Bauman-Cook
- **Lighting Engineer**: John Leonard
- **Marketing & Digital**: Matt Bowers
- **Medical**: Roger Mortimer
- **NSS Auction**: Bill Jackson
- **NSS Board Liaison**: J. Aurelia Nelson
- **Photography**: Dave Bunnell
- **Photographic Salon**: Dave Socky
- **Printshop**: AlphaGraphics
- **Private Pilots**: Jim Bulkeley
- **Publications**: Steven W. Frye
- **Registration**: Kristine Deveny
- **Security**: Herman Miller
- **Sessions**: Tom Evans
- **Signage**: Linda Starr
- **Special Projects (media)**: David Angel
- **Special Projects (construction)**: John Norman
- **Special Projects (mural)**: Carolina Shrewsbury
- **Special Projects (carrying case)**: Matt Bowers
- **Streaming Media**: Rodney Mulder
- **Supplementary Events**: Carol Vesely
- **Transportation**: Barbara Luke
- **Vendors**: Teresa Greissel
- **Venues**: Louise Hose
- **Vertical Advisor**: John Woods
- **Voiceover Talent**: Thor Bahrmann
- **Volunteer Coordinator**: Debbie Spoons
- **WNS Decon Officer**: Deanna Stever
- **WNS Decon Projects**: John Norman
- **Knut Peterson**: Jennifer Foote

### Special Thanks
- **White Pine County Tourism & Recreation**
- **Great Basin Heritage Area Partnership**
- **Nevada Commission on Tourism**
- **Great Basin National Park**
- **City of Ely, Nevada**
- **White Pine County, Nevada**
- **Lt. Governor Mark Hutchison**
Welcome Cavers!

As Lieutenant Governor I am honored you have chosen the Silver State as the site for the 75th anniversary convention of the National Speleological Society. I am pleased to welcome you to Nevada and hope this week’s adventures provide fond memories for years to come.

It's been said that Las Vegas contains over 15,000 miles of lighted neon tubing. We are also the only state in the country where ghost towns outnumber populated cities. With 109,781 square miles, Nevada is the seventh largest state, and has more mountain ranges than any other state. Nevada takes great pride in the deep cultural history of these facts and the many others that make our state great.

While you're in the area, be sure to visit Great Basin National Park - home of the Lehman Caves and the spectacular Wheeler Peak. The National Park Service is celebrating 100 years this August and we're pleased to include them in Nevada's list of famous destinations.

After the convention, I invite you to explore Nevada; take the Loneliest Road in America (U.S. 50) back to Reno. Or explore some of our amazing state parks and take the Great Basin Highway (U.S. 93) south to Las Vegas. For cavers, the slot canyons of Cathedral Gorge State Park offer a fascinating geologic history of the Great Basin region. For the adventurous, take a drive on the Extra-Terrestrial Highway (Nevada State Route 375).

For more Nevada road trips, visit DiscoverYourNevada.com for amazing routes, photos, maps and itineraries. I hope you enjoy your time in our great state.

Happy 75th anniversary!

Best regards,

Mark A. Hutchison
Lieutenant Governor
State of Nevada
This is an updated version of the map in the printed Program and supercedes it.
White Pine High School

Midway Gold Computer Facility
Room 203, the school's computer room, is named the "Midway Gold Computer Facility" in recognition of the Company's support for the school, especially for equipping the computer room. Midway is a relatively new exploration and mining company with minera properties located in Nevada and Washington.
Caving at the Convention

by Neil Marchington

Stop by the Decon Station in the Campground on Saturday to decontaminate your gear. The Decon Station will be open daily at least in the afternoon, so no rush unless you are caving the next day. You must have your gear deconned and dry before your trip. Do not expect to decon gear the morning you are scheduled to leave. You will also need to decon your gear between cave trips, so plan on coming back to the decon station after each cave trip. The volunteers there are likely to need your assistance, particularly at the beginning. We highly recommend you mark your gear with your name in something that will survive repeated 131 °F washings. Also remember to bring a trash bag and a change of clothes and shoes as you will need to bag your clothes and shoes after each cave trip before entering your vehicle.

We will post a weekly schedule of trips by Saturday, and post updates to the daily newsletter, Off the Rails. We will have sign-up sheets out in the Cave Trips tent starting Saturday afternoon for cave trips the following day. Each day at 8 AM we will open sign-up for the following day’s trips. We have some ability to add trips should the scheduled trips fill up. The sign-up sheet will include the trip leader’s name and the meeting time and place. Most trips will meet at the sign-up tent at about 8 AM or 9 AM. If you are not at the tent ready at the listed time, your slot will be open to anyone on site wishing to attend. If you didn’t get on a trip and wish to be on stand-by, please come by the tent before the start time and let us know, or check with the trip leader for the cave you are interested in.

The sign-up sheets will list specific suggested gear and other restrictions. Most Nevada caves are dry and warm. Most trips will only take a few hours underground, so most people may not need pee bottles, or even coveralls. You could attend most trips in pants and a t-shirt. In a few of the caves a fleece vest or top is nice to have. There are 3 caves which require coveralls and have lots of mud and water. Many caves have crawling passage where knee and elbow pads are desirable. Most of the hikes are short, but there will be a few caves with long, high elevation hikes. There are also several vertical trips planned, though most caves are horizontal passage. We are working on other interesting trips like slot canyons that people can do. There are also museums, ghost towns, high alpine peaks, alpine tours, and beautiful lakes in the area. Tuesday evening there will be special off trail tours through Lehman Caves available for 150 lucky people. Be sure to sign up for a time slot at the Cave Trips tent.

We will have loaner lights (Zebra and Princeton Tec headlights) and helmets for cavers from White Nose Syndrome-affected states. We will probably have some other gear to loan as well. Gear that is checked out to you will be your responsibility, and must be returned immediately upon returning from the trip. There are some vendors who have said they will have loaner caving gear on site. Please do not bring gear from WNS states.

If you are coming from a WNS state, consider options like cheap hiking boots and a fleece from a bargain store, or borrowing gear from your western caver friends. If you have the ability to borrow gear from a friend, please do so to leave loaner gear for others. You could also purchase some gear specifically for western caving (Remember, the 2017 Convention will be in New Mexico and the 2018 in Montana). Any gear you use in Nevada can be securely packed away and go back to White Nose states without risk of contamination, or be saved for non WNS state caving.
Caving at the Convention

Post-Convention Trips

Timpanogos Cave National Monument: NSS members (only) are invited to an after-hours tour of Timpanogos Cave in American Fork, UT (about 4 hours east of Ely). Meet at Monument HQ at 6:45 PM. This will be a developed tour, with lights and handrails. Visitors are welcome to bring flashlights and cameras, no tripods or monopods. There is capacity for two tours of 18 guests each. There will be no fee for NSS members as they are a valued partner of NPS. Properly cleaned and deconned gear from NV and other states is acceptable, but no dirty gear will be allowed. Preferably, participants should bring clothes, shoes, cameras, and lights that have not been in other caves. RSVP to Climbingallday@yahoo.com to reserve a space.

Other trips were not finalized at press time. Check “Off the Rails” for other trips.

Convention Caves

The list below is caves that are expected to be open for convention visitation. Check at the Cave Trips tent for current access status and procedures, and for driving directions or trip leader information.

Caves less than an hour drive from Ely:
- Cave Valley Cave
- Goshute Cave
- Lehman Cave (NPS, commercial)
- Pescio Cave
- Ragged Cave
- Rose Guano Bat Exit Flight
- Snake Canyon Cave (USFS, long hike, high elevation)
- Systems Key Cave (NPS)
- Wheeler’s Deep Cave (NPS, vertical)
- Whipple Cave (Vertical)

Caves a 2-3 hour drive from Ely:
- Cathedral Cave (steep hike on loose rock)
- Crystal Ball Cave (warm spring swimming)
- Forgotten Cave (steep hike on loose rock)
- Rockslide Cave (moderate hike, high elevation)
- Smith Creek Cave
- Snake Creek Cave (NPS)
- Yorks Guano Cave (moderate hike, high elevation)
General Information

Registration
Registration is located in the main hallway in the school. It will be open continuously from 9 AM on Saturday (July 16) until 5 PM on Monday (July 18). Registration will be open on Tuesday through Friday from 8:30 AM until 5 PM each day.

Badges
Your badge must be visible at all times when you are in the school. Your badge will also be required for entry into the campground, Howdy Party, Banquet, and Salon Awards Program (Photo Salon).

Car Tags
Car tags will be given to you during registration. These must be displayed in your vehicle’s window at all times during the week when parked at the school or campground. Vehicles not displaying this tag may be subject to towing at the owner’s expense.

Shuttle Buses
Shuttle buses run between the campground and the school with several stops at selected motels in town. The route and schedule are shown on the map below.

Off the Rails Daily Newsletter
We will be publishing a daily newsletter with announcements of the day’s activities, schedule changes, and other information. The title is Off the Rails and copies will be available each morning at Registration and other locations. Submissions for Off the Rails can be placed in the collections box in the NSS Bookstore.

Message Board
There is a Message Board near Registration.

Internet Access
The school has a Wi-Fi network that should be available to all convention attendees. It has proven widespread throughout the building and reliable during our visits, albeit the usage was much lighter at that time than we expect this week.

Open Computer Room
Room 203, the Midway Gold Computer Facility, is available for convention attendees to use when not occupied by a session. You may use these computers for printing but we have agreed with the school that attendees will limit printing to a maximum of 6 pages per attendee. Printed material will appear at the library printer. If you have a convention-related need to print more than 6 pages, please contact a convention staff member and ask them to print using the staff printer/copier.

Food and Drink in Rooms
The school asks that no food or drink (other than water) be brought into the gymnasium or Room 203 (Midway Gold Computer Facility). Food and drink are allowed in other rooms (unless posted otherwise).

Please Keep Classroom Doors Closed
Environmental design and fire code requires that doors be left closed and not propped open.

Junior Speleological Society
JSS information and activity schedules were not available at press time. Check at Registration for current information.

Log-in name: NSS2016
Password: convention

Network name: Convention1
Password: NSS75years

Ely, Nevada
Medical Support
Limited first-aid support is available at the volunteer-staffed medical facility in the campground. However, for any serious injuries or illnesses you should go to the William Bee Ririe Hospital at 1500 Avenue H in Ely. It is a small facility, but can take care of any emergencies or refer you to a higher level of care.

Emergency Phone Numbers
If you have an emergency please call 911. In case of a cave rescue incident you can call 911 or 435-406-1041 (Gretchen Baker, the convention’s Rescue Coordinator).

If you need to give someone an emergency number at the convention you can use 775-318-0626. This is a cell phone number that will be manned when Registration is open and at some other times. The Registration staff will post a message on the message board. The staff cannot go looking for you to deliver a message.

Vendors
The vendors are located in the school. As of press time, there were no vendors signed up to be in the campground. Some vendors will be open on Sunday afternoon and all will be open during the day from about 8:30 AM until 5 PM on Monday through Friday. They will be closing around noon on Friday.

Amateur Radio “Special Event” Station
The Convention will host the amateur radio “special event” station N5S. This special event station will be open to any NSS member that wishes to try their hand at around-the-world radio communications. Guests do not need an amateur radio license. The station is located in the school parking lot. Hours of operation are posted at the station, but are subject to change.

Amateur Radio Information
The main repeater in the Ely area is WB7WTS, located at 9,200 feet elevation on Kimberly Mountain, about 12 miles WNW of Ely. Output is 147.18+, PL tone 114.8.

There will also be a Cave Chat simplex frequency on 147.4800 MHz setup for the convention amateur radio attendees.

Lost and Found
Lost and Found is located at Registration and at the Security tent in the campground.

Pet Policy
Pets are permitted in the campground, but are strongly discouraged because of the weather conditions. They must be on a leash or contained at all times. They must...
never be left unattended. Clean up after them. Pets must not annoy or constitute a danger to others.

Pets are not allowed in the school building at all except properly registered Service Animals. Therapy and Companion pets are not allowed in the school. Do not leave pets in vehicles in the school parking lot. There are two alternative places in town to board pets. See the Ely Businesses chapter for more information.

Meal Options at the School
Breakfast and lunch will be available in the school on Monday through Friday. The full meal plan can be purchased when you register, and individual meals and ala carte items will also be on sale each day. The serving times are expected to be from roughly 7 AM to 2 PM. Food may be taken to the classrooms except the gymnasium and room 203 (the Midway Gold Computer Facility) unless posted otherwise.

Getting Copies and Presentation Support
Small volume printing and copying can be done in the school. Check with Registration for the procedure. However, the Convention cannot do high volume copying and printing. If you need this service ask the Registration staff to point you to a copy center in town.

Tobacco Restrictions
All tobacco use (including smoking, chewing, and e-cigarettes) is prohibited by state law in schools and on school property, in restaurants, and in grocery stores, convenience stores and drug stores. Stand-alone bars and gaming areas of casinos are exempt from the law and smoking may be allowed there.

Local Alcohol Laws
Alcohol is allowed in the campground and open containers are allowed while walking in town. It is unlawful for anyone to have an open alcoholic beverage container in the passenger area of a motor vehicle while the motor vehicle is being driven. The DUI limiter in Nevada is 0.08%. Please don’t drink and drive. Take the convention’s shuttle bus instead.

Alcohol is prohibited in the school and on school grounds. Please remember that at high altitude, such as Ely, many people need less alcohol to achieve the same effects as they achieve at sea level. Please respect this fact, especially when driving.

You may bring alcohol to the Awards Banquet on Friday, but there’s no real need to do so since it will be provided free.

Unlike some western states, possession and use of marijuana is illegal in Nevada and the laws are enforced.

Speed Limits
Nevada has lots of nice straight highways, but most towns take their speed limits seriously. Ely is no exception. Please obey the speed limit signs. You will save yourself some money and maintain the caving community’s good relationship with the town.

Firearms
While Nevada’s firearms laws are rather lenient, at least by some eastern U.S. standards, all kinds of guns are totally prohibited at all public schools, even in the parking lot. If you have questions about any other aspect of Nevada’s firearms laws you should check with the local or state police in Ely.

Land Ownership
Most of the land in Nevada, including most of the caves and karst, is public land administered by the U.S. Forest
Service (USFS) or Bureau of Land Management (BLM). The rules for accessing caves on public land seem to be constantly changing. Rather than trying to include the current regulations here and having them quickly become obsolete, you should check with the folks at the Cave Central tent in the campground for the latest information.

**Cave Digging Prohibited**

Anyone digging in any cave should always have explicit landowner permission and this includes Nevada’s caves that are on public land.

Most Nevada caves are on public land administered by the USFS or BLM. It is quite possible that anyone caught digging in a publicly owned cave will be considered an antiquities looter and be prosecuted accordingly, even if they are just digging to get into a new passage. The safe option is to not dig at all. If you stumble on any kind of historical objects or artifacts, leave them as you found them.

**Local Hazards**

**Altitude:** Ely is at an elevation of 6,400 feet and the surrounding mountains are, of course, higher. If you are not acclimated to the elevation you should take care before doing strenuous exercise. Above 8,000 feet you may be subject to altitude sickness. Consult your doctor about preventive medicine if you are subject to this and plan any activities at higher altitudes.

**Sunburn:** Ely’s high elevation and dry air mean that the sun is very intense. Be sure to use adequate sunscreen and/or wear protective clothing if you are going to be in the sun for an extended time.

**Dehydration:** Dehydration can creep up on you quickly in the dry air. Please drink lots of water and/or non-alcoholic fluids, especially during the first three days of your visit, to avoid altitude-induced headaches. When you go hiking or caving, be sure to take plenty of water and drink it as you go. There’s no reason to bring it back to town.

**Great Basin Rattlesnake** (*Crotalus oreganus lutosus*): The Great Basin rattlesnake is a venomous pit viper subspecies found in this region of the United States. They typically inhabit the dry and barren areas of the Great Basin region, being found on hills, summits and old lake benches. They are said to prefer southern exposures among rocks and boulders on hillsides and buttes. Garnet Hill (the rock hound area west of Ely) is a perfect example of the preferred habitat.

On a recent site visit to that area the convention team did meet a friendly snake in the parking lot. It’s unlikely you will share this experience, but you should be observant and mindful of where you put your hands. Use a shovel to turn over boulders and rocks on Garnet Hill. Rattlesnakes would prefer to leave you alone — unless you stick your hand in their face. On warm summer days, this species will seek out shady places to protect it from the sun.

The space under your car is very shady.
Campground Information

General
The Convention campground is at the White Pine Golf Course, about two miles north of downtown Ely. The golf course is allowing the Convention to use three of the course’s fairways for camping. It is very important to camp only in the designated areas because the rest of the course will still be open for golfing. Also, no cars are allowed on the fairways at all and we are not allowed to use the greens for camping or anything else.

For GPS users, the big red barn at the campground entrance is at 39.2685°, -114.8612°.

Opening and Closing Times
The Convention campground opens at noon on Saturday, July 16, and closes at noon on Saturday, July 23. Our contract with the golf course does not allow camping prior to the opening time and requires that all campers be completely out of the campground by the closing time. If you want to arrive early or stay late, please make arrangements at another local campground (see the list of commercial and public campgrounds in the Ely Businesses chapter).

Security
The campground is not fenced, but there will be security personnel on site throughout most of the convention with sporadic patrols by the local police, especially on Sunday, Monday, Thursday, and Friday evenings. It is probably best to store valuables out of sight in your car and not leave them in your tent while you are away from the campground.

Car tags will be given to you during registration. These must be displayed in your vehicle’s window at all times during the week. Vehicles not displaying this tag may be subject to towing at the owner’s expense.

Cars entering the main camping area will pass by a security shelter and the occupants will need to show their convention badges.

The speed limit in the campground is 5 mph. There is a fire lane around the main parking area that must be kept open at all times.

Parking
Primary campground parking will be in a central parking area. Smaller vehicles should back in next to the fairways around the golf course rough.

Under no circumstances is driving or parking allowed on the golf course fairways (or any other area with green vegetation).

Pets
Pets are permitted in the campground, but are strongly discouraged because of the weather conditions. They must be on a leash or contained at all times. They must never be left unattended. Clean up after them. Pets must not annoy or constitute a danger to others. Pets are not allowed in the school building at all.

Do not leave pets in vehicles in any parking lot or in the campground. There are two alternative places in town to board pets. See the Ely Businesses chapter for more.

Come Visit us in Room 202
Lots of new work!!

Shot in the Dark Cave Photography

Peter Jones
80 Mountain Street
Camden, Maine 04843
(207) 236-612 / (207) 542-9228
pjcaver@gwi.net
www.pjcaver.com
Fine cave photography since 1969

Guadalupe Mountain Lampworks

Peter Jones
80 Mountain Street
Camden, Maine 04843
(207) 236-612 / (207) 542-9228
pjcaver@gwi.net
www.pjcaver.com
Fine Stoneware & Porcelain since 1973
Quiet Hours
Quiet hours are 10:00 PM to 8:00 AM.

Fires
No personal fires at campsites are permitted. There are two designated campfire areas in the campground area. One is in the noisy area northwest of the main tent and one is in the quiet area northeast of the main tent. Bring a chair to sit around and enjoy the westward expansion theme.

Quiet, Noisy, & Family Areas
There are designated areas for noisy, quiet, and mixed camping. Please use your common sense when you choose where to camp.

Water
Water lines run adjacent to the fairways where there is camping and the tap locations are noted on the campground map. The water comes from the city, but when it enters the golf course piping system, the County Health Department declares it non-potable as the golf course does not have adequate backflow valves at every required location. This water is not legally drinkable.

Potable water is available from a truck in the campground.

Water is a valuable resource in the arid west. Please do everything possible to limit your use of water! Do not leave hoses, faucets or showers running any more than absolutely necessary.

Washing Dishes
There is no designated place to wash dishes. When you wash them please be sure to discard any food scraps in trash receptacles or the dumpster rather than discarding them on the ground. Also, please try to wash and rinse dishes away from highly trafficked areas.

Trash and Recycling
Trash receptacles and recycling containers for cans and bottles will be located around the campground and they will be emptied daily. A trash dumpster is located next to the red barn near the campground entrance road.

Ice
The golf course’s youth group will periodically travel through the campground selling ice or it can be obtained at the golf pro shop. However, the physical location of the pro shop is not convenient to the campground. Ice is also available at numerous locations in town.
Showers
At press time the status of showers in the campground was unclear, but the convention hopes to get the required permits to build temporary campground showers. In any case, showers are available in the school.

Toilets
There are numerous portable toilets, including two that are ADA-compliant, placed strategically around the campground. There is also a flush toilet available in a permanent building a few hundred feet before you get to the red barn on the way into the campground. Of course, there are flush toilets (and showers) available in the school.

RV Camping
There are no electric, water, or sewer hookups in the campground. RVs and large trailers are welcome to park next to the fairway north of the main tent. If you need a dump station, there is a list of local commercial campgrounds in the Ely Businesses chapter. They should allow dumping for a nominal fee.

Vehicle Camping (No Hookups)
Anyone wishing to sleep in their vehicle or trailer is welcome to park anywhere in the main campground parking area and do so. Remember, no generators are allowed during quiet hours.

Fireworks and Noise
No fireworks, carbide bombs, or other noisemaking is allowed. No discharge of firearms will be permitted. Any violations of this rule will result in expulsion from the campground and possible legal action by the local authorities.

One exception to the noise rule may be when the convention contracts to have a historic cannon fired. Please don’t try to retaliate in kind if this happens during the convention.

Alcohol Rules
Nevada has few restrictions about alcohol other than common sense. Don’t drive after drinking and don’t give children alcohol. Open containers are illegal in moving vehicles.

Food Service
There is no food service in the campground. However, the pro shop in the golf course office will have a simple menu and variable hours. The pro shop is on Golf Course Drive after you turn onto it from Route 93. At press time, the pro shop hours were not known so check with them to see when they will be open.

Avoid the Pond
Stay out of the pond located at the north end of the campground. It contains agricultural waste and is not potable water. Avoid any skin contact.

Additional Campgrounds
If you wish to arrive early or stay in Ely after the convention, there are several commercial and public campgrounds in Ely and the surrounding area. The Ely Businesses chapter has a list of these campgrounds. Please don’t ask to arrive early or delay your departure from the Convention campground.
Special Events

All Week

CaveSim

CaveSim is located outside the high school and will be open during the day all week. Look for the big silver trailer.

CaveSim is a realistic crawl-through cave obstacle course with computer-sensed artificial formations. All Convention attendees can crawl through the course for free. CaveSim moves beyond the traditional how-small-can-you-be squeeze box and challenges cavers with a new how-softly-can-you-cave approach. Formations such as stalactites, stalagmites, helictites, and gypsum flowers decorate the passages. Each man-made formation is electronically sensed. If cavers bump into or damage a formation, a buzzer sounds and the CaveSim computer counts the damage against the caver’s score. Cavers are also timed by the computer as they navigate the obstacle course. The goal is to cave swiftly and softly, without “damaging” the cave.

CaveSim also has non-contact sensors, so even close approaches to delicate formations like gypsum flowers can trigger damage points. There is even a real water feature and an electronic bat (please don’t shine your light on the bat!). The electronic sensing of CaveSim is a significant project on its own, but there is more: Dave and Tracy Jackson, the CaveSim developers, have become artists with their ability to re-create standard cave formations in plastic. Not a single formation was harmed or touched in the making of CaveSim. The stalactites and stalagmites are impressive with dripping tips and the gypsum flowers are so real that you won’t want to breathe on them.

Helmets and gloves will be supplied to make your cave trip even more realistic.

NSS Special Event Station

The Convention has an amateur radio special event station N5S. This special event station is located in the school parking lot and is open to any NSS member who wishes to try their hand at around-the-world radio communications. For those of you that are not licensed amateur radio operators, don’t worry, a controlling operator will be made available so you can still have fun. QSL cards will be made available for confirming contacts made. Sharpen up your multilingual skills because the world will be waiting for you to say hello. So bring your amateur radio license, bring your radios, or just bring yourself, and see who you can reach by radio.

Who knows who may answer your call? Nevada is known for its extraterrestrials.

The station will be operating from July 17-22 from 8 AM until 5 PM daily and 8-10 AM on July 23. Operating Frequencies are Approximately 1.8550(LSB) - 3.9350(LSB) - 7.1950(LSB) - 14.2850(USB) - 28.3850(USB). If you are a licensed amateur radio operator, there are five radios available for your use; two Kenwood 100 watt HF transceivers, one Yaesu 5 watt QRP transceiver, and two 45 watt Kenwood VHF/UHF transceivers or you can bring your own.
**Special Events: All Week**

**Fine Arts Salons**

The Fine Arts Salon will be hosting the Rock Project this year, a collection of rocks that have been on caving trips around the U.S. and abroad, all meeting in a carefully laid rock formation in the Salon center. The theme for this year’s Fine Arts Salon is Rock Art. The display will be opened with a small reception sponsored by Speleobooks on Monday at noon. Salon will be closed between 9-12 on Monday morning for our judges.

**SpeleoArt Workshop**

Each year the Arts and Letters Section of the NSS hosts a 3-day SpeleoArt Workshop during the NSS Convention. There is a different theme each year and the Workshop features a variety of activities related to the year's theme. This year the SpeleoArt Workshop will focus on the design and construction of this year’s SpeleoArt Collaborative. There will be a Rock Circle in the Fine Arts Salon open to rocks that have been caving and their stories. Bring a rock and add it to the display, which will open when Convention registration opens on Saturday morning. The Salon is located in the school’s library.

The workshop will begin with preparation of the canvas for the Collaborative artwork which is like a large flat mural depicting the rock art ideas to tell the story of this years Convention experience. The workshop is just $10 this year which will cover the materials provided. The Collaborative will start on Monday at 2 PM and finish Thursday afternoon.

**NSS 75th Anniversary History Display**

This year the NSS is celebrating its 75th Anniversary and several special events and displays have been added to the usual Convention program.

First, an NSS History Display in room 309 will be open throughout the week to display various historical artifacts brought to the Convention by attendees. Various displays may include a display of caving-ready old carbide lamps, a length of Goldline rope and early vertical caving gear, photo albums from one of the earliest NSS Grottos, early convention memorabilia, historical photographs from throughout the years, etc.

In conjunction with the displays, attendees will be encouraged to do some story-telling about the “good-old-caving-days”, an Oral History Project. A quiet room will be available for video and/or audio taping of these sessions. These recorded stories will be scheduled whenever someone indicates a willingness to participate, and attendees are invited to be an audience to hear the stories.

**Cave Ballads Listening Kiosk**

The Cave Ballad Listening Kiosk will be in the Fine Arts Salon room and will be open 9 AM to 5 PM all week so that you can listen to the ballads submitted this year, listen at your leisure, and read the lyrics and the background. You will be able to vote there for Caver’s Choice (awarded at the Thursday night Salon Award Program). The instructions for this year’s judges will also be on display, along with photos of the contestants and the judges.

**Vendors**

Many of your favorite vendors have traveled from all over the United States to showcase their products and to let you “touch and feel” before you buy. Equipment, books, clothing, speleo-memorabilia, whatever you want, you can find it here. Vendor Row is in the school. As of the date this Program went to press there were no confirmed outdoor vendors.

Some vendors will be opening at noon on Sunday (July 17) for your shopping convenience. All vendors will be open on Monday morning and will remain open during
Special Events: All Week

the day through about noon on Friday (July 22).

Please note that all vendors are required to collect sales tax or display a sign saying that sales tax is included in the price of the items they sell. The tax rate in Ely is 7.725%

**Book Signings**

There will be book signings in the vendor area on Monday and Tuesday from 11 AM to 1 PM. Check the *Off the Rails* newsletter for details.

**Caver Co-op**

The Caver Co-op (also known as Consignment Sales) provides an opportunity for cavers to sell any item they wish, except firearms and similar dangerous items, at the convention. Cavers consigning items will have the options to staff the room. A percentage will be deducted from the final sales receipt based on whether or not the consignor volunteers. It is necessary for sellers to participate or there are likely to be periods when the room will not be open. Just sign-in when you bring in your consignment.

<table>
<thead>
<tr>
<th>CAVER CO-OP</th>
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<tbody>
<tr>
<td>(Consignment Sales)</td>
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<tr>
<td>Get great bargains on caver-supplied</td>
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<tr>
<td>- Cave gear</td>
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<tr>
<td>- Publications</td>
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<tr>
<td>- Crafts</td>
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<tr>
<td>- Memorabilia</td>
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<td>- Other great stuff</td>
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Tables will be available, but arrive early to find the best space. The room will be open during normal vendor hours Monday morning for items to be checked in and sold. You can prepare items for sale by labeling and pricing them beforehand. Use your NSS number on each label (any identification numbers or letters are okay, just check to make sure there is no duplication). Items must be picked up during normal vendor hours on Friday. See Terry Chambliss for details.

**Speleo Olympics**

This year the Speleo Olympics course will be using CaveSim (located in the school parking lot and open throughout the week). Put your caving skills to the test in 60 feet of electronically-sensed crawling passage. See how few artificial cave formations you can hit. Speleo Olympic contestants will compete for short times and no formations damaged as they crawl and climb through CaveSim’s passageways. Your best of three scores will count in the contest.

**Retro Trips**

Newer cavers, have you ever wondered what it is like to go caving with a flame on your head? Older cavers, do you sometimes miss the warm, golden glow of your old carbide lamp? To help celebrate of the 75th Anniversary of the NSS, Convention 2016 will be offering special carbide-only “Retro Trips.” Here's your opportunity to get a glimpse of what it was like to go caving in the past (or to relive the past, if you are a caver of a “certain age”).

All Retro trips will be exclusively by carbide light to a horizontal, nicely-decorated cave. A carbide lamp “expert” will be on hand to show new people how the lamps work and to accompany every trip, because we all know that these old lamps require more personal attention than new-fangled LED headlamps. The convention committee will provide the carbide. So dig out your old carbide lamp and helmet with the appropriate bracket, if you have them. If you have extra lamps, bring one for a friend.

There will be a limited number of “loaner” lamps and helmets available, so sign up early. We ask that all electric lights be stashed in your cave pack for backup so as not to ruin the ambiance of the carbide glow. Everyone is encouraged to dress like they did in the past (jeans, flannel shirts, leather or cotton gloves, or cotton coveralls, no synthetics) to add to the fun. So search the back of your closet or your local thrift shop for appropriate clothing.
Special Events: All Week

Ely, Nevada

(Remember: do not bring anything that has been in a White Nose affected cave or has not been properly decontaminated).

The trip schedule will be in Off the Rails.

**NSS Salons**

The **Cartographic Salon** shows off the amazing technical skills and artistic talents of cave cartographers from around the world. The salon encourages the exchange of techniques and styles, recognizes cartographic excellence, and showcases recent exploration and mapping projects worldwide. Go to the salon area to see the maps and to vote a winner for the Caver's Choice ribbon. Attend the Salon Awards Show to discover what maps were judged best in their category. Best of all, join the informative and entertaining Friday Morning Critique sessions at the salon area. Anyone with even a passing interest in cave maps will be well rewarded.

The **Cave Ballad Salon** is a competition for cave-related songs and music. Entries are classified in three categories: Traditional (new words written to an existing song), Original (completely original words and music), and Avant-garde (non-standard). The winning and first-runner-up entries will be played during the Salon Awards Program. There is a session to review all of the Salon entries.

The **Crafts and Design Salon** displays the exceptional talent among cavers for arts and designs that are outside of the 'usual' Fine Arts category.

The **Cover Art Salon** exhibits and encourages excellence in the design and images on the covers of cave publications. Covers are judged in one of three categories: Computer Enhanced, Non-Photographic, and Photographic. Cover art may come from “traditional” paper publications, or from web-only publications. Cover Art Accepted for Show will be on display during the convention.

The **Fine Arts Salon** is the NSS venue for exhibiting speleologically-inspired artwork. Artwork can be in any medium, from painting and sketching to digitally altered photography, computer graphics, pottery and sculpture, textiles, and mixed media. The subjects involve karst and caves, focusing on the central interest of topography. Fine Arts Salon entries judged Accepted for Show are displayed during the week.

The Fine Arts Salon will be hosting the **Rock Project** this year, a collection of rocks that have been on caving trips around the U.S. and abroad, all meeting in a carefully laid rock formation in the Salon center. The theme for this year's Fine Arts Salon is Rock Art. The display will be opened with a small reception sponsored by Speleobooks on Monday at noon. The Fine Arts Salon will be closed until noon on Monday for judging.

The **MultiMedia Program Salon** displays multiple-image computer presentations less than fifteen minutes in length, which can include music, narration, animations, or video. The winning MultiMedia Program Salon presentation will be presented during the Salon Awards Program.

The **Photo Salon** celebrates the ethereal beauty of projected images of caves and caving. Cave-related slides and images that have been judged Accepted for Show are projected once, during the Thursday night Salon Awards Program, with a background of instrumental music. The top award is presented at the end of the Photographic Salon presentation. The Photographic Salon is the oldest of the NSS Salons; it is the longest portion of the Salon Awards Program.

The **Posters and Pamphlets Salon** is a judged exhibition of paper media (posters, pamphlets, postcards, brochures, etc.) related to caves or caving. All designs must be representative of a caving-related or karst-related organization (such as a caving club, grotto, section, or
Special Events: All Week

conservancy) or of a caving-related or karst-related event (such as a caving club event, grotto event, section gathering, meeting, conference, or convention), or have a caving theme. The art work submitted must be entirely that of the artist, or, if a collaborative effort, permission must be received from all artists and/or organizations involved.

The Print Salon displays the best of submitted cave photographic prints from around the world. The Print Salon entries Accepted for Show will be displayed during the week.

The Symbolic Emblems Salon is a judged exhibition of symbolic emblems (posters, logos, patches, decals, pins, etc.) related to caves or caving. Other types of symbolic emblems may be displayed if space permits. Symbolic Emblems that have been judged Accepted for Show are displayed during the week.

The T-Shirt Salon is a judged exhibition of T-shirt designs related to caves or caving. T-shirts that have been judged Accepted for Show are displayed during the week.

The Video Salon is a competition among producers of moving-image depictions related to caves, cavers, caving, and cave conservation/restoration. Time permitting, all entries will be shown at the Convention. Prizes will be awarded to the top three entries at the Thursday evening Salon Awards Program. The Video Salon will show all entries during the week.

View all the Video Salon entries at this self-serve viewing station in the school library. This station will be available every day during the convention. Winners of the Video Salon will be announced during the Thursday night Awards Salon.

NSS Bookstore

Order your item at Convention and we will ship it to your home!

Symbolic items:

Books:

Clothing:

And lots more items

www.nssbookstore.org  256-852-1300  6001 Pulaski Pike NW Huntsville, AL 35810
Special Events: Sunday

**Sunday**

**Geology Field Trip**
Sunday, 7:00 AM – 6:00 PM
Campground

The buses will leave promptly at 7:00 AM. The buses will load in the campground. Please wear appropriate footwear, no open-toed shoes. Water and box lunches will be provided on the bus. No hardhats, headlamps, or flashlights are needed for the trip. The buses will return around 5:30–6:00 PM.

Note: Tickets are required for the tour and the field trip was sold out at the time the Program went to press.

**Vendors Open on Sunday**

Many of the Convention’s vendors will open around noon on Sunday for your early shopping pleasure. Of course they will also be open every day during the Convention. Vendors are located in the school.

**Self Guided Activities**
Sunday, on your own

There are numerous caves and other attractions relatively close to the convention. See your Guidebook and the “Non-Caving Activities” chapter for suggestions about places to visit on your own.

**Evening in the Campground**

6:00 - 7:00 Ice Cream Social

6:00 - 7:30 Music by CW and Dr. Spitmore, the dynamic western, ragtime duo!


Every song comes with a story. Sometimes the song tells the story. CW Bayer's story-telling is so old-school it’s almost fashionable. Learning guitar during the folk scare of the mid-60s, he turned off the radio and television, retreating into a dangerous world of live music, street theater and traditional dance. His books on the evolution of mining-era music reflect these obsessions. Dr. Spitmore brings to the duo an impeccable attention to detail and tone borne of his many years as a performer of Baroque music. His favorite musical jug is the one that works. Regulars at Nevada's Genoa Cowboy Festival, the Ponderosa Saloon in Virginia City, Comma Coffee in Carson City... this performing duo is perfect for bankruptcies, wakes and foreclosures.

7:30 - 9:30 “Who Wants To Be A SpeleoMillionaire?” Trivia Game Show

Prepared and hosted by Chris Anderson and Presented by the Silver Sage Grotto.

The SpeleoMillionaire game plays just like the TV show (except that we’re not giving away a million bucks!). One person plays at a time, facing 15 cave-related, multiple choice questions of increasing difficulty. Along the way they have three lifelines available to them, including “poll the audience” (which will be simulated by the software in lieu of actual polling), “phone a friend” (where the contestant can call anyone they want for help if their cell phone works), and “50/50” which eliminates two of the wrong answers. Players may stop at any time and keep what they’ve won up to that point, even if a question has already been revealed. On the way to the Million Dollar Question there are two “safety levels” which, once surpassed, guarantee they don’t walk away empty-handed, even if they get a question wrong.

When this program went to press the prizes hadn’t been determined, but negotiations with Apple, Tesla, and others were underway. Also, unlike the TV show, the software doesn’t have a way of letting the entire audience compete for who gets to sit in the “hot seat”
Monday

Nevada: Treasures of the Silver State

Monday morning
Come learn about Nevada caves (cultural, biological, hydrologic and geologic features), mines, ghost towns, and more during this session. Our focus will be on providing interesting information about a range of topics, so there will be something for everyone to enjoy.

Fine Arts Salon Opening Reception

Monday during lunch
The Fine Arts Salon will open for refreshments and sales at noon on Monday. The opening is sponsored by SpeleoBooks. There will be opportunity to vote for your favorite artwork in the Salon. It will include items from the Craft and Design Salon, which is an extension of Fine Arts.

DistoX2 Session and Workshop

Monday afternoon
The DistoX2, the fast and easy little instrument with the ability to take compass and inclination readings in addition to distance measurements, has quickly become the tool of choice among cave surveyors. The combination session and hands-on workshop will cover a variety of DX2 topics including calibration, usage, digital sketching and more. At the end of the session, there will be an opportunity for DistoX2 owners to calibrate their distos using a fast and accurate method, so bring your DX2 if you have one. Also bring your tablet and a stylus if you want to follow along on the Digital Sketching presentation. In addition, Angela Morgan suggests that it would be helpful if people who bring a tablet for calibration pre-install TopoDroid (for Android devices). This is best done with an internet connection at home. The install is pretty easy, just go to Google Play on your device and search for “Topodroid”.

Howdy Party

Monday evening, Campground

Convention Rookies:
Tickets to the “Donner Party Howdy Party” are included in your registration package. The evening includes dinner, entertainment and social events with cavers from around the world.

On Stage: The New Christy Minstrels!

This is the social event that kicks off the week! Cavers from across the country and around the world rarely get the chance to meet in the same place at the same time. The annual Howdy Party will set the tone for the rest of the week!

This year, following our traditional irreverence, we’ve renamed this event the “Donner Party Howdy Party”! That ill-fated group of travelers came through eastern Nevada before they headed across the desert to the Sierra Nevada.

But instead of feasting on your friends, you can just feast with them at this event! And if you want to go all-in, we'll have some prizes for best costume. So come dressed as your favorite wagon master (or other side dish) and we'll greet you at the 75th Anniversary Howdy Party! (Just, please, stay away from the kitchen - you really don’t want to know.)

Of course, ghosts and zombies are always welcome!

In the world of music, it’s rare to find a single artist who defines an era of entertainment. But when that same artist also defines an entire genre... Magic happens.

The 2016 NSS Convention is pleased to welcome Grammy Award-winning artist, Randy Sparks and The New Christy Minstrels as our headline performers at the official “Donner Party Howdy Party.”

The New Christy Minstrels

For cavers steeped in the musically-rich 1960s and 70s, this performance will take you back to the edge of the counter-culture period of American history. Even the “lesser experienced” of our society, will recognize Sparks’ influence on later performers whose careers he helped launch: John Denver, Barry McGuire, Kenny Rogers,
Michael Martin Murphey, Gene Clark, Kim Carnes, and comedian-turned-bluegrass artist, Steve Martin.

Founded by Randy Sparks, The New Christy Minstrels delivers a big sound of finely tuned harmonics through the vocal and acoustic talents of the 7-piece ensemble. Now in their 6th decade of entertainment, their repertoire includes the iconic classics, “Green, Green”, “Today”, “Saturday Night”, “Mighty Mississippi”, and the protest-era hit “Eve of Destruction.” Allowing for nearly 60 years of experience, an entire new set of originals are also woven into the mix.

But this is still a cave story.

In his formative years, Sparks yearned for a bygone time when artists often discovered the world by hitching rides on cross-country trains. Following the footsteps of his mentor, Burl Ives, Sparks started chasing the same path.

“I wanted to emulate his collection of songs from the people, but free-riders were no longer welcome on the railroads in 1951, so I opted instead to hitch-hike through the west.”

Starting with $40, Sparks followed his wayfaring ways to the edge of “cave country” in California’s Calaveras County (home of the 1975 NSS Frogtown Convention).

“The ranch hand who’d carried me there told me there’d likely be cars and trucks going my way before nighttime, but that didn’t happen... not one bit of traffic, so I spread my sleeping bag in the ditch and went to sleep. In the early morning, my first ride was with a man who owned Mercer Caverns near Murphys. He said to me, ‘You have a good gift-of-gab, and when you finish your field trip in geography, if you want a job, you’re invited to work as a guide for my cave.’”

Sparks continued his real-life lessons by visiting Nevada, Utah and Idaho, learning much about history and the people of the west, some just generations away from famous heroes and villains. One of the historically-important small towns Sparks visited in his journey was Ely, Nevada.

“This was the genuine old west, and I was much impressed. Standing there on the highway, one could easily imagine the stagecoach coming to a halt to off-load ‘painted ladies’ for the entertainment of the boys who worked at the copper mine.”

Following his journey of self-discovery, he then returned to Murphys to work the rest of the summer as a tourist guide at Mercer Caverns.

Sparks reminisced, “Now, almost exactly sixty-five years later, I have been invited back to Ely for the NSS 75th anniversary, and I’m bringing along my own ‘Wayfaring Strangers.’ The term full-circle comes to mind.”

Convention Rookie?

Are you new to NSS Conventions? If so, that’s great! But, you need to learn your way around a bit before you jump into the deep end.

These are definitely festive events! You’d be hard-pressed to find an environment where you’re surrounded by so many experts in caves and cave science. Yet, all of these people are like family. Many cavers have known each other for decades.

If you find yourself over-intoxicated, it’s quite likely that your fellow cavers will take your keys and kindly escort you back to your tent to sleep it off.

However, fighting and illicit behavior will always be met with a zero-tolerance policy from our volunteer security staff. Same thing for underage drinking. If you decide to push that envelope, you can expect to be evicted from the event.

No excuses.
No apologies.
No refunds.

We have the sheriff’s cell phone number. Don’t make us use it.
Please behave.
Special Events: Tuesday

Tuesday

**Luminary Series I**  
**Penelope J. Boston (NSS 44478)**  
(SC)

“From Inner Space to Outer Space: The Role of Earth’s Subsurface in Our Search for Life in the Solar System and Beyond”

Tuesday 1:00, Multipurpose Room

While many scientists in the field of speleology spawned their early vocational interest through sport caving, Penny Boston’s trajectory followed the opposite approach. In particular, Dr. Boston was researching life on Mars, and considering where to look for evidence. She postulated that certain presumed Martian organisms may have retreated to the subsurface as the surface conditions became dryer and more hostile. She was eager to test this theory. While contemplating doing so, Penny heard of a place named Lechuguilla Cave—purportedly dry, pristine, and with a relatively high sulfur content. This sounded a lot like modern-day Mars. Further, K.I. Cunningham of the USGS believed that he had seen some microorganisms in SEM photomicrographs made of substrates removed from Lech. Penny was sold, and wanted to examine these aspects of Lechuguilla for herself, in-person, and with her own eyes.

With no prior knowledge of caving techniques, Penny went to Carlsbad Caverns National Park with two colleagues from NASA, met with Cunningham and Dale Pate, and was trained in vertical skills for circa 3 hours. Then, she and a team of 10 people went on an expedition into Lechuguilla for a five-day science expedition—her first wild caving trip.

While admittedly “very stressed out physically,” Dr. Boston was fascinated and encouraged by what she saw and experienced in Lechuguilla Cave. The cave seemed to provide a more-contained environment than was typically seen on the surface. As such, there was a limited exchange of materials and energy from the surface to the subsurface—making biological assessments more manageable. And, at one point during the expedition, what appeared to be corrosion residue sticking to the ceiling of the cave unexpectedly fell off, got in her eye, and gave Dr. Boston an almost instantaneous eye infection. Her eye swelled shut, but quickly cleared up in a matter of only about four hours after exiting the cave. To Penny, this suggested biology!

In the course of her research career, Dr. Penelope Boston has studied extreme environments all over the world. She has, for instance, been in fumarolic ice caves on Mount Rainier, rock salt caves in the Atacama Desert in Chile, Naica Crystal Cave in Mexico, various highly acidic places on the Earth including Cueva de Villa Luz in Tabasco, Mexico, the high Rocky Mountains of the American West, and many other extreme environments around the world.

Penny’s current research passion is life detection efforts germane to various bodies in our Solar System. She has had a longtime affair with Mars, and is fascinated by the icy moons around the gas-giant planets—including Europa, Io, and Titan. As such, one of the goals of her work is to help define the extremes of the envelope bearing terrestrial life forms. With this knowledge, Penny and her colleagues hope to be better informed as to where, and how, to look for life elsewhere in outer space. And, she has written extensively about the potential chemical and physical processes that can give rise to subsurface cavities on other planets, with or without the presence of biology.

Dr. Boston’s work has been sponsored by many organizations, including the National Aeronautics and Space Administration, the National Science Foundation, the National Cave and Karst Research Institute, the New Mexico Space Grant Consortium, and the National Geographic Society. A world-renowned expert, and an enthusiastic speaker on these topics, Penny has appeared on many forums read and viewed by the general public such as Smithsonian magazine, Air & Space magazine, The Weather Channel, NOVA, Discovery Channel, and in National Geographic television programming.

Conservation Tuesday Events

All day Tuesday

Cave/Karst Conservation, Management, and Restoration topics fill our Conservation Tuesday Sessions. Conservation Tuesday Talks include cave conservation, management, restoration, speleothem repair, and WNS presentations. Join us for lively presentations, plus forums, panels, interactive discussions, and workshops to explore state-of-the art conservation solutions and up-to-date current best practices. The topics to be covered include:
Bats of the Western United States (Workshop)  
(Tuesday morning)

Most bats in the western U.S. use cave features either primarily or secondarily throughout at least some part of their life cycle. Individuals that encounter bats in caves can be both beneficial and detrimental to bats, depending on the encounter and how invasive it is to the bats. This workshop will discuss what bat species are using caves in the west, how their use/needs change seasonally, how to identify bats when practical, what you should and should not do around bats when underground during certain times of the year, and what data from your caving expeditions may be useful to pass along to wildlife managers.

Conservation Lunch and WNS Roundtable  
(Tuesday during lunch)

This informal lunch meeting will focus both on discussion of new concerns in cave conservation and the latest information about White Nose Syndrome, including research into possible measures to reduce its impact. (See the schedule for WNS talks that will precede our Bring-Your-Own-Lunch Roundtable). All are welcome to attend and participate in open discussion among cavers, bat researchers, land managers, and agency representatives.

Conservation Session  
(Tuesday afternoon)

The session will feature Conservation Tuesday Talks with presentations on various aspects of cave conservation. Questions and discussion follow each talk.

CaveSim Special Presentation  
(Tuesday afternoon)

This will be a presentation and special tour of CaveSim by David Jackson, the creator of CaveSim, a traveling cave conservation experience. The technical features of CaveSim will be reviewed, with special emphasis on its use in promoting cave conservation and education to the public.

Fellows & New Members Reception  
Tuesday, 5:00–8:00  
Northern Nevada Railway Freight Barn

All NSS Fellows and all New NSS Members (NSS numbers who joined since the 2015 convention) are invited to a special reception on Tuesday evening from 5 to 8 PM in the historic freight barn at the Nevada Northern Railway. There are geology trains at 4:30 and 7:30 that depart just a hundred feet away (tickets are required for the train trips). This allows the Fellows and new members to go on either train and stop by the reception before or after their trip. Light munchies (not dinner) will be available along with beer, wine, and soda.

Rockin’ & Rollin’ Geology Train

Trip #1: Tuesday, 4:30 PM  
Trip #2: Tuesday, 7:30 PM  
Departs from Nevada Northern Railway depot  
Tickets Required

A lively presentation by a local mining geologist talking about the railroad, Nevada mining history, and a show and tell of ore samples. All of this as the century-old steam engine is pulling your train through the great geological “museum” right outside the window of your coach. Snacks, Beer, and other beverages available for purchase on-board.

There will be two trips, one at 4:30 PM and the other at 7:30 PM. They depart from the Nevada Northern Railway Museum, Depot, and Gift shop at 1100 Avenue A.

Tickets are required for each trip and are not interchangeable. Please arrive 30 minutes before your trip departs.

Open Mike in the Campground

Tuesday evening, Campground

The Open Mike will be held on the Campground Stage. Tuesday night from 7:00 PM on. Signup will start 1/2 hour before the performances and each performer will be allotted up to three songs (or poems of equal length). You will be able to take additional turns after those who initially signed up have performed. Acoustic instruments and all levels of skill and interest are welcomed.
Special Events: Wednesday

Luminary Series II
Forrest M. Wilson (NSS 16631) (FE)
“Where No Man Has Gone Before”
Wednesday 1:00, Multipurpose Room

While living as a child in New Orleans shortly after World War II, Forrest Wilson was underground for the first time in a famous commercial cave while on a family vacation. But, the event that really captured his imagination had a most-improbable start. In particular, young Forrest was hauled off to a lecture on the campus of Tulane University, where his father was a medical student. But, remarkably, the lecturer showed photographs of interesting fish, and Wilson thought that these animals were pretty cool. Soon, at his cousin’s house in Washington state, Forrest donned some borrowed SCUBA gear and headed over to a nearby lake. Not many interesting fish there, but the diving part seemed like a grand adventure.

Open water diving since age 14, Forrest Wilson—by now working at Atlanta’s Fernbank Science Center after attending Loyola University—began dry caving with a high school friend that, coincidentally, had also relocated to the Atlanta area. At work, Forrest wrote software, and did similar tasks, that controlled the projector and the ancillary equipment in the planetarium at Fernbank. In his spare time, Forrest went open water diving, and also explored dry caves such as Case Caverns, and the rugged Byers Cave, in north Georgia. Then, in the mid-1970s, Fernbank hosted an international symposium of planetarium educators. At this meeting was the man tasked to set up and operate a new planetarium for the Smithsonian Institution on the Mall in Washington, D.C. Forrest was asked to move up to the D.C. area to help with this effort. As regards avocations, at the time, Forrest’s caving and his diving were essentially independent hobbies.

While in Washington, Wilson attended meetings of the D.C. Grotto, met Paul Stevens, and learned of the Organ Cave Project being spearheaded by Stevens. Along the way, Paul mentioned that Organ had a sump that “needed diving” and suggested that Forrest take a look. Using an electric light designed for coal mining, and underwater gear that seems sophomoric by today’s standards, Forrest Wilson attempted the Bowen Sump in Organ.

A smart guy and an avid reader, Sheck Exley read about the Bowen Sump dives in the D.C. Speleograph and came up from Florida a few times to help. Together, Wilson and Exley found more than a mile of dry cave, thus becoming the first group in America to discover a mile of passage beyond a sump.

In the course of their budding friendship, and their work on the nascent Cave Diving Section of the NSS, Sheck proposed that the CDS needed to create the position of a Training Director. Florida cave diving politics being what they were, Sheck asked Forrest Wilson—an out-of-stater—to become the first Training Director of the CDS.

Wilson, an enthusiastic cave diver with an imaginative mind and a knack with tools has developed a number of significant cave diving innovations. For instance, he designed and constructed an early rebreather for the specialized problems of underwater caves.

Forrest also noticed that the cave diving line reels of that era were generally made by certain cave divers simply for their own usage, plus a select few of their tight circle of cronies. Thus, because each was custom made, and in very limited quantities, a lot of cave divers did not use reels at all. The consequences were pretty predictable, and often tragic. So, Wilson set out to design a reel that was specifically configured for cave diving, and that could be easily mass produced. One of the innovations of the Wilson Reel is that its enclosed sides are transparent, so that the user could see what was going on with his inventory of dive line.

It is also a fact that dive lines laid in caves are a two-way street. More than once a diver got turned around, followed the line in the wrong direction, and ran out of air in the cave. As a crude remedy, one diver fashioned duct-tape arrows stuck to the line. But, the adhesive on the tape could fail in the underwater environment, and the integrity of the arrow shape was not good enough. Several cave divers worked on the problem, but Forrest Wilson came up with the solution that is now widely employed. Forrest used the same plastic material that the divers already utilized for their underwater writing slates, cut it into an arrow-shape geometry, and then machined a set of slots and holes—configured just so—that made the arrow easy to place on the dive line, but difficult for it to accidentally fall off. In recognition of his efforts, these commercial products have been dubbed the Wilson Line Arrow.

Many divers, and other extreme adventurers, seem to pursue their activities in order to accrue a lifetime achievement list. Not so with Forrest Wilson. Instead, Forrest goes cave diving simply for the love of
exploration. This attitude and this outlook has taken him to numerous fascinating locales, and to many places on the forefront of human knowledge.

Never one to sit on his laurels, Forrest—now in his seventies—continues to operate at the leading edge of American cave diving. For instance, Forrest and his friends are now exploring what has become the longest underwater cavern in the cave-rich state of Alabama. It is not a stretch to say that, since the passing of Sheck Exley, Forrest Wilson has become the Senior Statesman of the American cave diving community.

An entertaining speaker with a great sense of humor, Forrest Wilson often enthralls audiences with tales of wonder from his decades of adventure, both underground and underwater.

**Campground Party**

Wednesday evening, Campground

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**Convention Rookies:**

Our social events on Monday and Friday include dinner. Not Wednesday. Eat before you come to the campground party! There are a lot of great restaurants in Ely - go explore.

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Many things are legal in Nevada that would make the rest of the country cringe. Most of the state is wide open wilderness. Several forms of “adult” entertainment are completely legal... and there is no closing hour.

So break out your repressed Burning Man and join us at the 75th Anniversary Convention Campground Party.

As you might suspect, Nevada’s annual Burning Man festival draws a fair number of NSS cavers. One prominent caver camp for several years has been the Hibernaculum - a space dedicated to the ethics (and free will) of most cavers. This encampment will make a special appearance at the NSS Convention this summer - just down the path from the loud camping area.

Cavers are invited to dress in their own version of playa attire for the evening and we’ll try to find some equally irreverent prizes for best costume. Please, however, keep in mind that this is a family event. Cover up anything you wouldn’t show to an 8-year-old!

**On Stage: Rose’s Pawn Shop!**

It may come as a surprise to hear the strains of Appalachian and Americana music channeled through five guys from Los Angeles, California, but heartache, loss and regret have always been the cornerstones of great music, and Los Angeles has more than its share. In a town better known for porn stars and face lifts, anything as authentic and heartfelt as Rose’s Pawn Shop is a pleasant surprise.

Singer/songwriter Paul Givant grew up on the same disparate array of popular musical styles as any other late 20th century kid. In that mishmash of Rock, Punk, Country, Pop, and Rap, it was American Folk and Bluegrass that rooted deepest in Paul, transforming him and his songs. Having made the rounds in various rock bands since early high school, Paul decided it was time to take his growing batch of new folk-oriented songs and create a band that could deliver this material the way he imagined it sounding.

As so many fortunate events have unfolded, it was through a series of chance meetings, twists of fate, and a little help from Craigslist, that Paul met kindred spirits in Stephen Andrews, John Kraus, Tim Weed and Christian Hogan. Together they began building the music and the band that would soon become Rose’s Pawn Shop. They combined, in their collective musical melting pot, the old style American sounds of Woody Guthrie, Bill Monroe, and Hank Williams with a higher energy approach more reminiscent of modern Alt-Rock, all with a deeply melodic songwriting sensibility. The goal was to create a sound that was unique, yet imbued with a sense of familiarity.

The final ingredient was added one fateful day when Paul’s scorned ex-girlfriend/former band-mate, Rose, in an act of revenge, stole the band’s gear and instruments from their practice space and brought it down to the local pawn shop. Priceless! The match was lit... and Rose’s Pawn Shop was born!

In 2010, the near-current line-up of the band recorded the album “Dancing on the Gallows,” and the band began hitting the road. Once the final line-up was locked in, they began touring the United States more consistently and have ever since. On any given night, you could find Rose’s Pawn Shop playing the Georgia Theatre in Athens, busking the streets of Jackson Square in New Orleans, opening for Jack White and The Raconteurs at the Henry Fonda Theatre in Los Angeles, ripping the walls off the club in their month-long residence at the Parkside Lounge in New York City, or hitting the main stages of prestigious festivals such as FloydFest in Virginia and Wakarusa in Arkansas. The band is out there, growing their music, igniting their passion, and converting an ever-increasing congregation of fans.
With an arsenal of guitars, banjo, thumping upright bass, fiddle, and drums delivering neo-classical-sounding melodies and lyrics, their sound is a wholesome mishmash of creek mud, rusty nails and your mom's cookin'. It's sincere, straight-forward and sexy as hell, effortlessly combining such disparate musical styles as rock, country, bluegrass, and punk to create an incomprehensibly smooth and accessible sound for true believers and skeptics alike.

They confront traditional country music themes of loss, lamentation, and redemption, with a couple of drinking songs for good measure. Sure, they're borrowing pages from the books of Hank Williams, Bill Monroe, and Johnny Cash, but Rose's Pawn Shop takes those pages, tears them up and sets them on fire with three and four-part vocal harmonies and lyrics that'll break your heart.

Something happens when you hear these songs. No matter how low you've sunk, something in the music finds you. It picks you up and carries you home.

Rose’s Pawn Shop recently released their newest album, Gravity Well under the production talents of Ted Hutt (Old Crow Medicine Show, Gaslight Anthem, Dropkick Murphy's). The album has received great critical and fan acclaim and the band is currently on tour in support of that album.
Thursday

Luminary Series III
Donald G. Davis (NSS 4956) (HM-LB-FE)

“Caving and Science: An Hour with Donald Davis”

Thursday 1:00, Multipurpose Room

Donald G. Davis is a well-known authority on certain aspects of speleogenesis even though he does not have any fancy advanced degrees in the field. Instead, Donald developed his insights by reading, by careful observations while exploring, and by independent thinking while comparing what was similar and different about a wide variety of caves. Early on in his caving career, Davis felt that the various theories of speleogenesis coming out of researchers working in eastern United States caves did not seem to explain all of the things that Donald was seeing out west in, for example, the caves on Marble Mountain. And, the formation mechanisms germane to some special western caves turned out to be fascinating indeed.

For instance, back in 1978, Dave Jagnow offered his belief that sulfuric acid was basic to the creation of certain caves located in the High Guads. Dave went on to postulate that pyrite oxidation was the main source of the requisite acid. But, Donald worried that such oxidation would produce only an inadequate amount of the corrosive chemical. Then, while poking around in Cottonwood Cave, Davis observed deposits of elemental sulfur. This discovery, coupled with Stephen Egemeier’s suggestion that hydrogen sulfide was the major source, crystallized a model in Donald’s mind. Pulling these complementary notions together, Donald wrote up a coherent, unified theory describing the formation of caves such as Carlsbad and had it published in the NSS Bulletin.

Donald Davis was on the team that performed the first scientific reconnaissance expedition in Lechuguilla Cave in 1986. Donald, in the presence of technical experts that included Harvey DuChene, Carol Hill, and Michael Queen went back to the Rift. Davis estimated that the wind was at least 10 times stronger than he had experienced in nearby Virgin Cave. And, because Virgin had been surveyed out to about three miles, Donald predicted that Lechuguilla might eventually be extended to a length of 30 miles—in retrospect, an almost comical underestimate.

A self-described eccentric, Donald Davis has led an interesting, and a somewhat nomadic life. His father was a schoolteacher and, as such, moved the family around when Donald was young. Davis went to school in the Colorado communities of Las Animas, Fort Collins, and Fairplay as a youth. He attended college at Colorado A&M (later CSU) where he was introduced to serious caving through the A&M Hikers Club. As a college sophomore in 1957, he found himself on his first wild cave trip to Table Mountain Cave in southern Wyoming, where he successfully negotiated the entrance pit using prusik knots.

From 1958 onward, Donald did original work and found virgin passage in Spanish Cave high on Marble Mountain, Colorado. He was introduced to Fort Stanton Cave on the way to the 1960 NSS Convention in Carlsbad and continues his interest in Fort Stanton to the present day. At the time, attending the 1960 Convention was a goal for Donald because the event organizers promised off-trail trips in world-famous Carlsbad Caverns. These were the caves that really hooked him on exploration, history, and cave science.

Davis has worked as a beekeeper, a library aid, an importer for the British Premier carbide lamp, and as a seasonal naturalist in Badlands, in Big Bend, and in Carlsbad National Parks. Tossing together his meager savings from some of these assorted endeavors, Donald paid $3,310 for a modest tract in Rulison, Colorado—where he summered for the next three decades. Along the way, Donald made sustained, original, and lasting contributions to caving, to cave science, to speleological history, and to the NSS. He has participated in exploration, survey, and scientific and historical understanding of caves in Colorado, New Mexico, Arizona, Utah, California, South Dakota, Wyoming, Montana, Washington, Texas, and Alaska. He has been a leading caver in important discoveries in Groaning and associated Colorado caves, in Caves of the Winds and nearby caves, in Lilburn Cave, in the Grand Canyon backcountry, and in the Scapegoat Wilderness in Montana. Donald has racked up tens of miles of virgin passage, some in places where long caves are not the norm.

Throughout Donald Davis’ caving career, a dominant thread has been experiencing and promoting the unity of exploration and science. He views speleology as among the few remaining disciplines where individuals not funded by institutions can still make actual geographic discoveries—and contribute to their analysis and their understanding. Davis has enjoyed an abundance of speleological rewards, and has had the privilege of sharing them with a host of unique and remarkable people. And,
Special Events: Thursday

at age 78, Donald Davis is still healthy—and still actively caving.

Use of Walls Cave Mapping Software
Thursday morning

We will cover basic and advanced aspects of Walls, including data entry; setting up your project tree; setting the geographical reference; loop closure analysis and blunder detection; transitioning from a dry (clinometer) to a dive (depth gauge) survey; weighting individual surveys based on assumed accuracy; conflicts created by using too many fixed GPS locations; best practices in managing large cave systems; exporting shapefiles; and exporting SVG files for round-tripping. Participants should bring laptops running Windows and any data they have to enter.

Drawing Maps with Adobe Illustrator
Thursday afternoon

This workshop will cover setting up the AI file by importing a line plot; the use of drawing tools such as symbols; brushes and swatches; round-tripping the drawing to adjust with new survey data; and saving as a PDF with option to turn on and off survey lines. Participants should bring a laptop with AI if possible. Trial version can be downloaded.

Using Group Lineament Analysis
Thursday morning and afternoon

Lineament analysis, which consists of highlighting and analyzing straight lines in geo-images, is a powerful and readily available tool that can help increase the chance of finding caves. In the first session we will use it as a group to analyze a nearby limestone ridge for promising areas, and in the second session we will check those areas indicated and use thermal imaging to further discriminate which of those leads may be promising.

Thursday Evening Salon Awards Show
(Photo Salon)
Central Theater

The Thursday evening program provides a venue to celebrate art and caves. Each of the NSS Salons displays photos of their top winners. The Salon Awards Show includes the Ballad Salon winner and runner-up songs, the Multimedia Salon winner in full, excerpts from Video Salon Accepted for Show entries, and is the only time Photo Salon images are presented during the convention, enhanced by music.

The 5:30 PM Salon Awards Show “Dress Rehearsal” is for those who prefer their cave art in a quiet venue. It contains the same elements as the regular show, without awards announcements and salon chair presentations. It should run about 90 minutes.

The 7:30 PM Salon Awards Show is for everyone who likes to see the salon chairs present the winning artists with their awards (and for winning artists who want to get their awards!). It runs about 120 minutes, without an intermission.

Terminal Siphons

The ever-popular caver band, the Terminal Siphons, will play in the Campground immediately following the Photo Salon.
Special Events: Friday

Friday

The Future of Cave and Karst Science & Exploration

Friday morning

Where will cave exploration go in the next 75 years? Dr. Penny Boston will explore this topic in the "Future of Caving" session. A long-time NSS member, Dr. Boston was recently appointed as NASA’s Director of Astrobiology at the Ames Research Center in California. Her specialties include the study of life in extreme environments.

Since the 1960s, researchers, examining low resolution imagery, have speculated about the presence of caves on the Moon and Mars. In 2007, researchers confirmed the first cave-like features on the Red Planet. To date, planetary scientists have identified more than 200 lunar and over 2,000 Martian cave-like features. The occurrence of caves (in either host rock or ice) on other planetary bodies in our solar system is reasonable.

Extraterrestrial caves will be high-priority targets for future robotic and human missions. Accurate identification and selection of candidate caves will be desirable for the establishment of astronaut shelters (temporary or permanent) on both the Moon and Mars. Martian caves may provide access to the deep subsurface where evidence of life is most likely to be preserved (provided life evolved on Mars), as well as significant water ice deposits for human consumption and for potentially generating hydrogen fuel to return humans to Earth.

Speleology for Cavers (class)

All day Friday

Speleology for Cavers is a one-day course that will be offered on Friday, July 22. Come learn the difference between strike and dip, vadose and phreatic, and the birds and the bats. Bring home with you the geologic reason that there are two parallel passages in Sinnett’s Big Room, the meaning to cavers of Bogli’s mixing corrosion, and the difference between the lifestyles of Riparia riparia and Perimyotis subflavus. Experts in Speleology will lecture on Geology, Geochemistry, Karst Hydrology, Biology, and Paleontology. The course will go the full day, costs $45, and includes extensive printed course notes and lunch. Registration is limited to 35 people.

Friday Morning Salon Critique Sessions

Friday morning in the Salon areas

Most of the Salons have ‘critique’ sessions on Friday morning during which the artists, interested observers, and judges talk about the entries and winners, judging criteria, and how judging worked. If you wish to learn more about approaches and technical details, a favorite artist’s or musician’s ideas, or how judging was done for a particular salon, please consider taking the time to attend a salon critique session.

Awards Banquet

Friday evening in the Big Campground Tent

This is the final big event of the 2016 NSS Convention. Join in the Big Campground Tent for food, friends, and fellowship. The NSS awards ceremony will follow dinner.
Local Attractions

The Convention Guidebook contains information about many of the non-caving attraction in and around Ely. These include:

- Lehman Caves National Monument
- Ward Charcoal Ovens
- Baker Archaeological Site
- Petroglyphs and Pictographs
- Nevada Northern Railroad and Museum
- White Pine County Public Museum
- Garnet Hill
- Cave Lake State Park
- Wheeler Peak Trail
- Wheeler Peak Scenic Drive

There are other attractions that were not included in the Guidebook due to space limitations. These are described here.

Nevada Northern Railway Walking Tour

You can walk back to a time when the iron horse ruled the rails. Today, the Nevada Northern Railway (NNRy) is one of the last of its kind – the sole survivor from a grand era of railroading in the Silver State. Now a National Historic Landmark, it is America’s best preserved short-line railroad and most complete rail facility still in existence.

The Nevada Northern Railway is a living, breathing, operating historic railroad. Sometimes it’s gritty, sometimes it’s dirty, and sometimes it smells of coal smoke, creosote and sweat. Locomotives whistle off, cars clang as they are coupled together and wheels squeal as the locomotive is turned on the wye. When it comes to American Railroad Heritage, this is as real as it gets.

Begin your walking tour at the main depot at the end of 11th Street. When you register at the ticket window you will be given the Walking Tour Passport. It points out highlights of the history that is in the yard.

As you step out of the station and onto the train platform take a moment to put yourself back 100 years. Think about what it would be like if you were one of the recent immigrants to Central Nevada.

Looking to the left you see the Freighthouse. This was a beehive of activity. It was the place where merchants sent their wagons to pick up wares. Think of it as the 1910 version of Costco. Beyond that, down by the Enginehouse you see the Railroad’s original storehouse.

Realistically, Ely was just a cog in the big picture of America’s Industrial Strength. The only thing that makes Ely and the Nevada Northern Railway unique is that it was passed over as this era came to an end since it was so remote. At first it was preserved by neglect. Now this treasure is preserved by conscious effort. So come, walk through history with us. Take a look around. This is exactly how it was.

Before you start your explorations, take a look at the historic logo of the Nevada Northern Railway. Prominent on the logo is the motto of the railroad—Safety First. There is a reason for the motto: railroading is dangerous. A moment’s inattention can cause serious injuries or death. At one time railroading was the most dangerous occupation in the country. You are welcome to explore what is the best-preserved, standard gauge, short line railroad left in America. As you explore the complex, please remember Safety First.

Admission to the NNRy Museum costs $8 and includes a self-guided yard tour. A guided tour of the yard and Enginehouse costs $14. Wear comfortable closed-toe shoes and clothing that doesn’t mind getting a little dirty. This is a real, working railway, so expect to see some oil, dirt, grease, and soot as you explore.

Hotel Nevada

When Sin City [Las Vegas] was just a dusty railroad stop, other Nevada towns were called “big” and “modern.” In Central Nevada, for example, there was the stately Mizpah Hotel in Tonopah, the plush Goldfield Hotel down the road and then the Hotel Nevada in Ely.

Opened in 1929 with ceremonies that included a U.S. Senator and the state’s only member in the House of Representatives, the Hotel Nevada was hailed as the tallest building in the state – all six stories of it. It was also Nevada’s first fireproof building. The hotel boasted an elevator and a private toilet in every room (both innovations in their day). Although Prohibition was the law of the land when it was opened, you could get an
Local Attractions

Dear guest:
Please be aware that because of the age of the historic building — built in 1929 — the hot and cold water flow may sometimes fluctuate without warning.

We hope this is a small inconvenience to pay for what we hope will be a memorable stay.

Thank you.

Ely Art Trail and Murals

Enjoy Ely’s eleven block outdoor Art Trail telling the story of our historic theme “Where the World Met and Became One.” See the map below.

One can follow the Art Trail starting with any mural or sculpture, but we suggest starting at the White Pine Public
Local Attractions

Museum with a tour of this worthwhile facility. Pick up a map of the Art Trail, and walk or drive this exciting journey. At the Museum, you will be able to enjoy the 4th of July Mural and read why the 4th has a huge celebration in Ely.

Continuing on the Art Trail, you will be led to over 20 outstanding art pieces and the signage will unveil our rich history. The Trail includes a sculpture park (be sure to walk the labyrinth), and tromp l’oeil, montage, abstract impressionism, historic interpretation, and architectural murals.

While on the path stop and experience Ely’s old fashioned soda fountain, tour the courthouse with its historic photographs, see the retro gas station, shop at our stores and community mercantile, and enjoy restaurants and historic gaming facilities.

This Art project was undertaken in 1999 by the Ely Renaissance Society, a Non-Profit group of volunteers who recognized the richness of Ely’s history and chose to tell its unique history through giant canvases of art and sculpture placed in an outdoor domain accessible to all. Prints and postcards of the murals, books of history, and art are sold to benefit the Ely Renaissance Society at Economy Drug, and the General Store at the Renaissance Village. The Garnet Mercantile showcases local artwork including painting, photography, pottery, and jewelry.

The lessons that formed a united community from a variety of ethnic backgrounds have become an ever visible story of accomplishment, pride, and hope. This effective project has had wide recognition within Nevada as well as globally with the 2004 Global Mural Conference hosted here. We invite you to become a participant on this unique Art Trail.

A recent addition to the Mural collection is one depicting Lehman Cave (see Lehman’s Illūminātiō below). Lehman Cave attracts tens of thousands of visitors to eastern Nevada yearly, a trend that began not long after their discovery in the late 1880s by Absalom Lehman. For over 60 years, Lehman Caves National Monument protected these underground wonders, with their unique geology and ecology. And today, they remain protected as part of Great Basin National Park.

Lehman’s Illūminātiō

When you pass by the Park Vue Motel (930 Aultman Street in downtown Ely), look to your right. The mural on the side of the Park Vue was created by Carolina Shrewsbury of the NSS Arts & Letters Section. The NSS received a $16,000 grant from the Great Basin Heritage Area Partnership to create and install the mural. The scene depicts the historic discovery and exploration of the Lehman Caves in Great Basin National Park. Discovered in the late 1880s by Absalom Lehman, the caves feature over 300 rare shield formations.

Ely Renaissance Village

The Ely Renaissance Society was founded in 1999 by a group of individuals with the vision of an attractive downtown area which would be representative of the art and culture belonging to the diverse group of people who had built and strengthened the small community through the years.

One venture was to purchase a piece of property made up of 12 narrow “shotgun” houses and a barn. These small houses have been made into unique museums depicting the turn of the century population of Ely. Re-enactments and living history presentations are held at the “Ely Renaissance Village” as well as many other yearly activities from Farmer’s Market to the Art/Wine Walk which celebrates local Nevada artists and their work.

The Village, located at 400 Ely Street, includes Asian House, English House, Slavic House, French House, Greek House, Italian House, Prospector Cabin, Spanish House, Village Barn, and General Store.

The Art Bank

The Art Bank is a Gallery and Cultural Center with a permanent art collection of painting, sculptures, and photos that depict the Great Basin area and White Pine County. These pieces represent art work that spans over 70 years and showcases the natural elements that people have used for generations to express life in the Great Basin.

Local artists’ work is also on display and for sale. Many of the local artists will be at the Grand Opening ready to show their work and explain their techniques. This is a great opportunity to meet and talk with the artists while you enjoy the atmosphere of the Art Among the Aspens.

Local craftsman Mark Caylor has did much of the restoration work transforming the old bank into a beautiful art gallery. Real aspen trees are mounted to the walls to give the impression of being able to walk among the trees to enjoy the art work.

The Art Bank is located at 399 Aultman Street in downtown Ely.

Native American Crafts
The Ely Art Bank and neighboring Garnet Mercantile are sponsoring a Native American Art Exhibit during the Convention. A display of traditional and ceremonial Tribal regalia and attire will be featured. Plus there will be an exhibit for show and sale. The show will feature handcrafted Shoshone beaded items made of deerskin, Traditional Pueblo pottery, One-of-a-kind copper & sterling silver Indian Jewelry and Traditional Native crafts. There will be Native jeweler on site who specializes in jewelry and beadwork repair. Bring your watches for a fresh battery installation.

Convention attendees are cordially and specifically invited to attend. Admission to the Native Exhibit is free.

The Tribal exhibit is “right next door” to the exhibit of historical Lehman Cave photos in the Art Bank.

Ms. Squaw will be waiting and anticipating her gifting to all NSS members: a token handcrafted item in gratitude for NSS efforts to protect the Sacred Caves. Her ancestral tribal lands include Lehman Caves and the Entrance to Another World. Her childhood Traditional education included an introduction to and knowledge of the Sacred Caves.

**Economy Drug Soda Fountain**

Economy Drug, 696 Aultman Street, is an operating pharmacy that also includes an old fashion soda fountain. They serve food and a variety of confections. It’s worth a visit to see how life was before the fast food chains took over.

**Historic Lehman Cave Photo Exhibit**

Not all cave exploration takes place underground.

Several years ago while, conducting research for the NSS 75th anniversary convention, an obscure reference was found in the digital card catalog at the Library of Congress in Washington D.C. The catalog record mentioned an old envelope of photographs taken in Lehman Caves in 1928 by a John Walker of Ely, Nevada. No digital scans or descriptions of the images were available which suggested the envelope had probably not been opened in almost a century. No other records could be found to describe the collection.

Bob Hoke and Dave West of the DC Grotto were tasked with visiting the library where they examined the contents of the envelope. The library staff graciously allowed them to take low resolution pictures of the black and white photographs which were then shared with Great Basin National Park. Upon examination by the park’s archive staff, we were all thrilled to learn that the park had no knowledge of the images in the envelope. They had been lost for decades.

Merilee Proffitt from Diablo Grotto then started to research the photographer. She learned that John Walker, operated the Walker Electric Studio in Ely, Nevada from 1923 to 1928. After his death in late 1928, his wife Mary S. Walker continued to operate the studio, and worked as a photographer in Ely and later in Churchill County, Nevada.

We knew that Walker had shot several photographs in another cave near Ely, but the collection that was discovered at the Library of Congress was the most complete record of the cave from that era.

Members of the NSS tracked down the grandson of John Walker. He’s currently living near Reno, Nevada and was excited to learn of our research. Sadly, he believes the original negatives for the photographs were likely destroyed in a house fire many years ago. This means that the photographs in the Library of Congress are the only surviving images of the cave from shortly after its designation as a national monument by proclamation from President Warren G. Harding in 1922.

In mid-2015, the Great Basin National Park commissioned the Library of Congress for a set of high-resolution scans of these historic images.

The Great Basin National Heritage Area was chartered by the US Congress as an agency dedicated to preserving the “lived in landscape” that is unique to the inter-mountain region of the western United States. Ely, Nevada and Great Basin National Park are located within the heritage area.

By decree of Congress, heritage areas are a combination of natural, cultural, historic and recreational resources that have shaped a nationally distinctive landscape. The deep history of mining and ranching in eastern Nevada, coupled with the diverse ethnic influence, now define this region.

Last December, the Great Basin Heritage Area Partnership awarded a grant to the Western Cave Conservancy and the NSS to cover expenses for Dave Bunnell to travel to the park and re-shoot the historic images frame-for-frame.

This summer, the resulting images from Bunnell’s work will be enlarged along with the corresponding images from 1928. For the first time in the history of the national park, cave scientists and land managers may view the effects of nearly 100 years of visitation to this pristine cave.

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Ely, Nevada
Local Attractions

The “Art Bank” in downtown Ely will feature a gallery show of these images on Saturday, July 16 - the opening weekend of our convention this summer. The free exhibit will be open to cavers and the public. We hope you can join us.

McGill

In 1910, McGill was a company town of the Nevada Consolidated Copper Company that is located on U.S. Highway 93 about 12 miles north of Ely. It was young and progressive, with one dusty main business street with raised wooden sidewalks. The town was sectioned off with the elite living in what was referred to as the “Charmed Circle.” This was the only section with houses with bathrooms. Other sections were the Upper Town, Middle town, Greek Town, Austrian Town, and Jap Town. Single people lived in tarpaper cabins in Lower Town. The general manager of the company lived in a two-story home in Charmed Circle that became one of the most attractive homes in Nevada. Tall black wrought-iron gates mark the entranceway leading up broad steps to a porch supported by red brick pillars. The home even provided rooms for servants. Now, however, the house stands silent, neglected, unoccupied, and represents fond memories of the elegant life in the “Charmed Circle” of a western mining camp.

McGill grew from a ranching community and became the smelting center for White Pine County’s copper mines. The ranch was first established in 1872 and soon had extensive grain fields. Neil McGill and his partner, William Lyons, purchased the ranch in 1886 and soon the ranch was one of the most prosperous in the county. A post office opened in 1891. Five years later, William McGill formed a partnership with Jewett Adams, a former Nevada Governor. The partnership created one of the largest sheep and cattle empires in Nevada. The Adams-McGill Corporation continued for many years, but tragedy struck on June 18, 1920 when Adams died in San Francisco. McGill continued to run the corporation until his death in April 1923. The empire deteriorated rapidly without McGill’s guidance, and in 1930 the corporation was liquidated.

While the McGill-Adams partnership was important to the town’s development, the real force was the McGill smelter. Built in 1908, the $10 million smelter was a joint venture of Cumberland and Ely Mining and the Nevada Consolidated Copper Companies. By 1909, McGill employed 2,200 men. The Steptoe Valley smelting and Mining Company, operator of the smelter, built large and modern facilities for its employees and to serve as the official company headquarters. The company also opened several businesses, and McGill became a company town. McGill’s population peaked at around 3,000 during the late 1920s and early 1930s. The population declined after the Depression, and by the time the smelter closed in the late 1970s only about 1,000 residents were left. Today, the plant has been dismantled. The tall smokestack was taken down in 1993. The town still has about 1,000 residents. Interesting buildings exist and a visit is well worth the time.

Ely Elk Viewing Area

This area offers motorists a chance to stop and see Nevada’s largest native animal, the Rocky Mountain elk. The biggest herd of elk in Nevada can be observed feeding during the fall and spring seasons, both along the paved highway south of Ely and at the viewing area pull-out. Peak viewing times are October through November and March through April, with elk sometimes also seen in mid-winter. Fall is the rutting season, when mature elk bulls join does, calves, and young bulls.

Directions: From Ely, drive south on U.S. Highway 6/50/93. Elk can be seen on either side of the highway, starting about 6 miles from the town. Elk viewing signs along the highway designate the best viewing areas.

A mile-long corridor has been dedicated to allow visitors a chance to stop and view elk right from their vehicles. Hawks, ravens, and eagles perch on poles along the highway, and golden eagles are common year-round. Other animals commonly seen in the area include black-tailed jackrabbits, badgers, and chipmunks.

Elks usually feed at dawn and dusk. Elks are large animals—adults weigh from 450 to 1,000 pounds and stand 5 to 6 feet high. Bulls have large, swept-back antlers that can be up to 5 feet long. Visitors are cautioned not to approach them. Motorists should be particularly cautious at night, because elk sometimes bed down on warm highway pavement. Wildlife viewers share the area with hunters in the fall.

Silver State Classic Challenge Road Race

The Silver State Classic Challenge Road Race is called the fastest road race in the world. It is an authorized Open Road Racing event that is run on a 90 mile stretch of State Route 318 from Lund (about 40 miles south of Ely) to Hiko. Route 318 is a major route between Ely and Las Vegas and is closed for the race. The event has been run since 1988, and was the venue for the highest speed achieved on a public highway, when Charles “Chuck” Shafer and Gary Bockman averaged 207.7801 mph in
May 2000 in a Chrysler LeBaron ARCA race car. Although high-speed race cars receive much of the publicity, the majority of participants take part in mainstream street cars at average speeds ranging from 95 to 150 mph. These cars run the gamut from sports cars such as Corvettes and Mustangs to sedans such as Infiniti G35s, Mercedes-Benz wagons, and even Saturns.

Unfortunately, you won’t be able to participate in a formal race during the Convention, but you can still drive the route and imagine what it would be like during the Challenge. The posted speed limit on most of Route 318 is 70 mph.

**Ghost Towns**

There are numerous ghost (and almost ghost) towns in the region around Ely. The Convention Guidebook contains a brief list of ghost towns in White Pine County, but without much detail. The map below shows the general locations of many of the towns and the descriptive text is keyed to the map locations.

When you visit any of the sites please treat them with respect and leave them exactly as you found them. Don’t take artifacts and don’t disturb any structures.

1. **Aurum** (1871) - Aurum developed near gold mines in Silver Canyon. The town had two boarding houses, saloons, blacksmith shop, store and a ten-stamp mill. The Aurum Post Office was located in Spring Valley below and south of the mining camp of the same name. The Post Office ceased operation in 1938. Mill ruins, building foundations and a cemetery remain. (57 miles from Ely. 2WD 39 miles north of Ely on U.S. 93 to the Pony Express Station site, east on Nevada 2 for 14.8 miles to stone house. Exit Nevada 2 and head south for 3.5 miles. Exit right and follow this rough road for 3 miles to Aurum.

2. **Belmont Mill** (1868) - Well preserved mill site. This site is a ghost town explorer’s dreamland. Judging by the ruins left to see, this fun little camp must have given the White Pine Mining District its last breath of life. Silver-lead ore from this mine was processed at this mill. (55 miles from Ely. 2WD 5 miles west of Hamilton on graded dirt road). (See the Belmont Mill Road trip later in this section).

3. **Black Horse** (1905) - Gold was discovered while searching for a black horse that had wandered off. Tents and crude wooden shacks and a mill constituted this camp. Remains of cellars and a graveyard can be seen. (34 miles southeast from Ely. 4WD 2 miles north of US 50).

4. **Blaine** (1878) - Governor Denver Dickerson developed the short-lived Blaine silver mine with a peak population of 200. Blaine had saloons, an assay office, boarding house, blacksmith shop, and a stage to Ely. Some activity was taking place here in the late 1930s. (35 miles from Ely. 0.75 mile north of McGill and then 21 miles northwest).

5. **Buck Station** (1869) - One of several stations established along the Central Pacific Railroad. Buck Station became the jumping-off point to the White Pine silver mines 110 miles south. Stagecoach travelers could eat and rest here. Long segments of the old Elko-Hamilton stage road can be seen stretching north to south from this site. (51 miles west of Ely on U.S 50 and then 21 miles north).

6. **Butte Station** (1860) - A station built by the Pony Express. Only the foundation remains. (75 miles from Ely. About 22 miles west of Cherry Creek by way of Egan Canyon).

7. **Cherry Creek** (1859) - Named for the wild cherry trees that grow nearby this was both a gold and silver mining town. Over 6000 people called Cherry Creek home during its peak and was the largest community in White Pine County at that time. There is still some mining activity here today and the town still has a few residents. (55 miles from Ely. 2WD US93 45 miles north of Ely and then at the end of SR489 to the west).

8. **Eberhardt** (1869) - Part of the rich White Pine District this town boasted over 200 people, a post office, saloons, carpenter shop, wagon shop and a blacksmith. Only rock
Local Attractions

ruins of mills and foundations remain. (50 miles from Ely, 4WD 5 miles southeast of Hamilton).

9 Ely (1878) - It was first called Murry Creek Station. Onetime stage stop in Steptoe Valley at Murry Creek. Ely became the second White Pine County seat in 1885 when the courthouse burned in Hamilton. The railroad was completed in 1907 and the population grew to over 5,000. The site of the most productive Copper district in Nevada history. Ely is currently the largest town in White Pine County.

10 Hamilton (1868) - This was part of the rich White Pine District and is currently one of the most noted ghost towns in the west. With over 10,000 people participating in the silver rush, Hamilton was very large in size. In the mines near Hamilton, silver was found in such quantities as to pay most of the Civil War debt. The town was first called Cave City because the early residents lived in caves and dugouts yet after its large growth the town did not survive the devastation of fire. (47 miles from Ely. 2WD 36 miles west of Ely on US50 and then 11 miles south on a graded dirt road).

11 Lane City (1869) - This site was the original settlement for the Ely area. Originally known as Mineral City and Robinson Canyon. The site boasted a 10-stamp mill, mercantile store, a post office, express office, six saloons, hotels, restaurants, livery stables, four boarding houses, a blacksmith shop, and a population of about 600 people. (2WD 3 miles northwest of Ely on north side of US50).

12 Lund/Preston (1898) - The Mormons settled this community and have consistently maintained a population of about 100. Old buildings still remain. (35 miles from Ely. 2WD SR318)

13 McGill (1906) - Originally a company town and site of the Nevada Consolidated Copper (and later Kennecott) reduction plant. Still inhabited today yet numerous vestiges from the past are apparent throughout including the McGill Drugstore Museum. (US93, 12 miles north of Ely).

14 Minerva (1917) - Minerva was started by the Minerva Tungsten Corp. during WWI and sporadically existed until the 1950s. This camp had several cabins and about 60 people in 1937. A post office and school known as Shoshone were located about 1 1/2 miles north of Minerva. Part of a mill and remains of cabins can be seen. (52 miles from Ely. 2WD 3 miles south on US93 at US50 junction and 17 miles southeast on SR894).

15 Monte Cristo (1865) - The first camp in the White Pine Mining District. Established on the west slope of Mt. Hamilton in 1865 with a total population of about 150.

Rock walls and part of the mill stack remain. (4WD 51 miles west of Ely on US50 and then 15 miles south/southeast).


17 Osceola (1872) - The longest lived placer gold mining camp in Nevada with one gold nugget found that valued $6000 at the time. With over 400 miners working the claims, Osceola built a canal from the other side of the mountain range to bring water to the camp. Numerous ruins of buildings and mining activity remain. (40 miles from Ely. 2WD US50 8 miles east of the junction with US93 and then 3.75 miles east).

18 Piermont (1869) - First discoveries made in 1869 and a mill built. Mines went bust in 1873. Little done until 1920. Soon, more than 100 men were employed. Active until 1936. Total production was $2.5 million. Many ruins remain. (50 miles from Ely. 30.7 miles north of US93 on NV893 then west at the Piermont Creek sign 3.5 miles).

19 Pinto Creek Station (1868) - Served travelers between Austin and Hamilton until stage road was rerouted to the south of the site in the early 1870s. (67 miles from Ely. 2.5 miles northwest of the Newark Valley road 5 miles north of its junction with US50).

20 Ruby Hill (or Rubyville) (1871) - A small short-lived camp with a mill and about 150 people. A few log ruins remain. (36 miles from Ely. 17 miles north of McGill on US93 and 7 miles east from there).

21 Ruth (1903) - Named for Ruth McDonald, only daughter of D.C. (Dan) McDonald, locator of the original Ruth Mine that touched off the Ely area copper boom. Old Ruth lies beneath the huge tailing pile. All the buildings were moved a short distance to New Ruth around 1955 when mining operations were extended. (7 miles from Ely. SR485 2 miles southwest of its junction with US50 5 miles northwest of Ely).

22 Schellbourne (Fort) (1859)- It has a long history of Indian fighting, and first served as a Pony Express Station, later as a fort for the US troops to protect the people coming cross-country to Virginia City. Silver ore was eventually discovered in the mountains and a camp developed with over 500 people. When the ore ran out many buildings were moved to Cherry Creek. Schellbourne now serves as the headquarters for a ranch. (Private Property).

23 Seligman (1880s) - Part of the rich White Pine District, this camp of 200 people had a blacksmith shop, a Wells Fargo office, a boarding house, assay office, a
Local Attractions

24 Siegel/Centerville (1870) - A silver camp with a peak population of 75 people. A few stone ruins remain. (4WD 39 miles north of Ely on U.S. 93 to the Pony Express Station site, east on Nevada 2 to junction of Spring Valley Road. 3 miles south on Spring Valley Road and then 4 miles west.

25 Stone House (1860) - Built as a ranch and stage stop this site serviced travelers for 30 years. Abandoned now, yet extensive structure remains. (54 miles from Ely. 39 miles north of Ely on U.S. 93 to the Pony Express Station site, east on Nevada 2 for 14.8 miles.

26 Taylor (1873) - There was activity in Taylor as early as 1872. Taylor reached its peak in 1885 when the population increased to 1,500 and business included three general stores, four restaurants, three boarding houses, a drug store, and a doctor. By the end of the year, a brewery, an opera house, and a school had been built. Taylor was a peaceful town with very little trouble. Taylor’s free milling silver began to run out in 1885. A revival started in 1918 lasting until this day. A few businesses have reopened. Only two buildings remain from old Taylor. (19 miles from Ely. 2WD US50 14 miles south of Ely and then 4 1/2 miles east on graded dirt road.

27 Ward Mining District (1872) - The State Park holds six well preserved charcoal kilns. The kilns were built by Italian artisans to burn Pinion pine wood that would produce batches of charcoal. The charcoal was then used to smelter the silver ore. The old townsite of Ward is located about 5 miles to the north of the kilns. This successful silver mine was a lawless mining camp with over 2,000 citizens at its peak. This area has seen mining off and on as methods have improved. (26 miles from Ely. 2WD State Park south of Ely 11 miles on US50 and then 5 miles southwest on a graded dirt road).

Belmont Mill Ghost Town Self-Guided Road Trip

Matt Bowers has prepared a detailed 7-page road log for a driving trip from Ely to the Belmont Mill Ghost town, one of the best preserved sites in Nevada. The round trip is 110 miles and takes about four hours including stops. The roads are suitable for regular passenger cars. Note: There are no services beyond Ely so gas up in advance!

Copies of the printed road log is available at Registration.
Ely Businesses

Ely Businesses

The following is a reasonably complete list of businesses and services in Ely that convention attendees are likely to need. If you need a business or service that isn’t listed, check with the registration desk and they may be able to point you in the right direction. All the addresses shown are in Ely unless otherwise noted.

This information was obtained from the White Pine County Tourism Board, the White Pine Chamber of Commerce, and several Internet sources. Some entries may be incorrect or obsolete.

Alcohol Sales
- Great Basin Inn & Quick Mart; 701 E Aultman St; 775-289-4468
- Sidhu Liquors; 1055 Aultman St; 775-289-3547
- Ridley’s Family Markets; 1689 Great Basin Blvd; 775-289-3444

Automotive
- Action Automotive Service Inc.; 135 High St; 775-289-3844
- Big 8 Full Service Tire Center; 1820 Aultman St; 775-289-6777
- C & B Auto Parts; 295 Great Basin Blvd; 775-289-8454
- Carney Bros Auto & Collision; 1125 Great Basin Blvd; 775-289-4886
- Cruise-In Car Wash & Auto Center; 1603 Aultman St; 775-289-6262
- D & S Repair; 1047 E Aultman St; 775-289-8662
- Dino’s Auto Repair; 190 Aultman St; 775-289-4444
- Ely Car Rental; 1077 E Aultman St; 775-289-3456
- Gale Oil & Tire; 807 E Aultman St; 775-289-3753
- KRM Auto Repair; 505 S Pioche Hwy; 775-289-3545
- NAPA Auto Parts; 1201 Great Basin Blvd; 775-289-8454
- Parts Plus of Ely; 295 Great Basin Blvd; 775-289-2500
- Precision Auto Repair; 808 E Aultman St; 775-289-5210
- Valley Motor Inc.; 802 Avenue E; 775-289-4855
- Van Camp Towing & Road Service; 1710 Avenue C; 775-289-2238
- W.S.E Auto Care Center; 600 S Industrial Way (Rte. 93 N); 775-289-3251

Banks
(There are ATM machines in many locations in Ely)
- Bank of America (ATM only); 1689 Great Basin Blvd
- First National Bank of Ely; 595 Aultman St; 775-289-4441
- Nevada Bank & Trust; 777 E Aultman St; 775-289-8868
- Washington Federal; 1689 Great Basin Blvd; 775-289-3910
- Wells Fargo (ATM only); 595 Aultman St

Bars & Lounges
- Club Rio; 735 Aultman St; 775-289-6979
- Liberty Club; 584 Aultman St; 775-289-8500
- Music Box; 2250 Aultman St; 775-289-2541
- Outpost Bar; 1001 E Aultman St; 775-289-4511
- Racks Bar & Grill; 753 Aultman St; 775-289-3131
- Shooter’s Lounge; 714 E Aultman St; 775-289-3200

Brothels
- Big 4 Ranch; 135 High St; 775-289-3174
- Stardust Ranch; 190 High St; 775-289-5352

Campgrounds (Commercial)
- Harry’s Wilderness Station RV Park; 58 N McGill Hwy (Rte. 93); 775-289-4900
- KOA RV Campground; 15936 S Highway 93; 775-289-3413
- Prospector RV Campground; 1501 E Aultman St; 775-289-8900
- Valley View RV Park; 40 N McGill Hwy (Rte. 93); 775-289-3303
- West End RV Park; 50 Aultman St; 775-289-2231

Campgrounds (Public)
- Cave Lake State Park; S of Ely about 10 miles on Highway 50/93.
- Cleve Creek (BLM); 12 miles north of Highway 6-50 in north Spring Valley. (no fees)
- Illipah Reservoir (BLM); 37 miles west of Ely on Highway 50. (no fees)
- Sacramento Pass Recreation Area (BLM); 48 miles east of Ely on Highway 50 (towards Great Basin NP)
- Ward Mountain Campground (USFS); From Ely, take Hwy 6 S towards Tonopah, 10 miles to Murray summit. Turn left just before the summit at the Forest Service sign for Ward Mountain Recreation Area and Campground. ($8/night)
Camping Supplies
Ridley's Family Markets; 1689 Great Basin Blvd; 775-289-3444
Sportsworld; 1500 Aultman St; 775-289-8886

Casinos
Hotel Nevada & Gambling Hall; 501 Aultman St; 775-289-6665
Jail House Motel & Casino; 211 5th St; 775-289-3033
Prospector Hotel and Gambling Hall; 1501 Aultman St; 775-289-8900
Ramada Ely; 805 Great Basin Blvd; 775-289-4884

Computer Supplies
Computa Cat Corner; 453 Aultman St; 775-289-7979

Dining
All Aboard Cafe & Inn; 220 11th St E; 775-289-3959
All American Pizzeria; 301 Aultman St; 775-289-3722
Arby's; 1693 Great Basin Blvd; 775-289-9110
Anderson's Deli; 1101 E Aultman St; 775-289-8844
Bakery Deli; 1689 Great Basin Blvd; 775-289-5333
Espresso Depot; 445 E 11th St; 775-289-2828
Evah's; 805 Great Basin Blvd; 775-289-4884
Happy Garden; 558 Aultman St; 775-289-3313
Jailhouse Cell Block Steak House; 211 5th St; 775-289-3033
La Fiesta Mexican Restaurant; 700 Avenue H; 775-289-4114
Margaritas Mexican Restaurant & Steakhouse; 1501 E Aultman St; 775-289-6296
McDonald's; 1695 Great Basin Blvd; 775-289-2272
Pizza Factory; 2060 Aultman St; 775-289-3739
Prospector Cafe; 1501 E Aultman St; 775-289-8900
Racks Bar & Grill; 753 Aultman St; 775-289-3131
Shepherd's; 945 N McGill Hwy (Rte. 93); 775-289-2200
Silver State Restaurant; 1204 Aultman St; 775-289-8866
Subway; 1690 Great Basin Blvd; 775-289-8226
The Cup; 566 Aultman St; 775-289-3713
Twin Wok Restaurant; 700 Park Ave (Avenue J); 775-289-3699

Food Stores
Anderson's Foodtown; 1101 E Aultman St; 775-289-8844
Food Mart; 1301 E Aultman St; 775-289-2383
Ridley's Family Markets; 1689 Great Basin Blvd; 775-289-3444
Sagebrush 66 Food Plaza; 1490 E Aultman St; 775-289-6688

Fuel
Chevron; 1301 E Aultman St; 775-289-2383
Conoco; 693 Great Basin Blvd; 775-289-9110
Shell; 1100 E Aultman St; 775-289-8783
Shell; 909 E Aultman St; 775-289-2601
Silver Sage Travel Center; 963 S Pioche Hwy; 775-289-6550
Texaco; 1490 E Aultman St; 775-289-6688

General Merchandise
All About Caring Thrift Shop; 1250 Aultman St; 775-289-9999
All About Thrift Shop; 2143 Aultman St; 775-289-9999
Andy's Western Shop; 501 11th St E; 775-289-2504
Creations (arts & crafts supplies); 742 Aultman St; 775-289-7999
Creative Baskets and Ceramics; 309 Aultman St; 775-289-3511
CTC Thrift Store; 1490 Aultman St; 775-289-3630
Family Dollar; 1400 Aultman St; 775-289-3585
Family Dollar; 1410 E Aultman St; 775-289-5345
Family Dollar; 1550 Great Basin Blvd; 775-289-3638
Flower Basket; 445 11th St E; 775-289-2828
Garnet Mercantile; 363 Aultman St; 775-289-4636
Just Stuff Thrift Store; 1458 Aultman St; 775-289-2211
Knit Knook & Gift Gamut; 1280 E Aultman St; 775-289-2116

Laundromats
Soak-N-Suds; 1625 Avenue F; 775-289-2292

Libraries
White Pine County Library; 950 Campton St; 775-293-6900
Ely Businesses

**Medical & Pharmacy**
- **Economy Drug**: 696 Aultman St; 775-289-4929
- **Ridley’s Clinic Pharmacy**: 6 Steptoe Cir (14th St E); 775-289-3420
- **Steptoe Drug Inc.**: 1689 Great Basin Blvd; 775-289-2671
- **William Bee Ririe Hospital**: 1500 Avenue H; 775-289-3001

**Miscellaneous**
- **Central Theatre** (movies); 145 15th St; 775-289-2202
- **Ely Bail Bonds**: 1665 Avenue F; 775-289-2245
- **Sunset Lanes Bowling**: 1240 E Aultman St; 775-289-8811
- **White Pine (Ely) Chamber of Commerce**: 636 Aultman St; 775-289-8877
- **White Pine County Tourism Board**: 150 Sixth St; 775-289-3720

**Motels**
- **Best Western**: 1101 Aultman St; 775-289-4529
- **Border Inn Casino**: Hwy 6 & 50 at the Nevada-Utah border, Baker, NV; 775-234-7300
- **Bristlecone Motel**: 700 Avenue I; 775-289-8838
- **Desert Motor Lodge**: 1425 Aultman St; 775-289-8885
- **El Rancho Motel-Ely**: 1400 Aultman St; 775-289-3644
- **Elk Ridge Motel**: 1550 High St; 775-289-2512
- **Four Sevens Motel**: 500 High St; 775-289-4747
- **Grand Central Motel**: 1498 Lyons Ave; 775-289-6868
- **Great Basin Inn & Quick Mart**: 701 E Aultman St; 775-289-4468
- **Hotel Nevada & Gambling Hall**: 501 Aultman St; 775-289-6665
- **Jail House Motel & Casino**: 211 5th St; 775-289-3033
- **La Quinta Inn & Suites Ely**: 1591 Great Basin Blvd; 775-289-8833
- **Motel 6**: 770 Avenue O; 775-289-6671
- **Park Vue Motel**: 930 Aultman St; 775-289-4497
- **Prospector Hotel & Casino**: 1501 E Aultman St; 775-289-8900
- **Ramada Ely**: 805 Great Basin Blvd; 775-289-4884
- **Rustic Inn Motel**: 1555 Aultman St; 775-549-5970
- **Town and Country Motel**: 710 Avenue G; 775-289-8224
- **White Pines Motel**: 1301 Aultman St; 775-289-4600

**Museums**
- **Ely Art Bank**: 399 Aultman St
- **Ely Renaissance Village**: Ely St & 3rd Ave
- **Nevada Northern Railway Museum**: 1100 Ave A; 775-289-2085
- **White Pine Public Museum** (home of Lilly the Cave Bear!); 2000 Aultman St; 775-289-4710

**Office Supplies & Services**
- **Graphics & Technology Center**: 766 Aultman St; 775-389-4600

**Personal Appearance**
- **A Cut Above**: 300 Clark St; 775-289-2122
- **A Touch of Class**: 648 Aultman St; 775-289-4141
- **Elysium Salon**: 705 Aultman St; 775-289-3201
- **Escape Salon**: 501 12th St E; 775-289-5222
- **Images Styling Salon**: 437 Aultman St; 775-289-3221
- **Stylized**: 441 Murry St; 775-289-6223
- **Teasers Hair Salon**: 1240 E Aultman St; 775-289-2898
- **The VIP Spa**: 153 2nd Ave; 775-289-3812

**Pet Boarding**
- **Groom Doggies**: 106 Mineral Dr (4th St); 775-289-3738
- **Wild West Grooming**: 822 E Aultman St; 775-289-9003

**Post Office and Shipping**
- **Goin’ Postal**: 705 Aultman St Ste 1; 775-293-4040
- **U.S. Post Office**: 2600 Bristlecone Ave.

**Religious**
- **Assembly of God Calvary**: 700 Avenue M; 775-289-9200
- **First Baptist Church**: 735 Avenue N; 775-289-8221
- **Grace Foursquare Church**: 1301 Avenue E; 775-289-4111
- **Immanuel Lutheran Church**: 975 Avenue K; 775-289-6353
- **Jehovah’s Witnesses**: 1650 Park Ave; 775-289-4646
- **LDS Church**: 900 Avenue E; 775-289-2987
- **St. Bartholomew’s Episcopal Church**: 209 7th St; 775-289-6208
- **United Methodist Church**: 890 Avenue M; 775-289-2174
Sunday Schedule

Sunday

Sunday During the Day

Geology Field Trip

Sunday, 7:00
Campground

The buses will leave promptly a 7:00 AM from the campground. Please wear appropriate footwear, no open-toed shoes. Water and box lunches will be provided on the bus. No hardhats, headlamps, or flashlights are needed for the trip. The buses will return around 5:30–6:00 PM.

Note: Tickets are required for the trip and it was sold out at the time the Program went to press. Check with Registration to see if tickets are available due to late cancellations.

Vendors Open on Sunday

Many of the Convention's vendors will open around noon on Sunday for your early shopping pleasure. Of course they will also be open on Monday through about noon on Friday. Vendors are located in the school.

Sunday Evening

Evening in the Campground

Sunday, 6:00–9:30
Campground

6:00 - 7:00 Ice Cream Social

6:00 - 7:30 Music by CW and Dr. Spitmore, the dynamic western, ragtime duo!


Every song comes with a story. Sometimes the song tells the story. CW Bayer's story-telling is so old-school it’s almost fashionable. Learning guitar during the folk scare of the mid-60s, he turned off the radio and television, retreating into a dangerous world of live music, street theater and traditional dance. His books on the evolution of mining-era music reflect these obsessions. Dr. Spitmore brings to the duo an impeccable attention to detail and tone borne of his many years as a performer of Baroque music. His favorite musical jug is the one that works. Regulars at Nevada's Genoa Cowboy Festival, the Ponderosa Saloon in Virginia City, Comma Coffee in Carson City... this performing duo is perfect for bankruptcies, wakes and foreclosures.

7:30 - 9:30 “Who Wants To Be A SpeleoMillionaire?”
Trivia Game Show

Prepared and hosted by Chris Anderson and Presented by the Silver Sage Grotto.

The SpeleoMillionaire game plays just like the TV show (except that we’re not giving away a million bucks!). One person plays at a time, facing 15 cave-related, multiple choice questions of increasing difficulty. Along the way they have three lifelines available to them, including “poll the audience” (which will be simulated by the software in lieu of actual polling), “phone a friend” (where the contestant can call anyone they want for help if their cell phone works), and “50/50” which eliminates two of the wrong answers. Players may stop at any time and keep what they’ve won up to that point, even if a question has already been revealed. On the way to the Million Dollar Question there are two “safety levels” which, once surpassed, guarantee they don’t walk away empty-handed, even if they get a question wrong.

When this program went to press the prizes hadn’t been determined, but negotiations with Apple, Tesla, and others were underway. Also, unlike the TV show, the software doesn’t have a way of letting the entire audience compete for who gets to sit in the “hot seat”
Monday Schedule

Monday Morning

Opening Ceremony
Monday, 8:30–9:00
Room 401

Please join us for a brief welcoming ceremony to kick off the convention. Society leaders will be joined by local community leaders to welcome Society members and guests to Ely and White Pine County.

Geology & Geography Session
Monday, 8:00–12:00
Multipurpose Room    Katie Schmid

This section will have talks about the geology and geography of caves and karst terrain.

08:00 Set-up

09:00 Integrating Conceptual and Geochemical Models in Cave Water Research (p. 86)
David Levy

09:20 Island Karst Update: Newly Documented Phenomena from Cat Island, Bahamas (p. 86)
Nancy Albury

09:40 The origin of Jewel Cave and its relationship to landscape-scale processes (p. 86)
Michael Wiles

10:20 Break

10:40 Structural and Lithological Influences on the Tony Grove Alpine Karst System, Bear River Range, North-Central Utah (p. 87)
Kirsten Bahr

11:00 Hydrogeologic Characterization of Karst Flow Systems in the Southeastern Uinta Mountains, Utah (p. 87)
Larry Spangler

11:20 Significance of Vadose Perching in Karst (p. 88)
Art Palmer

11:40 Flank Margin Caves of the Turks and Caicos Islands: Implications for Platform Geology (p. 88)
John Mylroie

Board of Governors Meeting (open)
Monday, 9:00–12:00
Room 401    Jean DeVries

The Board of Governors sets policy for the management of the Society. This opening meeting consists mainly of reports from the officers and committees. The newly elected vice presidents for next year will be introduced. The agenda will continue with other items of business until noon.

The meeting is open to all members. Take the opportunity to observe the board members in action and learn some of the details of society business. Members may be allowed to speak on subjects of interest to them at the direction of the President or at the request of a Board member.

Communication & Electronics Session
Monday, 9:00–12:00
Room 311    Sam Rowe and Brian Pease

The Communications & Electronics Session covers all applications of electronics in caving including surveying, photography, wired and wireless communications, lighting, data logging, and radio location. Amateur Ham radio may also be used in pursuit of these goals. Informal talks and demonstrations will follow the formal presentations. When possible, a trip to a real cave to have a hands-on experience will be held.

9:00 Sign in and introductions

9:10 Navigation and Communications Under and Through the Ice in Antarctica (p. 78)
Brian Pease

9:30 Drilling a Cave Radio Location (p. 79)
Paul Jorgenson

9:50 Laser Stimulated Fluorescence (p. 79)
Paul Jorgenson

10:10 An Update on the $300 Cave LIDAR (p. 79)
Bob Buecher

10:30 High Accuracy Vertical Slope Measurements in Caves Using Micro-Barometer (p. 79)
Bob Buecher
Monday Schedule

10:50  A Method to Determine the Accuracy of Cave Radio Locations (p. 79)
      Bob Buecher

11:10 Break

11:20 Informal Demonstrations, Show and Tell, and Discussions of Cave-Related Electronics

Nevada: Treasures of the Silver State
      Monday, 9:00–12:00
      Room 305  Gretchen Baker

Come learn about Nevada caves (cultural, biological, hydrologic and geologic features), mines, ghost towns, and more during this session. Our focus will be on providing interesting information about a range of topics, so there will be something for everyone to enjoy.

9:00  The Caves of Nevada (p. 94)
      Tom Gilleland

9:30  An Introduction to the History and Prehistory of the Great Basin (p. 95)
      Eric Stever

10:00 Cave Valley Cave: A Portal to the Past (p. 95)
      Dayna M. Reale

10:30 Nevada Caves Biology Overview (p. 95)
      Gretchen Baker

11:00 Cave Management in Nevada (p. 95)
      Doug Powell, Rebecca Urbanczyk, Gretchen Baker

11:30 Questions & Discussion

Video Section Meeting
      Monday, 9:00–12:00
      Room 301  Dave Socky

The NSS Video Section meets once a year at the NSS Convention. There is usually a short business meeting (mainly to railroad the current officers to run again), and then there will be interesting discussions and show-and-tell about the latest in doing cave videography. Plus there will be a viewing of some of the current videos that have been produced.

Vertical Climbing Contests
      (starting at 11:00 AM)
      Monday, 11:00–4:00
      Gym

One of the highlights at each NSS Convention is the Climbing Contest, where climbers of every age group can test their skills and equipment for ascending 11mm caving rope using Single Rope Techniques (SRT). There are separate age groups for Men and Women, with categories for Mechanical, Knot, and Sit-Stand Ascending systems. Contests are run at distances of both 30 meters and 120 meters for each category. Climbers may take up to three attempts in each category, provided there is sufficient time.

The Vertical Climbing Contest is not only for trying to get a fast time; it is also a chance for contestants to see if their gear is working efficiently and to make any needed adjustments in a safe environment. Also, there are usually other persons in the vicinity from which they can get helpful information concerning their system. In other words, it is a place to learn more about making your climbing rig safer for your caving trips.

There is a Team Relay category, where 4 climbers must use 4 different systems to climb 30 meters each, in a relay-race format. The climbers on a given team must be members of the same grotto or organization for at least 6 months prior to the Convention. The team must also have at least one member of the opposite sex.

The Contests run from 11:00 AM– 4:00 PM on Monday and from 9:00–4:00 on Tuesday. Everyone is welcome to participate, watch, and learn.

Monday Lunch

Fine Arts Opening Reception
      Monday, 12:00–2:00
      Library  Carol Jackson

The Fine Arts Salon will open for refreshments and sales at noon on Monday. The opening is sponsored by SpeleoBooks. There will be opportunity to vote for your favorite artwork in the Salon. It will include items from the Craft and Design Salon, which is an extension of Fine Arts.
Monday Schedule

Geology & Geography Lunch
Monday, 12:00–2:00
Multipurpose Room  Katie Schmid

Communication & Electronics Lunch
Monday, 12:00–2:00
Room 311  Brian Pease

Monday Afternoon

Geology & Geography Session (continued)
Monday, 2:00–5:00
Multipurpose Room  Katie Schmid

This is a continuation of the Geology and Geography Session that began in the morning.

2:00  The Influence of Glaciation on Pseudokarst Development (p. 88)
Max Cooper

2:20  Records of Catastrophic Floods in Caves (p. 89)
Art Palmer

3:40  A Hydrologic Review of National Park Service Shared Karst Landscapes (p. 89)
Melissa Bishop

3:00  Class V Injection Wells as a Means to Drain Swamps in Karst Areas to Reduce the Spread of the Zika Virus and for Recharging Aquifers (p. 90)
Albert E. Ogden

3:20  Break

3:40  Controls on carbon dioxide dynamics in karst: The answer is blowin’ in the wind (p. 90)
Matt Covington

4:00 Discussion

Board of Governors Meeting (closed)
Monday, 2:00–5:00
Room 401  Jean DeVries

This is a closed meeting of the NSS Board of Governors.

Canyoneering for Cavers Workshop
Monday, 2:00–4:00
Room 312  Andy and Bonny Armstrong

This workshop will focus on the crossover between caving and canyoneering. Topics to be discussed are the similarities and differences of gear, techniques, access, data sharing, and conservation. We will also touch on the history of canyoneering, popular canyoneering locations, and common causes of accidents in canyoneering. The second half of the workshop will be a hands-on demonstration and practice of appropriate rigging techniques for canyoneering. No experience is needed for participation.

DistoX2 Session & Workshop
Monday, 2:00–5:00
Room 203  Carol Vesely

See page 24 for a description of this session and workshop.

2:00  DistoX2 Basics (p. 83)
Fofo Gonzolas

2:30  Introduction to Digital Sketching with Topodroid (p. 83)
Angela Morgan

3:15  Assembling a DistoX2 (no abstract)
Alan Rice

3:35  Calibration of the DistoX2 with a PVC Apparatus (no abstract)
Howard Kalnitz

3:50  Easy Calibration of the DistoX2 using a Wooden Triangular Frame (p. 83)
Ted Lappin

4:10  Hands-on Calibration Workshop (p. 83)
Ted Lappin, Howard Kalnitz, Fofo Gonzalez, Angela Morgan and Carol Vesely

Future Convention Planning
Monday, 2:00–5:00
Room 311  Carol Tiderman

This is an informal discussion of what is involved in hosting an NSS Convention. Anyone working on an upcoming convention or considering hosting a convention is encouraged to attend this meeting to get a better idea of what is involved.
**SpeleoArt Workshop Canvas Prep**  
*Monday, 2:00–5:00*  
*Room 301  Fine Arts Salon artists*

This is a session to prepare the canvas for the SpeleoArt Workshop activities on Tuesday through Thursday.

**Vertical Climbing Contests**  
*(until 4:00)*  
*Monday, 11:00–4:00*  
*Gym*

This is a continuation of the vertical climbing contests that began in the morning. Note that the contests end at 4:00 and resume at 9:00 on Tuesday.

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**Monday Evening**

**Howdy Party**  
*Monday, 7:00–?*  
*Campground*

See page 24 for a description of the Howdy Party.  
If you are not camping, please follow the signs to the appropriate parking area for campground guests.
Tuesday Schedule

Tuesday Morning

U.S. Exploration Session
Tuesday, 8:45–12:00
Multipurpose Room  Pat Kambesis

The U.S. Exploration Session is a venue in which cavers working in U.S. caves and karst lands report on their activities and accomplishments. The day-long session features new explorations as well as ongoing projects.

8:45  Mapping the North Castle Flow: Lava Beds National Monument (p. 100)
     Scott House

9:05  Paul Gibson Cave, Klamath Mountains, California (p. 100)
     Joel Despain

9:25  Survey of Caves in Grand Canyon, Arizona (p. 100)
     Jason Ballensky

9:45  Recent Exploration in the Sea Caves of Santa Cruz Island, California (p. 100)
     Dave Bunnell

10:05 Caver Quest: Virtual Reality Cave Simulation and Armchair Exploration (NM) (p. 101)
     Ron Lipinski

10:35 Break

10:50 Groaning Cave, Colorado – Survey and Exploration (p. 101)
     Derek Bristol

11:10 Caving Where We Shouldn’t: Mount Emory Cave, Big Bend National Park, Texas (p. 101)
     George Veni

11:30 Jewel Cave, South Dakota (p. 101)
     Mike Wiles/Dan Austin

Conservation Tuesday
Tuesday, 9:00–12:00
Room 401

9:00 Western Bat ID Workshop (p. 80)
     Jason Williams

11:00 Managing the Spread of Pseudogymnoascus destructans and Conserving Bats Threatened by White-nose Syndrome in North America (p. 80)
     Bronwyn Hogan, Jeremy T. H. Coleman, Jonathan D. Reichard, Christina Kocer, and Richard Geboy

11:45 Tips and Tricks for WNS Decontamination Protocol (p. 80)
     Jennifer Foote

Flex  Speleothem Repair Technique PowerPoint (p. 81)
     Jim C. Werker & Val Hildreth-Werker

Speleophilatelic Section Meeting
Tuesday, 9:00–12:00
Room 312  Roger McClure

NCRC Presentation
Tuesday, 9:00–12:00
Room 305  Anmar Mirza

The National Cave Rescue Commission will present on its activities for the year. We will also have a short presentation on cave rescue. Meet some of the Regional Coordinators and NCRC Instructors!

SpeleoArt Workshop
Tuesday, 9:00–12:00
Room 301  Fine Arts Salon artists

This is the beginning session of the 3-day Workshop. It will begin with PowerPoint presentation about entering the art salons and engaging in the workshop activities. Participants will then all go on an expedition to a nearby cave to explore techniques in collecting information for creating rock form and formation development in an exercise of ROCK ART. No cave rocks will be harmed during this activity.

The Workshop continues in the afternoon, and on Tuesday and Wednesday.
Vertical Climbing Contests (continued)
Tuesday, 9:00–4:00
Gym

This is a continuation of the vertical climbing contests that began on Monday. The climbing contests run until 4:00 today.

Rebelay Workshop
Tuesday, 10:00–4:00
Gym    Gary Bush

This hands-on workshop provides demonstration, instruction, and practice of ascending and descending caving rope with the European style of rope rigging using rebelayas. Vertical Section instructors will be available during the workshop to assist students in learning and practicing the techniques necessary to negotiate rebelayas. Participants may come and go on their own schedule during the workshop timeframe, and must furnish their own SRT ascending and descending gear. Homemade gear is subject to approval by the instructors. All gear will be evaluated by the instructors for safety, serviceability, setup, and “tuned” if need be for optimal performance while crossing rebelayas. Cowstails will be provided if needed.

Tuesday Lunch

Luminary Series I:
Penelope J. Boston
(NSS 44478) (SC)
Tuesday, 1:00–2:00
Multipurpose Room

“From Inner Space to Outer Space: The Role of Earth's Subsurface in Our Search for Life in the Solar System and Beyond”

Please see the detailed biography of Penelope Boston on page 26. This presentation will be recorded and will be available on the NSS Web site at a future date.

Conservation & WNS Brainstorming Roundtable
Tuesday, 12:00–2:00
Room 401    Val Hildreth-Werker

All are welcome to participate in our open, interactive discussions among cavers, researchers, land managers, and agency representatives. The WNS Decon Tips and Tricks Talk will lead us into the noon hour with lively conversation. Feel free to bring your own lunch munchies. We'll focus on the latest concerns, issues, and ethics of cave/karst/bat conservation.

A Light Lunch
Tuesday, 12:00–2:00
Room 305    Doug Warner

Thinking of buying a new high-powered LED caving light but don’t know a lumen from a luminary? Want to learn more about the coolest features of various LED headlamps including your own? Just enjoy tech-talking with like-minded gear heads? Come to “A Light Lunch,” an illuminating informal discussion and hands-on demonstration of various high-powered LED caving lights with experts available to answer questions on numerous lights including: ElSpeleo, Manley 20, Sten, Zebra, Scurion, Surefire, and others. Bring your own lunch and definitely feel free to bring your own light.

Report on the Current State of the NSS Headquarters and Its Upcoming Refinance
Tuesday, 12:00–2:00
Room 312    Wm Shrewsbury

The Board of Governors will present an update on the NSS Headquarters and Conference Center, along with a spreadsheet analysis of refinancing options for the Headquarters mortgage. Come see what we started with, what the HQ Commission accomplished, and get a better understanding of the various strategies your Board is considering for refinancing the balance of our mortgage.
Tuesday Schedule

Tuesday Afternoon

U.S. Exploration Session (continued)
Tuesday, 2:15–5:00
Multipurpose Room  Pat Kambesis

This is a continuation of the U.S. Exploration Session that began in the morning.

2:15 Maxwelton Sink Cave - Thunder Dome (WV) (p. 102)
Dave & Nick Socky

2:35 Lechuguilla Cave, New Mexico – The Discovery and Exploration of Neuland (p. 102)
Derek Bristol

2:55 New Discoveries in Vermont (p. 102)
John Dunham

3:25 Break

3:35 Alexander Archipelego Sea Caves, Alaska (103 no abstract)
Johanna Kovarik

3:55 Searching for Lava Caves – A Rapid Method (p. 103)
Chuck Chavardian, Gregory Chavdarian

4:15 John Henry Cave - Following the Trail of Tires (p. 103)
Howard Kalnitz

4:35 Hitting the Wall: New Discoveries on Isla de Mona (p. 104)
Pat Kambesis

Conservation Tuesday (Continued)
Tuesday, 2:00–5:00
Room 401  Val Hildreth-Werker

This is a continuation of the morning’s Conservation Tuesday Session.

2:00 Caver Village Study (p. 81)
John M. Wilson and Maria Alejandra Perez

2:30 Protecting Cuevas de Bellamar, Cuba: A Conservation Success Story (p. 81)
Esteban Grau – Sociedad Espeleológica de Cuba

3:00 It Was a Dark and Stormy Night When the Crickets Returned: Recovery of Biota After

Cleaning a Heavily Impacted Commercial Cave (Crystal Cave, Kutztown, PA) (p. 81)
Doug Soroka and Kathy Lavoie

3:30 Sandia Cave: New Mexico Rock Art Restoration Project (p. 82)
Carrin Rich, Sandra Arazi-Combs, Pete Lindsley, Val Hildreth Werker & Jim C. Werker

4:00 CaveSim Enhances Public Conservation Outreach (p. 82)
David Jackson and Tracy Jackson,

SpeleoArt Workshop (continued)
Tuesday 2:00–5:00
Room 301  Fine Arts Salon artists

This is a continuation of the SpeleoArt Workshop

Vertical Climbing Contests (until 4:00)
Tuesday, 9:00–4:00
Gym

This is a continuation of the climbing contests that began in Monday. Note that the contests end at 4:00.

Rebelay Workshop (until 4:00)
Tuesday, 10:00–4:00
Gym  Gary Bush

This is a continuation of the Rebelay Workshop that began in the morning. Note that the course ends at 4:00.

Tuesday Evening

Rockin’ and Rollin’ Geology Train Rides
Tuesday, 4:30–6:00
Tuesday, 7:30–9:00
Nevada Northern Railway  Roger Bowers

A lively presentation by a local mining geologist talking about the railroad, mining history, and a show and tell of ore samples. All of this as the century-old steam engine is pulling your train through the great geological “museum” right outside the window of your coach.
Snacks, Beer, and other beverages available for purchase on-board.

There will be two trips, one at 4:30 PM and the other at 7:30 PM. They depart from the Nevada Northern Railway Museum, Depot, and Gift shop at 1100 Avenue A. **Tickets are required for each trip and are not interchangeable.**

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**Fellows & New Members Reception**

*Tuesday, 5:00–8:00*

*Northern Nevada Railway Freight Barn*

All **NSS Fellows** and all **New NSS Members** (NSS numbers who joined since the 2015 convention) are invited to a special reception on Tuesday evening from 5 to 8 PM in the historic freight barn at the Nevada Northern Railway. There are geology trains at 4:30 and 7:30 that depart just a hundred feet away (tickets are required for the train trips). This allows the Fellows and new members to go on either train and stop by the reception before or after their trip. Light munchies (not dinner) will be available along with beer, wine, and soda.
Wednesday Schedule

Wednesday Morning

International Exploration
Wednesday, 9:00–12:15
Multipurpose Room   Cyndie Walck

The international exploration session features presentations on exploration, mapping, and studying caves outside of the U.S. Past presentations have featured caves from all over the world, including Central America, Asia, Europe, the Caribbean, South Pacific, and more! Emphasis is on current exploration projects.

9:00 The Caves of Cayman Brac, Revisited (p.90)
Michael Lace, Joan and John Mylroie

9:15 The Exploration of Sistema Zumpango, Quintana Roo, Mexico (p. 91)
Angela Morgan

9:35 Recap of Exploration in Northern Laos (p. 91)
Matt Oliphant

9:55 It Takes an Army—2nd Joint Mindanao Expedition, Philippines (p. 91)
Cyndie Walck and Shane Fryer

10:25 Break

10:35 The Bellamar Project: Exploring Cuba’s Karst Heritage (p. 91)
Esteban Grau

10:55 Bahamian Update: Field Work 2014-2016 (p. 91)
John Mylroie and Mike Lace

11:10 Shi Jia Gou--A Dream Cave in China (p. 92)
Nancy Pistole

11:30 Proyecto Espeleologico Sistema Huautla Update (PESH) (p. 92)
Tommy Shifflett and Bill Steele

12:00 International Exploration Fund (p. 92)
Joel Despain

Cave Photography Workshop
(starts at 8:00)
Wednesday, 8:00–12:00
Room 312   John Woods & Peter Jones

Wednesday

The Cave Photography Workshop will have two components: Classroom presentation in the morning (open to all to attend) and a cave photography trip in the afternoon (limited to 10 participants). Sign up for cave trip will be available first come, first served at the classroom presentation. Workshop will begin with a classroom presentation by John Woods on “Digital Cave Restoration” or how to digitally remove graffiti from and repair cave images. The second presentation by Peter Jones will be on “Light” and understanding how to use it in cave photography for artistic expression, both in taking the image and using it effectively in your digital image processing. Participation in the cave portion in the afternoon will involve a 90 minute drive to Goshute Cave and a 30 minute uphill climb. Carpooling will be arranged for at morning session.

Biospeleology
Wednesday, 9:30–12:00
Room 311   Sarah W. Keenan

This session contains oral and poster presentations highlighting the latest research in Biospeleology. These presentations will cover a variety of topics ranging from species descriptions, behavioral observations, to large-scale ecosystem dynamics in cave systems.

9:30 Bat Microbiota and the Hunt for Natural Defenses (p. 65)
Diana Northup

9:50 What Do We Know About Western Bat Hibernation Patterns? Hibernacula Conditions Chosen by Some Western Bat Species (p. 65)
Debbie Beucher

10:10 Assessing Hyporheic Zone Stygobiont Biodiversity in Texas, U.S.A. (p. 66)
Ben Hutchins

10:30 Break

10:40 Barcoding and Sequencing of Hadenoecus subterraneus Cave Crickets from Mammoth Cave National Park Shows Differences by Cave (p. 66)
Kathleen Lavoie

11:00 The First Observations of a Stygobiont Snail (Hydrobiidae, Fontigens sp.) in Tennessee (p...
Wednesday Schedule

Biology Section Lunch

Wednesday, 12:00–2:00
Room 311 Megan Porter

Wednesday Afternoon

International Exploration
(continued)

Wednesday, 2:10–5:00
Multipurpose Room Cyndie Walck

This is a continuation of the International Exploration Session that began in the morning.

2:10 Sistema Ponderosa: New Discoveries and Caver/Diver Collaboration (p. 92)
Peter Sprouse

2:30 Expedition Cerro Caballero, Oaxaca, Mexico, Proyecto Sierra Mazateca (p. 92)
Ron Adams, Tony Akers

3:00 Surveying the Far Reaches of the Jaguar Claw System, Quintana Roo, Mexico (p. 93)
Benjamin Schwartz

3:20 Break

3:30 Huautla Resurgence Cave 2016 Expedition (p. 93)
Zeb Lilly

3:50 Raspberry Rising: Exploration, Science, Logistics, and Adventure in the Canadian Rockies (p. 93)
Diana Kirkwood, Nick Vieira

4:10 Beyond the Xe Bang Fai: Other Caves in the Hin Nam No National Protected Area, Laos (p. 93)
Terry Bolger

4:30 Eco touring in the Great Caves of Phong Nha Ke Bang, Vietnam (p. 94)
Dave Bunnell

Congress of Grottoes

Wednesday, 2:00–5:00
Room 401 Blake Jordan

Composed of delegates representing each Internal Organization (IO), the Congress of Grottoes (COG) is an
Wednesday Schedule

advisory body to the NSS Board of Governors. The Congress provides a structure for receiving feedback from members through their IOs, discussing ideas and formulating recommendations based on the results of its annual meeting. Resolutions are presented to the NSS Board for consideration.

National Speleological Foundation Meeting

Wednesday, 2:00–5:00
Room 305  Ted Kayes

The National Speleological Foundation is the money and endowment managing organization associated with the NSS and other cave-related organizations. Come and meet the Trustees and learn a little bit more about the financial side of caving. Everyone is welcome.

Cave Photography Workshop (continued)

Wednesday afternoon
Off-site

This is the off-site portion of the workshop at Goshute Cave. Participants must have attended the morning session and signed up for the field portion.

Biospeleology (continued)

Wednesday, 2:15–5:00
Room 311  Sarah W. Keenan

This is a continuation of the Biology Presentations Session that began in the morning.

2:10  Microbial Communities of Lava Caves in Hawai’i (p. 68)
Diana Northup

2:30  Preliminary Analysis of Ten Years of Biomonitoring Data from Lehman Caves, Nevada (p. 69)
Gretchen Baker

2:50  New Acoustic Bat Survey Methods Yield New Species at Timpanogos Cave National Monument (p. 69)
Andy Armstrong

3:10  Break


3:50  Iron Reducing Microbial Communities Associated with Brazilian Iron Ore Cave Formation (p. 70)
Ceth Parker

4:10  A Little Drop Will Do: Surprises from Epikarstic Drip Water Microbiology (p. 70)
Annette Summers Engel

4:30  Poster Presentations:

Kathleen Lavoie

The Impact of Tourism on Microbial Communities in Touristic and Pristine Caves, Chongqing, China (p. 71)
Qiufang He

A Biological Inventory of Cave Point Cave (Stone County, AR) (p. 72)
David Thomas

Genetic Analysis of Ozark Cave Bacteria (p. 72)
David Thomas

A Biological Inventory of Lafferty Spring Cave (Izard County, AR) (p. 73)
David Thomas

SpeleoArt Workshop (continued)

Wednesday, 2:00–5:00
Room 301  Fine Arts Salon artists

This is a continuation of the collaborative mural.

Wednesday Evening

Campground Party

Wednesday, 7:00–?
Campground

See page 29 for details about the Wednesday evening party in the campground. If you are not camping, please follow the signs to the appropriate parking area for campground guests.
Thursday

Thursday Morning

Spelean History Session

*Thursday, 9:00–12:00*

*Multipurpose Room  Dean Snyder*

The Spelean History Session presents papers on the study, interpretation, and dissemination of information about spelean history, which includes folklore, legends, and historical facts about commercial and wild caves throughout the world, and the people who are associated with them.

9:00  Set-up and Introduction  
Dean Snyder

9:10  Devils Hole, Nevada (p. 96)  
Jack Speece

9:25  The Quakers Exiled from Pennsylvania in 1777 and Their Strange Visit to Indian Echo Caverns (p. 96)  
Bert Ashbrook

9:45  Henry D. Gilpin and His Caving Trips in Virginia in September 1827 (p. 96)  
Bert Ashbrook

10:10  Special Convention 75th NSS Anniversary Events (p. 96)  
Paul Damon

10:20  Mrs. A. Galbreath’s Stereoviews of Manitou Grand Caverns (p. 97)  
Michael McEachern

10:40  Break

10:50  A Medieval Historian’s Interconnected World: Gervase of Tilbury’s Subterranean Passageways (p. 97)  
Cordelia Ross

11:10  Evolution of the “Eye-Draught of the Mammoth Cave, Warren County, Kentucky” (p. 97)  
William R. Halliday

11:25  Family and Business Linkages in the Mammoth Cave Saltpeter Period (p. 97)  
William R. Halliday

11:40  The Writing on the Wall (p. 98)  
David Harwood

12:00  Annual Business Meeting of the American Spelean History Association

Cave Photography Session

*Thursday, 9:00–12:00*

*Room 401  Bob Stucklen*

All who are interested in cave photography from beginner to expert are encouraged to attend. Presentations will be of interest for photographers of all levels.

9:00  Open-source (free) Software for Photography (p. 77)  
Kenneth Ingham

9:25  Creative Lighting Can Improve Your Cave Photos (p. 77)  
Brent McGregor

9:55  Using Studio Strobes in Caves (p. 78)  
Kenneth Ingham

10:20  Break

10:30  Announcements  
Bill Frantz

10:35  Big Volume Photography in Some of the World’s Largest Caves (p. 78)  
Dave Bunnell

11:05  Art vs Documentation (p. 78)  
Josh Hydeman

Medical Section Meeting

*Thursday, 9:00–12:00*

*Room 311  Stephen Mosberg*

Use of Walls Cave Mapping Software

*Thursday, 9:00–12:00*

*Room 203  Peter Sprouse*

We will cover basic and advanced aspects of Walls, including data entry; setting up your project tree; setting the geographical reference; loop closure analysis and blunder detection; transitioning from a dry (clinometer) to
Thursday Schedule

a dive (depth gauge) survey; weighting individual surveys based on assumed accuracy; conflicts created by using too many fixed GPS locations; best practices in managing large cave systems; exporting shapefiles; and exporting SVG files for round-tripping. **Participants should bring laptops running Windows and any data they have to enter.**

**Using Group Lineament Analysis**

*Thursday, 9:00–12:00*

*Room 305*

Lineament analysis, which consists of highlighting and analyzing straight lines in geo-images, is a powerful and readily available tool that can help increase the chance of finding caves. In the morning session we will use it as a group to analyze a nearby limestone ridge for promising areas, and in the afternoon session we will check those areas indicated and use thermal imaging to further discriminate which of those leads may be promising.

**Awards Committee Meeting**

*Thursday, 9:00–12:00*

*Room 312    Mike Backe*

The Awards Committee reviews NSS member nominations and make recommendations to the Board of Governors for our annual NSS Awards. The Society presents the Awards at the Convention’s Award Banquet on Friday night. If you are interested in how the process works, want to provide helpful suggestions, or are just curious about what we do, the Awards Committee conducts an open meeting on Thursday between 9:00 AM and 10:00 AM. The committee holds a closed meeting for Awards Committee members from 10:00 to 11:00 AM.

**SpeleoArt Workshop (continued)**

*Thursday, 9:00–12:00*

*Room 301    Fine Arts Salon artists*

This is the final day of the SpeleoArt Workshop. It will be devoted to completing the Collaborative, which will be displayed in the Salon area in the school library.

**National Perk Service Meeting**

*(closed)*

*Thursday, 9:00–12:00*

*Room 304*

This is a closed meeting for Park Service employees.

**Vertical Techniques Workshop**

*Thursday, 9:30–3:00*

*Gym    Kurt Waldrom*

No previous vertical experience is necessary to attend this workshop. It provides beginners with a basic overview of American-style Single Rope Techniques (SRT) in a controlled environment. The workshop is NOT intended as a complete training course. There are hands-on sessions in knot tying; belaying; cable ladder work; rappelling with the rappel rack and Petzl Stop descenders; and the basic use of the Ropewalker, Mitchell, Frog, and Hitch rope ascending systems. All participants MUST provide their own climbing/caving approved helmet, seat harness with appropriate load-bearing fastening, a locking carabiner, and gloves. All other equipment is provided. No home-made gear is allowed without previous instructor approval. Students are advised to bring their own lunch. Do not wear excessively loose clothing. Avoid sandals, thongs and other non-supportive footwear. Sneakers or boots are recommended. Students with long hair should have a way to secure it. Participants must be at the workshop site before 9:30 AM to register and sign liability waivers. Minors must have written parental permission. Attendance is limited to the first 35 students to register.

**Thursday Lunch**

**Luminary Series III**

*Donald G. Davis (NSS 4956) (HM-LB-FE)*

*Thursday, 1:00–2:00*

*Multipurpose Room*

“Caving and Science: An Hour with Donald Davis”

Please see the detailed biography of Donald Davis on page 31. This presentation will be recorded and will be available on the NSS Web site at a future date.

**Cave Photography Section Lunch**

*Thursday, 12:00–2:00*

*Room 401    Bob Stucklen*
### Human Sciences Section Lunch
**Thursday, 12:00–2:00**  
**Room 311**  
Barnice Gottschalk

### NCKMS Steering Committee Lunch
**Thursday, 12:00–2:00**  
**Room 312**  
Jim Kennedy

All members of the National Cave and Karst Management Symposium (NCKMS) Steering Committee should plan to attend this annual meeting. Bring your lunch, or eat beforehand. Meeting highlights include plans for the 2017 Symposium in Arkansas, and hopefully also the 2019 and 2021 Symposia. All interested cavers are welcome.

### Cave & Karst Management Session
**Thursday, 1:00–5:00**  
**Room 305**  
Johanna Kovarik, U.S. Forest Service  
Session Co-Chairs: Dale Pate, National Park Service; Jim Goodbar, Bureau of Land Management

This session will be a forum for promoting, advancing, and sharing concepts in effective management of cave and karst resources. Presentations from cave/karst conservancies, federal land managers, state land managers, and/or private land managers are welcome and invited.

1:00 **Highlights for the National Park Service Cave and Karst Program** (p. 73)  
Dale L. Pate

1:20 **The Bureau of Land Management Cave and Karst Program Update** (p. 73)  
Jim Goodbar

1:40 **The U.S. Forest Service Cave and Karst Program in 2016** (p. 74)  
Johanna Kovarik

2:00 Break

2:10 **JBSA – Camp Bullis: Cave and Karst Resource Management by the Department of Defense in San Antonio, Texas** (p. 74)  
Chris Thibodaux

2:30 **Development of Two Cave Management Plans at Great Basin National Park** (p. 75)  
Gretchen M. Baker and Ben Roberts

2:50 **New Tunnel Doors Protect Microclimates of Timpanogos Cave System** (p. 75)  
Andy Armstrong

### Thursday Afternoon

#### The Founding and History of the Cave Research Foundation
**Thursday, 2:00–5:00**  
**Multipurpose Room**  
Paul Damon

This will be a round-table discussion group with several long-time members of the Cave Research Foundation, discussing the reasons for founding the CRF, the CRF History, and current CRF efforts. One of the original founders from the 1950s will be one of the participants, as will another who was CRF President in the early 1970s. The current CRF President will also be there, and hopefully several others.

#### Cave Diving Session
**Thursday, 2:00–5:00**  
**Room 312**  
Forrest Wilson

This is an informal discussion of cave diving projects that attendees have going on.
Thursday Schedule

Using Group Lineament Analysis
Thursday afternoon
Off-site

This is a continuation of the morning Lineament Analysis Session. It will be held off site and will use thermal imaging to further discriminate which of the leads determined in the morning session may be promising.

Human Sciences Session
Thursday, 2:00–5:00
Room 311 Bernice Gottschalk

Cave & Karst Management Session
Thursday, 1:00–5:00
Room 305 Johanna Kovarik

This is a continuation of the session that started at 1:00.

Drawing Cave Maps with Adobe Illustrator
Thursday, 2:00–5:00
Room 203 Peter Sprouse

This workshop will cover setting up the AI file by importing a line plot; the use of drawing tools such as symbols; brushes and swatches; round-tripping the drawing to adjust with new survey data; and saving as a PDF with option to turn on and off survey lines. Participants should bring a laptop with AI if possible. Trial version can be downloaded.

SpeleoArt Workshop (continued)
Thursday, 2:00–5:00
Room 301 Fine Arts Salon artists

This is the last session of the SpeleoArt Workshop.

Vertical Techniques Workshop
Thursday, 9:30–3:00
Gym Kurt Waldron

This is a continuation of the Vertical Techniques Workshop that started in the morning. The Workshop ends at 3:00.

Thursday Evening

Salon Awards Show
“Dress Rehearsal”
Thursday, 5:30–7:00
Central Theater (145 W 15th St. in Ely)

See the description of the Full Salon Awards show at 7:30 PM (below).

The 5:30 PM Show is a “Dress Rehearsal” for those who prefer their cave art in a quiet venue. It contains the same elements as the Full Program, but without awards announcements and Salon chair presentations. It should run about 90 minutes.

Salon Awards Show
Full Program
Thursday, 7:30–9:30
Central Theater (145 W 15th St. in Ely)

The Thursday evening program provides a venue to celebrate art and caves. Each of the NSS Salons displays photos of their top winners. The Salon Awards Show includes the Ballad Salon winner and runner-up songs, the Multimedia Salon winner in full, excerpts from Video Salon Accepted for Show entries, and it is the only time Photo Salon images are presented during the convention, enhanced by music.

The 7:30 PM Salon Awards Show is for everyone who likes to see the Salon chairs present the winning artists with their awards (and for winning artists who want to get their awards!). It runs about 120 minutes, without an intermission.

Terminal Siphons
Thursday, after the Photo Salon
Campground

The ever-popular caver band, the Terminal Siphons, will play in the Campground immediately following the Photo Salon.
Friday Morning

The Future of Cave and Karst Science & Exploration
Friday, 9:00–12:00
Multipurpose Room  Penelope Boston

Where will cave exploration go in the next 75 years? Dr. Penny Boston will explore this topic in the "Future of Caving" session. A long-time NSS member, Dr. Boston was recently appointed as NASA's Director of Astrobiology at the Ames Research Center in California. Her specialties include the study of life in extreme environments.

Since the 1960s, researchers, examining low resolution imagery, have speculated about the presence of caves on the Moon and Mars. In 2007, researchers confirmed the first cave-like features on the Red Planet. To date, planetary scientists have identified more than 200 lunar and over 2,000 Martian cave-like features. The occurrence of caves (in either host rock or ice) on other planetary bodies in our solar system is reasonable.

Extraterrestrial caves will be high-priority targets for future robotic and human missions. Accurate identification and selection of candidate caves will be desirable for the establishment of astronaut shelters (temporary or permanent) on both the Moon and Mars. Martian caves may provide access to the deep subsurface where evidence of life is most likely to be preserved (provided life evolved on Mars), as well as significant water ice deposits for human consumption and for potentially generating hydrogen fuel to return humans to Earth.

9:00  The Future of Cave Exploration and its
       Contributions to Cave Science  (p. 84)
       George Veni

9:30  Laminar Flow and Cave Development in
       Eogenetic Rocks  (p. 84)
       John Mylroie and Joan Mylroie

10:00 Hunting for Caves with Microbes and Beakers:
       Using Metagenomics and Chemistry to
       Explore for the Extension of Ft Stanton Cave,
       NM  (p. 85)
       Michael N. Spilde, Jason C. Kimble, and Diana E.
       Northup

10:30 Extraterrestrial Caves: Advanced Technologies
       in the Search  (p. 85)
       P.J. Boston

11:00 Futures Interactive panel with the audience
       Join the speakers for a wide-ranging discussion of
       the future of science and exploration of charts and
       cave systems on Earth and beyond.

Board of Governors Meeting (open)
Friday, 9:00–12:00
Room 401  Jean DeVries

This is an open meeting that is essentially a continuation
of the Board of Governors meetings held on Monday.
All NSS members are welcome and encouraged to attend.

Video Salon Viewing
Friday, 9:00–12:00
Room 305  Dave Socky

This session will present the videos that were highlighted
at last night's Salon Awards Show. They will be shown in
their entirety.

Poetry Corner / Writer’s Workshop
Friday, all day
Room 304  Jo Schaper

Calling all caver-writers! This will be the convention’s
workshop for all sorts of poets, fiction, nonfiction, and
scientific writing types. Bring paper, writing implements,
and works in progress. Be prepared to share. Check the
Off the Rails newsletter for additional information. The
Workshop runs all day.

Vertical Section Business Meeting
& Session
Friday, 10:00–12:00
Room 301  Terry Mitchell

The Business Meeting will formally conduct the official
business of the Vertical Section, including reports about
the Section’s financial posture, Section activities, new
initiatives, and the annual election of officers and
Executive Committee members.
Friday Schedule

The Vertical Session will be held immediately after the Business Meeting. The Session allows participants to present new vertical techniques and equipment, and report on newly discovered vertical caves and their explorations.

Cooperative Caver & Public Lands Manager Projects – Tools for Better Cave Management

*Friday, 9:00–12:00*

*Room 311 Ray Keeler*

This session has presentations and discussion on projects and potential projects on Federal and State lands. Twenty minute presentations on project summaries, goals achieved, and areas that did not succeed. We will touch on structures for longer term relationships including Challenge Cost Share agreements, Volunteer agreements, Partnering agreements, Special Use Permits, paperwork requirements, etc. This session is about cavers and land managers learning about structural tools that will help them work more easily together.

The schedule of presentations will be available at the Convention. These presentations will be followed by a round table discussion of projects, issues, and helpful ideas to make the projects more useful with better (or less) paperwork.

Fine Arts Salon Critique

*Friday, 9:00–10:00*

*Library with Salon judges*

This will be a tour of the gallery and a critique of this year’s entries. There will be a discussion about why some made the grade and why others did not. The critique is very helpful to those planning on entering and others who want to learn from the Salon experience.

Cartographic Salon Critique

*Friday, 9:00–11:00*

*Cartographic Salon Hallway*

If you are a potential or experienced cave map cartographer you should join the Salon judges this critique to see how they decided on the winning maps. You will certainly get valuable insight into what makes an award-winning map.

Photo Salon Critique

*Friday, 9:00–11:00*

*Room 313*

This will be an open discussion explaining the process and criteria for selecting the winning photos shown in last nights Salon Awards Show. This is a great way to see what you can do to improve your photographic techniques and be next year’s Medal winner.

Print Salon Critique

*Friday, 9:00–1100*

*Library Pat Seiser*

Meet the Print Salon judges and find out how and why they selected the winning print photos.

Cave Ballad Critique

*Friday, 10:00–11:30*

*Room 105A Roland Vinyard*

This is a short (all day) course. Come learn the difference between strike and dip, vadose and phreatic, and the birds and the bats. Bring home with you the geologic reason that there are two parallel passages in Sinnett’s Big Room, the meaning to cavers of Bogli’s mixing corrosion, and the difference between the lifestyles of *Riparia riparia* and *Perimyotis subflavus*. Experts in Speleology will lecture on Geology, Geochemistry, Karst Hydrology, Biology, and Paleontology. The course will go the full day, costs $45, and includes extensive printed course notes and lunch. Registration is limited to 35 people. Preregistration is required.

Cave Conservancy Roundtable

*Friday, 1:30–3:00*

*Room 311 Kelley Prebil*

This will be the 19th annual Cave Conservancy Roundtable. Cave Conservancies are the future of private cave management. Should there be more cave

Friday Lunch
conservancies or fewer through consolidation? Since many cave conservancies have become well-established institutions, what do we do now to expand these functions? Everyone interested in cave management is welcome to attend and share ideas so we can all learn from each other. Most of the active cave conservancies have at least one member at the roundtable who provides a brief update on their conservancy’s plans and activities. All interested Conservancy members are encouraged to attend and share knowledge and maybe gain insight from other conservancies that could benefit your organization. The NSS Nature Preserves should also participate. The session is scheduled for Friday at 1:30 PM.

Note: The Roundtable starts at 1:00 PM and ends at 3:00 PM.

Vertical Contests Awards Ceremony
Friday, 1:00–2:00
Multipurpose Room

Climbing Contest award certificates and prizes for winners in each category and age group will be presented. Award winners must be present or send a representative to receive their prizes. Join in congratulating the winners of the Vertical Climbing Contests that were conducted on Monday and Tuesday.

Friday Afternoon

Lightning Talks
Friday, 2:00–5:00
Multipurpose Room  Jim Washington

Every year at NSS Convention, we have a “just for fun” session of short form talks and presentations. Speakers get about five minutes for showing off about a topic of their choosing. We try to be fairly fast-paced, and the variety of subjects makes Lightning Talks often one of the most interesting and entertaining sessions of the Convention. To participate, just show up. There is no preregistration required. If you need a projector, we will be set up to show PowerPoint. Bring your displayable stuff on a USB flash drive. If you intend to speak (and please do!), the Lightning Talks session is a good place for experimentation. Whether it is your first talk at a Convention or a synopsis of a much larger presentation you have given hundreds of times, we have a warm and friendly audience for you. Tell us a little about your big project, or a lot about your small project. Tell us an amusing anecdote. Dust off and re-edit that Grotto program that went so well. If you are watching presentations all week and think, “I want to do that!” we’ll make a place on the podium for you.

Survey & Cartography Session
Friday, 2:00–5:00
Room 305  Carol Vesely

The Survey and Cartography Session provides an opportunity for cavers interested in cave mapping to learn about new techniques, tools, and software related to mapping and cave surveying. Presentations may be on any topic related to any aspect of cave mapping such as: keeping cave mud off your survey instruments (while still going into the cave), resolving survey blunders, large project management, new tools for mapping or cartography, representing complex caves cartographically, comparisons of various programs for survey data processing, map drawing and data visualization, or integrating cave survey data with surface and GIS data.

2:00 Leave Nothing but Footprints, Kill Nothing but Time, Make… Photo-realistic 3D Computer Models (p. 98)
John R. “Jack” Wood, Robyn Henderek, Benjamin Tobin, Chad Hults, and Blase Lasala

2:30 Electronics for Better Cave Surveys Models (p. 99)
Bob Buecher

3:00 Creating a Virtual Model of Timpanogos Cave National Monument (p. 99)
Blase Lasala

3:30 New Tools, Gadgets and Techniques for Cave Surveying: An Open Opportunity for Show and Tell (p. 99)
Carol Vesely

4:00 Meeting of the Survey and Cartography Section
Rod Horrocks, SACS Chairman

Convention Debrief
Friday, 2:00–5:00
Room 313  Carol Tiderman

This is an informal discussion of what went right, what might not have gone as planned and what might have been done differently during the convention. This should be especially valuable for anyone hosting a future
Friday Schedule

convention or thinking of doing so. It is a good way to find out what is involved in putting on a convention and to meet past and future organizers and staff personnel. This is a way to learn how to improve conventions, not a gripe session. Everyone is welcome.

Cave Conservancy Roundtable
Friday, 1:00–3:00
Room 311   Kelley Prebil

This is a continuation of the Cave Conservancy Roundtable that began at 1:00.

Western Region Business Meeting
Friday, 9:00–12:00
Room 301

Poetry Corner / Writer’s Workshop
(continued)
Friday, 2:00–5:00
Room 304   Jo Schaper

This is a continuation of the morning workshop.

Speleology for Cavers Class
(continued)
Friday, 2:00–5:00
Room 312   Steve Stokowski

This is a continuation of the morning class.

NSS Nature Preserves Meeting
Friday, 3:00–5:00
Room 311   Tom Griffin

This is a meeting of the managers of the NSS nature preserves. It is open to anyone interested in managing these properties.

NSS Finance Committer Meeting
(closed)
Friday, 2:00–5:00
Room 105A

Friday Evening

Awards Banquet
Friday, 7:00–10:30
Big Campground Tent

This is the final big event of the 2016 NSS Convention. Join is in the Big Campground Tent for food, friends, and fellowship. The NSS awards ceremony will follow dinner.
Bat Microbiota and the Hunt for Natural Defenses
Diana E. Northup*1, Nicole A. Caimi1, Paris S. Hamm2, Andrea Porras-Alfaro2, Ara S. Winter1, Jennifer J.M. Hathaway1, Jason C. Kimble1, Debbie C. Buecher3, and Ernest W. Valdez4
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4 United States Geological Survey, Biology, University of New Mexico, Albuquerque, NM
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Recent studies have shown that mammals, such as humans, have a natural external microbiota that acts as a first line of defense against disease-causing pathogens. We know little about this potential defense in bats and its effectiveness against Pseudogymnoascus destructans, the causative agent of white-nose syndrome (WNS). Our investigations of bat microbiota have shown that the microbiota of cave-caught bats differs from that of surface-netted bat and that the microbiota differ by ecoregion. We have also found that Actinobacteria, the source for two-thirds of our antibiotics from nature, are found on many bat species in Arizona and New Mexico. To see if we could isolate Actinobacteria that can kill or slow P. destructans, we cultured external Actinobacteria from bats and tested for the production of antifungals that are effective against P. destructans. Several isolates inhibited P. destructans, with 50% of the inhibitors coming from bats swabbed at Carlsbad Caverns National Park. In addition, metagenomic studies of NM bats revealed the presence of many antibiotic resistance genes, as well as secondary metabolite genes. Understanding the antifungal potential of the external microbiota on bats will help to identify potential WNS management tools. Our studies are shedding light on potential biocontrol agents for addressing white-nose syndrome.

What Do We Know About Western Bat Hibernation Patterns? Hibernacula Conditions Chosen by Some Western Bat Species
Debbie C. Buecher
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Temperate zone bats in the family Vespertilionidae hibernate in winter when they face greater thermoregulatory demands but reduced food resources. Since 2007 white-nose syndrome (WNS) has moved south and west of its initial discovery in New York State. To date it has been detected in 28 states and 5 Canadian provinces, killing over 6 million hibernating bats. Not all bat species appear as vulnerable to WNS but the once common little brown bat (Myotis lucifugus) has been severely impacted. Evidence suggests that the WNS pathogen prefers 2-16°C and high humidity (>90%). Unfortunately, these conditions are also selected by many bat species during winter hibernation. Our knowledge of the preferred microclimate for western bat species and where these animals hibernate are generally unknown. Since the threat of WNS, many western bat biologists have focused on understanding and monitoring winter bat behavior but the topographic complexity of the West is challenging. Since 2008 I have measured microclimate near hibernating bats using programmable loggers across Arizona and New Mexico. These bats chose colder conditions than reflected by local mean annual surface temperatures and much higher relative humidity. This ensures that during hibernation they can slowly live off fat reserves accumulated in the fall. It appears that not all western bats choose similar hibernacula conditions. However it is critical that we quantify the microclimatic conditions chosen across hibernating bat species so that we can anticipate which species will be at greatest risk from WNS.
Assessing Hyporheic Zone Stygobiont Biodiversity in Texas, U.S.A.

Benjamin T. Hutchins1*, Aaron P. Swink2,3, Benjamin F. Schwartz2,3, and Pete H. Diaz4

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Although the hyporheic zone of rivers and streams has been well documented as an important habitat for stygofauna, hyporheic communities remain unassessed in large swaths of North America. For example, although Texas’ karst aquifer fauna have been the subject of over a century of investigation, its hyporheic fauna remains almost completely unknown. As part of an ongoing, statewide assessment of biogeographic and hydrochemical influences on invertebrate community structure, 56 hyporheic samples were collected from 18 sites in west, central, and east Texas. Hyporheic communities were dominated by annelids, diptera, cyclopoid copepods, and ostracods, followed by isopods (Lirceolus spp.) and ephemoptera. Stygobionts were present at most sites but linear models failed to reveal relationships between stygobiont species richness and physicochemical data. Changes in stygobiont community structure over time were not detected in redundancy analysis, although pronounced temporal changes in the abundance of two stygobiont species illustrate that repeated sampling is probably important. Analysis of variance revealed that stygobiont diversity was significantly higher at sites proximal to karst aquifers, which may have served as refuges during Pleistocene and Holocene episodes of pronounced aridity. Conservatively, sampling has produced 53 new occurrence records, 24 of which are new county records, for 16 stygobiont species. Of the stygobiont species collected to date, 12 have previously only been collected from caves, karst springs, and wells in karst aquifers. The presence of rare species in previously unassessed habitats has clear implications for stygobiont conservation, particularly given the state’s substantial water conservation challenges.

Barcoding and Sequencing of Hadenoecus subterraneus Cave Crickets from Mammoth Cave National Park Shows Differences by Cave

Nancy Elwess1, Francine Francis1, Lisa Soucia1, Marving Francois1, Meagan Hogan1, Isadora Park1, Meghan Pentak1, Meghan Netterville1, Carolina Brito1, Caitlyn Gibiault1, Rebecca Muschio1, Dragomir Vasilev1, Kurt Helf2, Rick Olson3, Rick Toomey3, and Kathleen Lavoie*1

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Ours is the first study of cave cricket DNA samples from Hadenoecus subterraneus cave crickets from three caves in Mammoth Cave National Park, Kentucky. Eggs were collected from Great Onyx Cave at a deep cave site at 900 m, and collected from Frozen Niagara entrance to Mammoth Cave. Great Onyx and Frozen Niagara are located on separate deeply bisected ridges on the south side of the Green River. Cricket legs were collected from Coke Cave on the north side of the Green River. We tested for two regions of the DNA; the cytochrome c oxidase subunit I (COI) is one of 37 genes found in the mitochondria, and the small subunit of the 16s DNA. The regions were amplified using PCR, isolated, and sequenced. The sequences were analyzed for their validity and accuracy before being compared to existing cricket sequences in the National Center for Biotechnology database. The sequences were evaluated using BLASTn and showed them to be 89-91% related to the outlier, Hadenoecus cumberlandicus. Phylogenetic trees showed clustering of samples by cave using both sequences of DNA, suggesting low levels of gene flow among caves. Changes in the sequences were fixed by cave, and showed 1-2% difference between Great Onyx and Frozen Niagara populations. Differences at the 5% level support classification as a new species. At the time of abstract submission results from Coke Cave were still being analyzed.
The First Observations of a Stygobiont Snail (Hydrobiidae, Fontigens sp.) in Tennessee

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Despite decades of cave exploration in the Valley and Ridge region of East Tennessee, about 20 caves had been systematically and comprehensively biologically inventoried prior to three years ago. Biological knowledge gaps were significant, including not having a clear understanding of cave biodiversity in the region, or of species distributions. Thus, the potential to find new taxa is high. During a bioinventory of Cruze Cave (TKN24) in Knox County in 2013, we identified small (~1–3 mm), white to translucent, aquatic hydrobiid snails on the sides and bottom of rocks in the stream. All in the team were immediately aware of the snails’ significance as the first recorded stygobiotic snails in the state of Tennessee. Detailed monthly surveys from March to August, 2014, were conducted to estimate snail density, physical location on rocks, stream physiochemical conditions, and to gain insights into the life cycle of the snails. In a one hour period, 10 rocks were selected for snail counts. Across six observation survey events, 65 to 100% of the snails were observed on the bottom of rocks completely submerged in the stream water. The remainder were found on the sides of rocks, but still below or at the stream water level. Total snail density negatively correlated with increasing temperature (R² = 0.61). Snail density was greatest in March (4.8 snails per rock) in 9 °C water, and lowest was in August (1.4 snails per rock) in almost 15 °C water. Previously described stygobiotic hydrobiid snails in the eastern United States include Antorbus breweri from northeastern Alabama, Fontigens bottimeri, F. morrisoni, F. tartarea, F. turritella, and Holsingeria unthanksensis from the Virginias, as well as F. cryptica from Indiana, F. antroectes from Illinois, and Antroletes spiralis from Indiana and Kentucky. The Cruze Cave hydrobiid has been tentatively identified as a member of the genus Fontigens based on morphology. If confirmed, then this new record will extend the distribution of the genus southward in Tennessee. This research emphasizes the need for continued bioinventories in the region.

No Effects of a Gypsum Gradient on Numbers of Fungi and Bacteria in Great Onyx Cave, Mammoth Cave National Park, KY

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Great Onyx Cave in Mammoth Cave National Park in Kentucky, U.S.A., crosses through Flint Ridge. The central part of the cave is known for its diverse gypsum content in the main passage. Poulson calls this area of the cave the ‘Great Kentucky Desert’, as it has low biodiversity and decreased animal populations. We collected soil and swab samples for microbiological studies, as well as biological census data, in order to make associations between gypsum with microbial population levels and biodiversity. Soil samples were tested for water content, C:N ratios, and microbial population counts and diversity. Swabs of passage walls were used to determine microbial counts and the diversity of cave isolates by sampling every 100 m along both Edwards and Cox Avenues. Cave crickets, Hadenoecus subterraneous, were counted +/-5 m from each sample site in order to determine the effect of gypsum. Neither geographical location from an entrance, nor population counts of bacteria correlate with water content of the soil. C:N ratios are very low, usually below the limits of detection, supporting the highly oligotrophic nature of the cave. Although bacterial populations appear unaffected by gypsum, H. subterraneous populations are absent in areas associated with abundant gypsum, although these gypsum areas are also furthest from an entrance. The Great Kentucky desert concept appears to apply to crickets, but not to microbes.
Status and Distribution of Invertebrate Troglobionts in Blanchard Springs Caverns, Stone County, Arkansas

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Blanchard Springs Caverns is the most biologically diverse cave system in Arkansas with more than 90 taxa documented from the cave. The site occurs on Forest Service land in Stone County, Arkansas, and portions of the cave have been developed into commercial tour routes. The cave provides habitat for 8 troglobionts making it one of the richest sites in the Ozarks for obligate species. Yet, for many of the invertebrate troglobionts, little information (e.g. status, distribution, life history, etc.) is available beyond the original species descriptions. From 2009 December to 2010 August, invertebrates were monitored at 25 stations over thee time periods for a total of six sample sets. Frozen weanling mice, similar in mass to *Myotis griseus* (Vespertillionidae), were placed as baits at stations and allowed to decay, and all invertebrate species were visually counted within a 0.5 m radius of bait stations. Environmental conditions (air temperature, soil temperature, relative humidity) were also recorded at each station. The troglobiotic pseudoscorpion, *Apochthonius tianicus* (Chthoniidae), was rediscovered and was mainly found in the deeper and lower levels of the cave. Naïve occupancy within the cave for this species was compared to modelled occupancy that incorporated detection probabilities. The troglobiotic millipede, *Causeyella causeyae* (Trichopeltalidae) was found throughout the cave, but abundance varied across sampling periods. Similar patterns were observed for Collembola (*Pseudosinella* sp.) and Diptera (*Spelobia tenebrarum*). Because many stations were placed in proximity to actively used recreational routes, anecdotal observations were made on visitation impact to invertebrates. Human disturbance at stations did not appear to reduce abundance of organisms, and crushed or dying animals were not observed within the census radii around stations. The observations made during this study were used to update management plans for Blanchard Springs Caverns.

Microbial Communities of Lava Caves in Hawai’i

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Microbial mats are a prominent feature in many Hawaiian lava caves, but little is known about these communities. Since 2008, we have sampled 16 lava caves on the Big Island of Hawai’i for microbial communities for scanning electron microscopy (SEM) analysis, microbiological cultivation, and DNA sequencing. Sample sites varied in rainfall from 47—401 cm per year. Sampled communities included microbial mats of various colors from white to tan, yellow, and orange; white mats floating on puddles in the floor; and butterscotch-colored organic ooze. We also sampled “microbes that masquerade as minerals” to determine whether mineral deposits contained substantial microorganisms. SEM studies revealed diverse morphologies across the lava caves, with coccoid and filamentous shapes predominating, but with several instances of beads-on-a-string morphology being observed. Culture media inoculated with microbial mat or mineral deposits on site in Hawaiian lava caves revealed morphologies consistent with Actinobacteria and many cultures demonstrated the presence of fugitive dyes that were aqueously soluble. DNA analysis revealed that the white wall microbial mats differed from the yellow, pink, and orange mats, which were more similar to each other. Actinobacteria dominated the latter deposits. Bacterial phyla recovered across samples included Alpha-, Beta-, and Gammaproteobacteria, Actinobacteria, Acidobacteria, and Nitrospirae. Overall, the type of sample (mat versus mineral versus surface soil) made the greatest composition difference. Lava caves provide excellent...
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Preliminary Analysis of Ten Years of Biomonitoring Data from Lehman Caves, Nevada

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For the past ten years, cave biota have been surveyed at fourteen paired stations in Lehman Caves on a quarterly basis. A small amount of bait is placed at the station and removed the next day. A one-meter area is then searched at each station for cave biota. Over the ten-year study period, we have made over 2,900 observations on 40 survey trips. The most predominant taxa are grey springtails (n=1383), white springtails (n=974), millipedes (n=102), and pseudoscorpions (n=88). A marked decrease in the total number of taxa was shown from year 1 (n=702) to year 10 (n=94), but the downward trend has slowed over the last five, perhaps due to a change in baiting practices. Taxa were most abundant during autumn surveys (n=936) and least abundant during summer surveys (n=485). A comparison of taxa on and off trail showed that overall numbers were nearly equal; however flies, pseudoscorpions, and millipedes were much more likely to be found off trail than at near trail stations. Differences in sites that vary by visitation may be difficult to distinguish due to the effects of distance to entrance, with stations closer to the entrance generally having more taxa. This is one of the longest-running biomonitoring efforts in a show cave.

Gretchen M. Baker is an ecologist, Margaret A. Horner is a biologist, and Ben Roberts is the Chief of Natural Resource Management at Great Basin National Park. All have been involved in this study since its inception in 2006.

New Acoustic Bat Survey Methods Yield New Species at Timpanogos Cave National Monument

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In 2014 and 2015, Timpanogos Cave National Monument was awarded funding to enhance and expand bat survey techniques in order to more fully document species presence and behavior. This was done in an effort to better understand the bats of American Fork Canyon ahead of WNS entering the area. Adding to an eight year program of netting and trapping, Timpanogos Cave NM acquired state of the art acoustic monitoring equipment and training on its use. An acoustic monitoring guidance document was created and implemented. One summer and one winter of deployment has resulted in adding Euderma maculatum, the Spotted Bat to the park species list, with two more species likely to be added soon. In addition, NPS managers now have a much greater understanding of how different species of bats utilize different habitats within the canyon environment. This includes a better understanding of migration times, and how different species are using cave roosts on the monument.

Starving in the Dark: The Impact of Ultra-Small Cells in the Lakes of Wind Cave

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The lakes at Wind Cave National Park, South Dakota, provide a rare natural window into the Madison Aquifer. Lack of sunlight and long groundwater residence results in nutrient-limited conditions. Under such nutrient limitation, microbes adapt by reducing cell size to more efficiently absorb nutrients. Previously, theoretical limits on cell size allowed filtration of bacterial cells at a pore.
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diameter of 0.2um. However, the recent detection of ultra-small cells (smaller than 0.2um) in other aquifer systems suggests that community diversity of the lakes in Wind Cave may have been underestimated due to ultra-small cells. To test this hypothesis, we compared community profiles from microbial communities collected using 0.2 and 0.1um filters. Approximately 140L cave lake water was filtered and DNA was extracted for 16S rRNA community analysis, amplified using universal bacterial/archaeal 16S rRNA primers, sequenced on the Illumina MiSeq platform and evaluated using QIIME and the Greengenes and SILVA databases. When comparing assigned taxa between 0.1um and 0.2um samples, the communities appear to be similar; however, up to 30% of the OTUs in the 0.1um filter sample remained unassigned to representative taxa, indicating that a large portion of the microbial community was previously excluded, and remains unclassified, due to cell size. This change in our knowledge of the community composition of the lakes has implications for future work in attempting to culture and categorize microbes from aquifers, uncovering processes that support survival in starved environments, and assesses the limits of cell size.

Iron Reducing Microbial Communities Associated with Brazilian Iron Ore Cave Formation

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The majority of caves form through the speleogenic processes of water-mediated dissolution, chemical weathering and erosion of karst-rich rocks. Nonetheless, there are increasing examples of caves whose formation cannot be attributed to these traditional speleogenic processes. Brazil has two of the world’s richest banded iron formation (BIF) deposits, the Carajas and Caue Formations, which contain high grade crystalline Fe. Despite the low solubility of both hematite and quartz (major components of BIF), along with the Fe-rich rock’s low erosion rate (0.29 and 2.35 m/Mya) and low weathering rate (2.37 - 2.69 m/Mya), the BIF regions of Brazil contain a remarkable number of caves (>3,000 iron ore caves; IOCs). Through molecular techniques we show evidence that IOCs contain a diverse microbial ecosystem dominated by the phyla Chloroflexi and Acidobacteria along with the sub-phyla Alphaproteobacteria, both of the latter contain Fe reducing species. These Fe reducing microorganisms (FeRM) identified through molecular techniques have the ability to reduce insoluble Fe(III) mineral phases into soluble Fe(II) that can be mobilized and removed with the flow of groundwater. Our work suggests that FeRM are not only present in IOCs but that their metabolism could be responsible for IOC formation itself. Though there are examples of microbial metabolism leading to the production of hypogenic caves in karst, Brazilian IOCs are the first example of biospeleogenesis occurring in Fe-rich rock.

A Little Drop Will Do: Surprises from Epikarstic Drip Water Microbiology

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Epikarst drip water flow rate and chemistry affect speleothem precipitation. Microorganisms affect (and control) drip water chemistry, whether the microbes live on epikarst surfaces, in drip water, or growing speleothem surfaces. However, an understanding of microbial roles to speleothem precipitation is lacking, mostly because the microbiology of water flowing through the epikarst is poorly known, as is the microbiology of drips once exposed in a cave passage. The microbiology and geochemistry from six drip water sites were sampled in the winter and summer from Cascade Caverns in Carter Caves State Resort Park, Kentucky (USA). Drip/seepage rates varied significantly between seasons, from an average of 37 L/min (winter) to 4.7 L/min (summer). The slowest drips in both seasons had the highest conductivity values, and there were significant differences in seasonal temperature and pH for the same locations. Total organic carbon varied seasonally, with an average of 7.1 mg/L in the winter to <1 mg/L in the summer. The slowest drips in both seasons had the highest conductivity values, and there were significant differences in seasonal temperature and pH for the same locations. The microbiology and geochemistry from six drip water sites were sampled in the winter and summer from Cascade Caverns in Carter Caves State Resort Park, Kentucky (USA). Drip/seepage rates varied significantly between seasons, from an average of 37 L/min (winter) to 4.7 L/min (summer). The slowest drips in both seasons had the highest conductivity values, and there were significant differences in seasonal temperature and pH for the same locations. Total organic carbon varied seasonally, with an average of 7.1 mg/L in the winter to <1 mg/L in the summer.
to summer communities, but seasonal communities originated from the same or similar sources (e.g., surface forest soil). Because sulfate reduction and methanogenesis affect CO2 and alkalinity balance, changes in microbial communities have important implications to speleothem formation.

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**The Impact of Tourism on Microbial Communities in Touristic and Pristine Caves, Chongqing, China**

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Xueyu Cave and Shuiming Cave are touristic and pristine sections, respectively, of the same karst cave system located in Chongqing, southwest China. To understand the impact of tourism on the microbial community compositions in cave stream water that flows through the both system, water was collected and 16S rRNA gene sequences were obtained for high-throughput sequencing. Shuiming Cave (the pristine cave) had less diversity than Xueyu Cave (the tourist cave) according to the Shannon's diversity index from Illumina operational taxonomic units (OTUs). Proteobacteria, represented mostly by Gammaproteobacteria, and Bacteroidetes dominated both systems. OTUs from Shuiming Cave were dominated by 38% Proteobacteria, 24% Chlorobi, and 19% Bacteroidetes. In Xueyu Cave, OTUs from upstream samples were comprised of 62% Proteobacteria but 64% downstream. In Xueyu Cave, Bacteroidetes represented 11% of the OTUs upstream, and 16% of the OTUs downstream. Among the Gammaproteobacteria, Acinetobacter and Pseudomonas spp., which are related to potentially pathogenic species, were prevalent in Xueyu Cave, whereas Methylobacter and Methylomonas spp., and uncultured Methylococcaceae, all methane-oxidizing bacteria, had high relative abundances in Shuiming Cave. Among the Bacteroidetes, OTUs related to potentially pathogenic species of Flavobacteriaceae were between 53% and 65% in Xueyu Cave. In contrast, in Shuiming Cave only 34% of the OTUs from Bacteroidetes were Flavobacteriaceae, with another 28% of the OTUs being related to Chitinophagaceae, which are considered to be hydrocarbon-degraders. These results reveal that potentially more pathogenic bacteria are present in the stream waters from the tourist cave, which has important implications for how touristic caves are managed.


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White Cave is a small (135 m) remnant trunk passage with the richest biota in MCNP. We have conducted a yearly visual census of the first 80 m of White Cave from 2003-2016. There are extreme fluctuations in populations of Hadenoecus subterraneus cave crickets, which are affected by weather as they must leave the cave to forage. Cave crickets are a keystone indicator species. Many other species depend on inputs of energy from cave crickets as guano, eggs, and carcasses. Cricket populations were high in 2003, reached exceptional lows from 2004-06, then fluctuated with another low in 2009, with a steady increase after that. Trogloxenic camel crickets (Centophilus stygius) and salamanders (Eurycea lucifuga) were highest in the early 2000s and show a steady decline to the present. While always low, no bats have been censused in White Cave since WNS arrived in MCNP in 2014. The pattern in numbers of predatory Meta cave spiders closely follows the numbers and distribution of cave crickets. Reproduction by the cave crickets is shown by comparing the ratio of the two smallest size classes of crickets to the two largest size classes. Large crickets normally exceed small crickets by 3-10x more, but in 2004 and 05 small crickets were at normal levels, but the great reduction in larger crickets flipped the ratio. The extreme variations in our long term data show the importance of repeated observations over time to monitor keystone species.
A Biological Inventory of Cave Point Cave  
(Stone County, AR)
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During the period of March 2009 through February 2016, 32 trips were made to Cave Point Cave in Stone County, AR. During these trips, we counted animals and collected water samples. Heterotrophic and autotrophic microorganisms were cultured from the samples, and identified by ribosomal gene sequence analysis. The cave is approximately 415 meters long, and most of the human-accessible passages follow an underground stream. Cave Point Cave has been used by the local populace for over 100 years, and is moderately vandalized. Presumptive fecal coliform bacteria were found in water samples throughout the cave. Notable vertebrate animal species within the cave included: salamanders (Eurycea lucifuga, E. longicauda melanopleura, Plethodon albagula, P. angustidavius, P. serratus); frogs (Rana palustris, R. clamitans, Pseudacris crucifer crucifer, Acris crepitans blanchardi); bats (Perimyotis subflavus, Plecotus rafinesquii, Eptesicus fuscus, Myotis septentrionalis); and other mammals (Procyon lotor, Marmota monax, Neotoma sp.). Common invertebrates include camel crickets (Ceuthophilus sp.), several varieties of millipedes (class Diplopoda) and spiders (order Araneae), helomyzid flies (family Helomyzidae), small beetles (order Coleoptera), mosquitoes (family Culicidae), springtails (order Collembola), bristletails (Litobolus sp.), amphipods (Stygobromus sp.), webworms (Macrocercus nobilis larvae), and pseudoscorpions (order Pseudoscorpionida). Members of the COBRA Grotto assisted during cave expeditions. This research was funded by the Arkansas Space Grant Consortium.

Genetic Analysis of Ozark Cave Bacteria
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The microbial diversity within cave ecosystems is largely unknown. Ozark caves maintain a year-round temperature of 12-14°C, which is within the viable range of most microorganisms. However, oligotrophic conditions in many caves may limit species diversity. Classical cultivation techniques provide some understanding of microbial biodiversity, but because only a small portion of microorganisms can be cultured in the lab, some species have been overrepresented while a large number remained unidentified. Molecular phylogenetic and metagenomic analyses have allowed the identification of nonculturable microbial species from many environments that were thought to be completely devoid of life. We used Ozark region caves as test sites for isolating potentially novel microorganisms and monitoring long-term biodiversity. Bacterial samples were obtained from cave surfaces, soil and water. DNA extraction of the bacterial samples was performed with Wizard® Genomic DNA Purification Kit. PCR amplification was done using two sets of primers: M13F-27Funiv-Bact and M13R-1492Rlong-Bact to amplify a fragment of the 16S rRNA gene in heterotrophic bacteria, and p23SrV_f1 and p23SrV_r1 to amplify a fragment of the 23S rDNA plastid in autotrophic bacteria. The PCR amplicons were sequenced at Genewiz using two universal primers (M13F and M13R-27). The Basic Local Alignment Search Tool (BLAST), was used to identify sequences in databases. Most of the bacteria identified so far belong to the Phyla Proteobacteria, Firmicutes, and Cyanobacteria. Metagenomic analyses indicated that microbial communities within the caves are different from each other and different from surface communities. This research was funded by the Arkansas Space Grant Consortium.
A Biological Inventory of Lafferty Spring Cave (Izard County, AR)

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During the period of July 2013 through April 2016, we completed fourteen trips through Lafferty Spring Cave. During these trips, we counted animals and collected water and soil samples. Microorganisms were cultured from the samples, and identified by ribosomal gene sequence analysis. A creek flows throughout the length of the cave, and emerges as Lafferty Spring below the cave’s entrance. The cave is approximately 200 meters long with a sump at its rearmost passage. This is a fairly typical limestone cave with both erosional and depositional formations. The cave creek has a gravel bed that is covered with clay and silt in places. This cave has the highest population density of salamanders of any of the caves we have studied to date. In June 2014, we counted 145 salamanders in a single trip. Conversely, bats are relatively scarce. The highest population counted was 45 tricolored bats (*Perimyotis subflavus*) in January 2016; two bats had visible signs of white nose syndrome. Notable vertebrate animal species within the cave included salamanders (*Eurycea lucifuga*, *E. longicauda melanopleura*, *E. longicauda*, *E. spelea*, *Plethodon albagula*), pickerel frogs (*Rana palustris*), and tri-colored bats (*Perimyotis subflavus*). Invertebrates include: camel crickets (*Ceuthophilus* sp.), spiders (order Araneae), mosquitoes (family Culicidae), heleomyzid flies (family Heleomyzidae), amphipods (*Stygobromus* sp.), daddy longlegs (family Sclerosomatidae), centipedes (class Chilopoda) and bladetooth snails (*Patera* sp.). Unlike most caves in the region, we found very little graffiti or other vandalism in this cave. COBRA Grotto members assisted during cave expeditions. This research was funded by the Arkansas Space Grant Consortium.

Cave and Karst Management
(Thursday afternoon)

Highlights for the National Park Service Cave and Karst Program

Dale L. Pate, National Cave and Karst Program Coordinator, National Park Service

Recent highlights from the national program include a continued push to know about and understand the cave and karst resources found within NPS park units through the development of cave and karst summaries and shared karst landscape reports. Education and outreach continues to be a significant part of the national program as well. This includes the very popular Junior Cave Scientist booklet and badges. With 19,500 booklets distributed from the 1st edition, a 2nd updated edition should be available by convention time. Outreach and communication continues through the publication of Inside Earth, the national program newsletter. Begun in 1998, Inside Earth moves into its 19th year of publication under the editorship of Bonny Armstrong (Many thanks to Timpanogos Cave National Monument for allowing Bonny to complete this during work hours.) An important highlight for the national program continues to be requests for technical assistance from parks and the many questions answered from park managers, outside organizations, and the general public.

The Bureau of Land Management Cave and Karst Program Update

Jim Goodbar, Senior Cave and Karst Resources Specialist, Bureau of Land Management

The Bureau of Land Management is responsible for managing over 1.33 million acres of karst lands in the eleven western states. On record we have over 1,000 caves designated as Significant and management plans written for approximately half of them. The current BLM primary initiatives include the continued development of national level cave resources management training courses. The current update is to offer the first unit of the course On-line and expand the

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instructor lead portion of the course to cover other sections in more detail and complexity.

This year the BLM funded $40,000 to field offices for local cave projects and WNS projects. Seventeen projects in seven states were awarded funding for projects that include; graffiti removal, C-14 dating, dye tracing, cave inventories, bat surveys, and environmental education. This is the 16th year Cave Project Funding awards have been given out.

The BLM is in the final stages of completing their Cave and Karst Resources Management Hand book. The handbook gives the on-the-ground guidance to field offices to implement the policies in the Manual. It includes updated Safety Standards, the how-tos of Significant Cave evaluation and designation, and ever so much more.

We are moving forward with Interagency WNS Response plans in Washington, Idaho, and Oregon.

The U.S. Forest Service Cave and Karst Program in 2016

Johanna Kovarik, National Cave and Karst Coordinator, U.S. Forest Service

Over the past five years, the Forest Service National Cave and Karst Program has moved forward with several key efforts. The program updated the Forest Service handbook with direction on cave safety protocol. National courses and regional workshops have occurred to train Forest Service employees in caves and karst management and more are planned agency-wide. The program developed guidance to assist forests in forest plan revisions, and is working to connect with forests individually to ensure that caves and karst are considered in these updated plans. Finally, the agency created national internal communication tools to facilitate broad understanding within the agency concerning all aspects of the program. At the forest level, forests are working to nominate and designate new significant caves, with forests adding caves to the list from the Pacific Northwest Region and the Rocky Mountain Region in 2015. One of the main goals of the Forest Service National Cave and Karst Program is to strengthen relationships with key partners at the national, regional, and forest level through facilitation and education. Partners from Cave Research Foundation, the National Speleological Society, and Bat Conservation International have mapped, cleaned, restored, documented, monitored, and studied our caves with skill, passion, and dedication. With limited budgets and diversified duties of resource managers, the assistance received from all of our partners has allowed a great quantity of work to be accomplished furthering the cause of cave conservation.

JBSA – Camp Bullis: Cave and Karst Resource Management by the Department of Defense in San Antonio, Texas

Chris Thibodaux, Cave and Karst Specialist, 502d CEIEN, Natural Resources

JBSA-Camp Bullis is a nearly 28000 acre military training facility located on the west side of San Antonio, TX. The Sykes Act requires military installations with significant resources to produce an Integrated Natural Resource Management Plan (INRMP). This document is produced and signed in coordination with the USFWS and the State fish and wildlife agency, the Texas Parks and Wildlife Department (TPWD). In addition, 2 biological opinions filed with the USFWS require significant management activities related to cave adapted species and groundwater pumping.

To date, JBSA Camp Bullis has identified over 1400 caves and potential karst features within the Edwards Aquifer Recharge and Contributing Zone. 112 known caves have been located within its’ boundaries. 74 of these caves and karst features have been identified as containing endemic species of concern and/or one of three federally listed endangered karst invertebrate species. A fourth species of aquatic salamander is currently proposed for federal listing under the Endangered Species Act and currently receives management as a state threatened species. Karst Preserves have been set up for all 74 of these sensitive environmental features. These preserves are maintained with particular emphasis on non-native species control; most specifically the Red Imported Fire Ant (RIFA), Solenopsis invicta. The 29 caves known to contain the federally listed species are subject to more intensive management guidelines involving direct monitoring of species and habitat health and threats. In addition, these karst preserves serve to protect the land as valuable groundwater recharge areas.
Development of Two Cave Management Plans at Great Basin National Park

Gretchen M. Baker, Ecologist, Great Basin National Park*

Ben Roberts, Chief of Natural Resources, Great Basin National Park

Great Basin National Park is currently developing a Lehman Caves Management Plan and a Wild Caves Management Plan. The Lehman Caves Management Plan includes an updated natural and cultural history for the cave, as well as management guidelines. These guidelines will be implemented as funding becomes available. Changes from current operations may include adding additional types of cave tours, such as historic, photographic, and wild tours; changing the maximum tour size; updating infrastructure while minimizing impacts to the cave; and developing virtual tours of the cave and other educational and outreach opportunities available at and near the visitor center as well as remotely. The Wild Caves Management Plan includes the other forty caves in the park. Management objectives include to regulate or prohibit uses that would cause resource damage to cave systems, protect and preserve biodiversity, manage cultural resources, prioritize safety, encourage, facilitate, and conduct high-quality scientific study, use partnerships and volunteer resources where feasible, support cave and karst systems education and outreach, and provide recreational access to selected wild caves. Tribal involvement has been ongoing and the park would like to reach out to the public to get feedback as these plans are refined. To be involved in the cave management planning process, please email Gretchen_Baker@nps.gov.

New Tunnel Doors Protect Microclimates of Timpanogos Cave System

Andy Armstrong, Cave Resource Specialist, Timpanogos Cave National Monument

Joinied by artificial tunnels in 1936-1939, the three caves of the Timpanogos Cave System have seen alterations to their natural airflow patterns, temperature and relative humidity as a result. Beginning in the 1970s, tunnel doors have been utilized to isolate the caves and reduce these impacts. Early versions of the doors were only partially successful. In 2015, the NPS installed stainless steel cold-storage type doors in order to establish effective isolation between the three cave environments. During the 2015 tour season, active dripping of formations was observed in areas that had been dry for many years, and the wet areas persisted longer into the season. During the 2015-2016 winter, the new doors prevented cold, dry air from spilling into the interior of the cave system. Managers are noticing a stabilization of cave temperature and humidity, with the artificial chimney-effect airflow between the caves having been essentially eliminated.

The Southeastern Cave Conservancy, Inc. – “Sharing Secrets”

Bill Stringfellow, Director and Founder, Southeastern Cave Conservancy, Inc.

It started 25 years ago with a small group of Atlanta, GA cavers who wanted to try something new: create a land conservancy dedicated solely to cave conservation with a never-wavering eye to recreational caver access. The idea turned into something much bigger than ever imagined. The Southeastern Cave Conservancy, Inc. (SCCi), is now the largest land conservancy devoted specifically to caves and karst environments. It has gained this status through the hard work of many individuals, good timing, and patience. Today, SCCi conserves 170 caves on 30 preserves in 6 southeast states. From Fricks Cave in North Georgia which is closed 364 days a year to protect a 10,000 endangered gray bat colony to Howards Waterfall Cave which is visited by hundreds of people a year, SCCi strives to balance conservation with recreational access.

SCCi has been very effective at raising funds for stewardship and acquisitions through programs such as sustaining memberships. SCCi sustaining members make up 40% of all memberships and provide monthly contributions. For SCCi, this means a solid financial footing to continue expanding stewardship of current preserves and supporting future acquisitions.

Sharing the Secrets is a short film funded by the Southern Environmental Law Center as part of their Southern Exposure fellow program. The film was shot in Alabama Caves over a two-week period. It covers Secret Waters, Secret Beauty, Secret Life and Secret Adventures that are to be found in caves and stresses the importance of conservation in sharing these secrets.
The Western Cave Conservancy – “Protecting the West’s Last Frontier”
Chuck Chavdarian, Land Research Director, the Western Cave Conservancy
Mark Bowers, Public Relations Director, the Western Cave Conservancy

The Western Cave Conservancy (WCC), an all-volunteer organization, was incorporated in California in 2002, and currently consists of eight Directors (who are also cavers), a large advisory board, and general members. Various volunteer committees undertake tasks such as the management of specific caves, conducting various cave projects (survey, restoration, gating, research), public education (including newsletters), the generation of promotional materials, etc. The goal of the conservancy is the protection and management of threatened caves throughout the western United States.

In this presentation, with photos, we will show the current caves under WCC supervision and provide examples of different approaches to cave management: (1) the management of caves on behalf of a government agency or private land conservancy, (2) direct cave ownership, and (3) the leasing of cave properties from private landowners. With videos of recent gate installations by a professional contractor, we will demonstrate the protection of two caves leased by the WCC. We will discuss terms and costs of leasing, as well as the benefits to both the landowner, the WCC, and the caving community at large. Also, the promotion of WCC activities will be discussed.

The West Virginia Cave Conservancy - Successes and Challenges
Bob Hoke, Treasurer, West Virginia Cave Conservancy

The West Virginia Cave Conservancy is a 501(c)(3) West Virginia corporation that owns the entrances to eight caves and manages three other caves. Most of the caves are in the cave-rich karst of Greenbrier County, WV, but two caves are in Virginia and one is located about 175 miles north of Greenbrier County. Three of the owned caves were purchased and five were donated. The Conservancy keeps its caves open for recreational use and scientific study by properly equipped cavers unless special circumstances require limiting access. Two of the caves are restricted because one is an archaeological site and the other has a significant bat colony. Funding for the purchased caves came from donations by the caving community. The Conservancy is, of course, always looking for additional acquisitions, but acquiring caves is a long-term effort because most owners are reluctant to break up their property. The Conservancy generally maintains a low profile, but there are some community outreach activities to let local landowner know the Conservancy exists and to provide karst education. One of the biggest challenges the Conservancy faces is getting volunteers to help maintain its properties and to serve as officers and directors. The current volunteers are getting “long in tooth” and finding replacements is proving to be a challenge.

Cave Management by the Northeastern Cave Conservancy
Thom Engel, Preserve Manager, the Northeastern Cave Conservancy

The Northeastern Cave Conservancy (NCC) was founded in 1978 to accept the donation of Knox Cave, a former commercial cave and the site of a fatality in 1975. In 1998 Onesquethaw Cave was given to the Mohawk-Hudson Land Conservancy (MHLC) by Albany County. MHLC asked the NCC to manage the cave. The NCC, at the time, was just 3 officers and a handful of others. In 1999 the NCC became a membership organization and obtained charitable status under 501(c)(3). The Sellecks Karst Preserve, the second preserve we owned, was acquired in 2002. Sellecks protects 15 acres of a recharge area for McFails Cave, owned by the NSS and the longest known cave in the northeast. Since 2002 we’ve acquired or have been given seven more preserves. These include: Clarksville Cave, the most popular wild cave in the Northeast. We get over 3000 visitors a year; Merlin’s Cave, a pristine marble cave; Bensons Cave, the downstream end of a commercial cave. Additionally, the NCC has been involved with several projects including the mapping and inventorying of the caves and karst in John Boyd Thacher State Park in New York.

Challenges of Cave Access and Conducting Speleology in Huautla de Jimenez, Oaxaca, Mexico
Bill Steele, Proyecto Espeleologico Sistema Huautla, National Speleological Society (8072 LB-FE-AL)

The discovery of and first rappel into an entrance of what is now called Sistema Huautla, occurred 50 years ago this year. Since that time and through much work the cave has 20 entrances, is the deepest cave in the Western
Hemisphere, the 8th deepest cave in the world, and the longest of the 17 deepest caves in the world. Following the 2016 expedition it is 1560m (5,117 feet) deep and 75.5km (46.9 miles) long. Proyecto Espeleologico Sistema Huautla (PESH) was organized in 2013 as the restarted project to conduct annual month-long expeditions to this area for ten years. The 2016 expedition was the third of these.

One of PESH’s goals is to gain access to all of the entrances within the Sistema Huautla karst drainage system. This is difficult in some areas due to the local residents being Mazatec Indians with ancient beliefs about cave spirits residing in the caves and a historic mistrust of outsiders. Another of PESH’s goals is to support the work of Mexican cave scientists. PESH is making progress with community relations through the strategies of good local government relations, brochures about the project in Spanish and Mazateco, presentations about the caves in schools and to community groups, and by consulting a curandero, who conducted a ceremony with the cavers to get things right with the cave spirits. The ceremony involved copal incense, beeswax candles, cacao beans, prayers in Mazatec, and the sacrifice of a turkey which was dropped into a 200 foot deep pit.

Cave Management Update from Grand Canyon National Park

Ben Tobin, Grand Canyon National Park

Since January 2015, numerous projects have been ongoing in caves of the Grand Canyon. Management activities have focused on four main areas: karst aquifer documentation, paleontological resource documentation, survey and inventory, and development of a 3D modeling methodology for long-term resource monitoring. Researchers and park staff have combined to survey (and resurvey) and inventory over 10 miles of cave in over 10 different caves. Additional work has focused on understanding the hydrology of karst springs, including attempting the first dye trace in the canyon. Another project has focused on improved methodologies for photomonitoring and resource documentation: adapting photogrammetry methods to cave environments. These projects are all focused on providing necessary information for park management actions.

Cave Photography
(Thursday morning)

Open-source (free) software for photography
Kenneth Ingham
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Open-source software provides nearly the same capabilities that commercial software provides. In particular, free software has systems that rival Photoshop, Lightroom, and Adobe Camera Raw, among others. Additionally, even cameras now have open-source operating systems for them. I will demonstrate several of these software packages, and tell where you can download them for your computer or camera. This talk is an update of one I gave in 2013.

Creative lighting can improve your cave photos; photos can improve your caves.
Brent McGregor
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Outdoor photographers often wait for the magic light of early dawn and late evening to avoid a landscape of sun drenched highlights and just too many stops of light for the camera to deal with. Cave photographers, on the other hand, create most of the light in their photos which gives them considerable control when making their photographs. Creating dramatic images can be challenging, but the more you know about your camera gear and the cave environment you are shooting, the more likely you are to walk away with a great shot.

Brent will show alternative options not involving a flash and slave units, but rather, light painting and LED panels which have their place in cave photography. Other subjects covered are Macro, using models for scale, and
using photography to protect our caves. References to post production will be used to complete the photo vision.

**Using studio strobes in caves**

Kenneth Ingham  
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Ingham@i-pi.com

Improving battery technology is allowing powerful studio strobes to be portable. I recently acquired a Godox AD600M, which is a 600Ws studio strobe with a LiIon battery pack. This strobe is at around six times as powerful as the most powerful speedlights. Having this much light makes some big room photos easier than using multiple smaller flash units.

Come see example photos and judge for yourself.

**Big Volume Photography in Some of the World’s Largest Caves, Hang Son Doong and the Phong Nha Cave System**

Dave Bunnell  
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I was fortunate to go on the first Photography trip to Hang Son Doong in Vietnam offered by Oxalis Adventure Tours, and to several other caves in the same cave system. Using a combination of huge LED lights, flashbulbs, and high power strobes, and shooting in RAW, I managed to get some pretty good shots. This talk focuses on issues involved with using these by themselves and mixed with daylight to get the best shot. Issues include color temperature differences, difficulty in matching daylight exposure times to LED light times, use of high power lights and post processing the images. Another issue in these big caves is the parallax effect in shooting large formations from floor level and how to correct for everything looking like the leaning tower of Pisa.

**Art vs Documentation.**

Josh Hydeman  
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Caves are a place of darkness. In order to photograph these spaces artificial light is necessary. Cave photographs contain human models to show scale; the way these models dress and pose influence the image. There are many decisions that determine the outcome of an image captured in a cave.

Throughout my career as a cave photographer I have been told that my photographs are “art.” What does that mean? What are the factors that distinguish if a cave photograph is considered documentary or art? Realistic or unrealistic? Art vs. Science? Can an image function simultaneously as a document and a “work of art?” I will be using examples of my own work as well as the work of many other cave photographers to provoke thought and questions behind this topic.

**Communications and Electronics**

*(Monday morning)*

**Navigation and Communications Under and Through the Ice in Antarctica – Taking Radiolocation to the ends of the Earth**

Brian Pease  
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In the fall of 2015 I spent 2 ½ months in Antarctica working on a NASA funded project called SIMPLE, which stands for Sub-ice Investigation of Marine and PLanetary-analog Ecosystems. My main task was radiolocating the unmanned underwater vehicle ARTEMIS to aid in improving its dead reckoning navigation under the ice, and for emergencies. A second task was to test ways of communicating with ARTEMIS through the ice. Stone Aerospace (Bill Stone) in Austin Texas built and fielded the ARTEMIS vehicle, which carried many science sensors.

I constructed a radiobeacon for ARTEMIS with a large ferrite rod antenna and push-pull Class-E amplifier. I
also designed a 2MHz radio system with a floating wire antenna to attempt 2-way RF communications through the ice.

High winds and white-outs delayed camp construction for a month.

ARTEMIS was deployed through an ice hole for several data gathering missions. At pre-programmed stops, I would radiolocate the vehicle and record its GPS location. Radiolocation was very challenging due to the highly electrically conductive sea water and the very uneven conductivity of the ice. I eventually succeeded in every location attempted.

The 2MHz radio tests with ARTEMIS were not attempted due to a bad connection deep inside the vehicle. A fixed test with the floating antenna placed under the ice failed due to the unusual nature of the sea ice.

Drilling a Cave Radio Location
Paul R. Jorgenson KE7HR NSS 39382
ke7hr@cox.net

A cave radio beacon was used to locate a point for drilling into Grand Canyon Caverns, a private commercial cave. A new section of the cave was discovered by cavers and an access hole for an electrical drop was needed into this section. A video documenting the location and drilling of the access hole will be presented along with discussion of the technical aspects of the beacon.

Laser Stimulated Fluorescence
Paul R. Jorgenson KE7HR NSS 39382
ke7hr@cox.net

A technique developed by Tom Kaye to use lasers and other high frequency light sources to stimulate fluorescence in minerals, photograph the result through a filter, and post process the image will be presented. The technique is being applied to highlight details not otherwise visible in fossils and also cave formations. For the first time we are now able to do entire cave panoramas, using this technique. Information on safety aspects of the technique and the technical aspects of the electronic system will be presented.

An Update on the $300 DIY Cave LIDAR
Bob Buecher
buecher@comcast.net

This will be an update on my $300, DIY Cave LIDAR. I’ve incorporated the new LidarLite sensor which increases the scanning speed by 50% and improved the over-all mechanical design.

High Accuracy Vertical Slope Measurements in Caves Using Micro-barometers
Bob Buecher
buecher@comcast.net

I have been using micro-barometers / altimeters to make vertical slope measurements in Fort Stanton Cave. The slope of the 10 mile long Snowy River is approximately 0.2% and could not be accurately measured by conventional cave survey techniques. By using 4 micro-barometers I was able to determine the passage slope to an accuracy of plus or minus 2 feet. As a bonus the elevations were confirmed with a radio location.

A Method to Determine the Accuracy of Cave Radio Locations
Bob Buecher
buecher@comcast.net

I have developed a method to determine the error of cave radio locations. Usually cave radios are used to independently confirm the accuracy of a cave survey. But, how accurate is the cave radio location? I have used a method that I call “Single Blind Cave Radio Location” to determine the accuracy of the radio location itself. Several tests of this method have shown that horizontal cave radio locations can be accurate to within 1% of the depth.
Western Bat ID Workshop

Jason Williams, Nevada Department of Wildlife
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Most bats in the western U.S. use cavernicolous features either primarily or secondarily throughout at least some part of their life cycle. Individuals that encounter bats in caves can be both beneficial and detrimental to bats, depending on the encounter and how invasive it is to the bats. This workshop will discuss what bat species are using caves in the west, how their use/needs change seasonally, how to identify bats when practical, what you should and should not do around bats when underground during certain times of the year, and what data from your caving expeditions may be useful to pass along to wildlife managers.

The Workshop will run about two hours, followed by bat talks that will set the stage for our joint Conservation/WNS lunch discussion, questions, Brainstorming Roundtable. Most bats in the western U.S. use cavernicolous features either primarily or secondarily throughout at least some part of their life cycle. Individuals that encounter bats in caves can be both beneficial and detrimental to bats, depending on the encounter and how invasive it is to the bats. This workshop will discuss what bat species are using caves in the west, how their use/needs change seasonally, how to identify bats when practical, what you should and should not do around bats when underground during certain times of the year, and what data from your caving expeditions may be useful to pass along to wildlife managers.

Managing the Spread of *Pseudogymnoascus destructans* and Conserving Bats Threatened by White-nose Syndrome in North America

Bronwyn Hogan¹, Jeremy T. H. Coleman², Jonathan D. Reichard³, Christina Kocer³, and Richard Geboy³, U.S. Fish and Wildlife Service
¹ Sacramento, CA; ² Hadley, MA; ³ Bloomington, IN

White-nose syndrome (WNS) is an infectious disease, caused by the fungus *Pseudogymnoascus destructans* (*Pd*), which is responsible for decimating hibernating bat populations in eastern North America. WNS continues to spread and now has been confirmed in 7 North American bat species in 29 states and 5 Canadian provinces. The fungus infects torpid bats resulting in physiological and behavioral impacts, often leading to mortality. Corresponding population declines exceeding 90% have been documented at many hibernacula. *Pd* was likely recently introduced to North America and it has been documented on numerous bat species across Europe and Asia. Coordinated plans in both the U.S. and Canada provide the framework for a comprehensive North American response and working groups have been established to address the research and management needs for affected bats. The U.S. Fish and Wildlife Service is the lead federal agency coordinating the response to WNS in the U.S., and since 2008 the agency has allocated over $32 million to the response. The Service has provided the majority of funding, with additional funds coming from other partner agencies and organizations in the national response team for important research that has led to promising disease treatment and management strategies, as well as advancements in our understanding of bat hibernation physiology, population dynamics, disease ecology, and general bat behavior. Collaboration between the many groups engaged in the WNS response and management of bat species remains critical to continue the considerable advances we have made in our understanding of this disease and conserving bats.

Tips and Tricks for WNS Decontamination Protocol

Jennifer Foote, NSS WNS Liaison
wnsliason@caves.org

The new National White-Nose Syndrome Decontamination Protocol was released by the U.S. Fish and Wildlife Service in 2016. This presentation will provide a common sense interpretation of the seven (7) page document. Did you know that if you have an unused turkey fryer, you could reuse it, and save bats by sterilizing your dirty underwear in it? This is one of the tips and tricks you might learn if you attend this presentation.
Speleothem Repair Technique PowerPoint
Jim C. Werker & Val Hildreth-Werker
werks@cunacueva.com

A slideshow will be available during Conservation Tuesday Lunch and Breaks. It shows cave-safe, minimum-impact materials, techniques, and protocols in formation repair, including large stalagmites, long heavy stalactites, tiny helictites, and a variety of other speleothems. Jim and Val will be available for questions.

Caver Village Study
John M. Wilson
Maria Alejandra Perez

A sociocultural anthropological study entitled “Caver Villages: Community, Sense of Place, and Conservation of the Underground, A Comparative Study” will describe the history, function, and structure of caver villages. The researchers are in the discovery phase of the study and have documented four existing caver villages in Virginia, Hawaii, Tennessee, and Texas. There may be others in the United States and elsewhere.

While the definition of a caver village may change depending on the data collected, some of the features of the caver community initially are defined as:

1. A concentration of cavers living in a relatively compact area.
2. A community in which some cavers own homes in the village.
3. The village cavers have a sense of community, and probably a formal organization.
4. The village cavers have a significant percentage of the population but may not be the majority of the people in the community.
5. The caver population of the village may also include migratory cavers and satellite caver residents.

It is plausible that some caver villages may be part of a much larger community or city but have some structure or organization that identifies these cavers as belonging to a village within a city.

Please notify us of the existence of a caver village, anywhere in the world; and send its location, the name, and email address of a contact person to both authors.
John M. Wilson, jmwgeo@gmail.com and Maria Alejandra Perez, maria.perez@mail.wvu.edu

Protecting Cuevas de Bellamar, Cuba: A Conservation Success Story
Esteban Grau – Sociedad Espeleológica de Cuba

In 1992, a new conservation project of the Cuevas de Bellamar began with the discovery of 10 kilometers with new galleries of extraordinary beauty and the confirmation of the existence of a major paleocave of 23 kilometers. Speleological societies of various countries, educational centers, and the participation of the community that lives on the area above the cave have all come together with the objective of protecting and resoritng the 545 hectares that cover the great paleocavern. The result has been a successful endeavor of environmental education, as well as the training in and of promotion sustainable livelihoods for the local population.

It Was a Dark and Stormy Night When the Crickets Returned: Recovery of Biota After Cleaning a Heavily Impacted Commercial Cave (Crystal Cave, Kutztown, PA)
Doug Soroka, Greater Allentown Grotto, Allentown PA
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Crystal Cave in Kutztown, PA, is the oldest continually operating commercial cave in the state, currently with about 40,000 visitors a year. Early visitors were guided using candles, oil, and kerosene lanterns. For a grand lighting, kerosene was spilled onto flowstone and set ablaze to illuminate some of the larger rooms. The first rudimentary electrical lighting was installed in the 1920s. The cave has been heavily impacted by humans, and showed it. In 2007 the Greater Allentown Grotto began cleaning lampenflora growth around lights. In 2009 power washing of formations and surfaces began. Prior to power washing a biological inventory showed no animal life along the tourist trail or in lower passages. It was estimated that 80-90% of the visible rock was coated with dark deposits of lint, dirt, grime, and smoke. SEM studies of biovermiculations showed clay, synthetic fibers, algae, bacteria, and diatoms. The wash water showed silt and clay, but no hydrocarbon residue was detected. It took three years to complete power washing the cave.

Occasional small animals were noted on the clean areas of the cave. Sand was mixed with clay and small rocks, and placed off trail for possible use by cave crickets. In 2015 a large number of Centrophilus camel crickets arrived,
observed massing by the entrance to exit the cave for nightly foraging. There are few reported troglobites in Pennsylvania caves, and no historical records of cave animals from Crystal Cave. We hope the return of the crickets shows the improved environment for cave animals, and we will continue to monitor the biological recovery of the cave.

Sandia Cave: New Mexico Rock Art Restoration Project

Carrin Rich, Sandra Arazi-Combs (USFS), Pete Lindsley
Sandia Grotto of the NSS

Val Hildreth Werker & Jim C. Werker, NSS Conservation
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During the 2015 Sandia Cave Restoration Project, several New Mexico organizations photo-inventoried and removed decades of graffiti from the famous Sandia Cave site north of Albuquerque. Dozens of local volunteers and Forest Service employees worked under the guidance of rock art specialist, Jannie Loubser, Ph.D. Before-and-after photos depict the etched and spray-painted defacement of the site and the extent to which workers were able to restore these areas to a more natural-looking state. We employed special methods for this type of critical restoration to protect discovery/preservation of potential cultural markings as well as cave features previously obscured by graffiti and rendered visible again. Historic and prehistoric markings in the first two chambers of the cave revealed themselves through close-up photos and digital enhancements. Through our Sandia Cave Open House event held during the project, amazing public outreach resulted in education, enthusiasm for the site, and a surprising and continuing outcome of “No New Graffiti” during the first year of clean cave walls! The net result of the Sandia Cave Restoration Project sums up bold changes in pop-culture trends among the thousands of New Mexicans who regularly visit this significant archeological site.

CaveSim Enhances Public Conservation Outreach

David Jackson, CaveSim Designer and Founder
Tracy Jackson, CaveSim Outreach Educator
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www.cavesim.com

Join us for this presentation and special tour of CaveSim, a traveling cave conservation experience. The technical features of CaveSim will be reviewed, with special emphasis on its use in promoting cave conservation and education to the public.

Only one in every 31,890 Americans is a part of the National Speleological Society. If our mission is truly to protect and study caves, we may need to broaden our approach. CaveSim is building a solution: artificial caves that teach good caving ethics by providing real-time feedback to visitors who cave carefully. Electronics behind speleothems, artifacts, and cave creatures give immediate audible and visible feedback for careless caving practices. Designed to increase people’s understanding of caves, cave simulators take conservation concepts directly to the public with hands-on challenges. Real-time data logging tracks the progress and skill of each caver as they navigate the obstacle course and displays results on computer monitors as they exit the cave. CaveSim’s mobile cave has been a huge success with science museums, public fairs and festivals, schools, and youth groups. This Conservation Tuesday Talk will begin with a PowerPoint before moving outside to the mobile CaveSim trailer where over 60 feet of passage will be open for exploration. Review our evidence suggesting cave simulators are effective tools for cave conservation education, or crawl through and judge for yourself. Careful conservation-wise caving ethics always win out over speed.
Abstracts

**Disto X2 Session & Workshop**
(Monday afternoon)

**DistoX2 Basics**

Fofo Gonzolas

The DistoX2 is a great tool that makes cave surveying faster, more accurate and more fun. This session will cover the basic modes and operation of the unit, as well as providing tips and hints on its operation.

**Introduction to Digital Sketching with TopoDroid**

Angela Morgan

This session provides a brief introduction to digital sketching using the DistoX2 with TopoDroid on an Android tablet. Participants with their own gear (DistoX2, tablet, stylus) may follow along with examples. A discussion of the pros, cons, and limitations will be conducted.

**Easy Calibration of the DistoX2 using a Wooden Triangular Frame**

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The DistoX2 has been a great advance for cave survey. However, the DistoX2 requires periodic calibrations of at least 56 readings. The described procedure allows one person to take the calibration readings for the E7400x-based DistoX2 in bright sunlight in about 10 minutes. A home-built wooden triangle with a plywood back and non-magnetic brass screws was constructed for about $20 worth of materials. The triangle has a size of approximately 15 inches x 15 inches x 3 inches, providing a platform for taking the measurements. By utilizing the squareness of the DistoX2 case, calibration is performed inside the triangle without the use of any external targets. Any non-magnetic location is selected for calibration. The triangle is placed flat on the ground for 4 vectors, tipped up for another 4 vectors and rotated on the ground for another 4 vectors. Finally, the triangle is pointed up for the last 2 vectors, making a total of 14 vectors, each with 4 roll orientations of the DistoX2. Data is processed in the field using TopoDroid. Using this procedure, an average convergence error of less than 0.08 degrees has been achieved.

**Hands-On Calibration Workshop**

Ted Lappin, Howard Kalnitz, Fofo Gonzalez, Angela Morgan and Carol Vesely

During this segment of the workshop we will head outside where various workshop participants will demonstrate their calibration devises. People who have brought their DistoX2s will have an opportunity to calibrate them using the calibration devises and techniques presented at the session. Bring your DistoX2 and tablet or computer if you have them.
Abstracts

The Future of Cave and Karst Science & Exploration
(Friday morning)

The Future of Cave Exploration and its Contributions to Cave Science

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The history of cave science is tied closely to advances in cave exploration. As technology has allowed further and longer exploration underground, our understanding of the subterranean world has deepened. However, I see humanity on the cusp of a new style of exploration. Over the next 100 years, the technological advances in our physical exploration of caves will likely be incremental and relatively small. But our abilities to explore those environments through technological surrogates will increase exponentially and further blur the fuzzy line between exploration and science.

I divide the next century of cave exploration into three overlapping periods:

**The Future is Here, the Next 35 Years.** Major advances will occur through refinement and application of recently developed technologies, such as drones, LiDAR, photogrammetry, and integration of geophysical tools.

**The Future is Almost Here, 35-65 Years Ahead.** Existing and fledging current technology will be miniaturized, ruggedized, and reduced in price where field analyses of minerals, air, biota, and water will be affordable to cavers. Robotic and miniaturized robotic exploration will allow regular study of hot volcanic caves, geysers, and other humanly inaccessible cavities.

**The Future is Out There, 65-100 Years from Today.** Exploration of caves elsewhere in the Solar System will begin to mature.

While technology will reduce direct human presence in some future cave exploration, I believe the spirit of exploration will soar through these new tools.

Laminar Flow and Cave Development in Eogenetic Rocks

John Mylroie and Joan Mylroie
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Traditional quantitative modeling of epigene cave development has demonstrated that flow transitions from laminar to turbulent conditions at “breakthrough”, when dissolitional pathways reach approximately 1 cm in size (width or diameter, depending on the model). These models assume that the rock is telogenetic, with little primary or matrix porosity, and that flow initiates through planar features such as joints, bedding planes or faults (which can be summed as “fracture flow”). Work over the last few decades on hypogenic caves has challenged this model, as deep circulation and mixing occurs primarily as laminar flow. Because hypogene speleogenesis occurs at depth over long periods of time, it is difficult to observe directly to demonstrate that model assumptions are correct. Flank margin cave development by mixing dissolution in coastal environments offers a novel laboratory for laminar flow modeling. The majority of these caves are in eogenetic rocks with high primary (matrix) porosity, a consequence of cave formation proximal in time and space to the original site of carbonate rock deposition. The dissolitional drive for flank margin cave development is essentially an infinite geochemical pump, which allows modeling to focus on the nature of dissolution dispersed through a granular three-dimensional flow system. The striking similarity of hypogene speleogens to those found in flank margin caves suggests that the origin of the dissolitional potential is secondary to the flow dynamics and pathways found in laminar flow conditions. Flank margin caves offer a robust and tightly constrained modeling environment for understanding laminar flow dissolution.
Hunting for Caves with Microbes and Beakers: Using Metagenomics and Chemistry to Explore for the Extension of Ft Stanton Cave, NM

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Analytical science is moving toward less invasive and more sensitive methods, and karst science is no exception. While artificial tracers have been used for decades to understand water movement in the subsurface, natural tracers represent the cutting edge of hydrologic analysis.

Fort Stanton Cave in central New Mexico contains Snowy River passage, explored to over 19 km in length with no end in sight. A creamy-white calcite crust covers the floor of the borehole passage, forming what is likely the world’s longest continuous speleothem. Snowy River floods intermittently, but the source of this flow has never been identified. Determining the source of the water and the location of the passage are important for the protection of the cave as it approaches developed areas on the surface. Water samples collected from several losing streams, along with samples from the cave, provide a means of comparing water chemistry. More distant Eagle Creek is a good potential source of water in Snowy River, whereas nearby Little Creek is high in chloride and trace metals and is not a viable candidate unless extensively diluted. Samples of speleothems near the end of mapped passage demonstrate the presence of pathogenic Enterobacteriaceae. A neighborhood waste treatment facility exists near Little Creek, and the sampling site in the cave is about 1 km horizontally from and 167 m below an insurgence pool. While the chemistry indicates that Little Creek is not a major water source for the cave, metagenomic data, nevertheless, provides support that enteric bacteria from the surface are brought in from Little Creek.

Extraterrestrial Caves: Advanced Technologies in the Search

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Detection of caves on other bodies in the solar system and the potential for others is sparking interest in the subject. Apparent volcanic caves on some Solar System objects are probably produced by processes similar to those we find on Earth, but on icy objects (e.g. Titan or Europa) unknown speleogenetic processes may be at work. Finding and subsequently exploring such caves is of great interest for science, and even human exploration in some instances (Moon and Mars). Promising new approaches to future extraterrestrial speleological exploration and study include: 1) thermographic contrast mapping from orbital or aerial platforms, 2) radar imaging of several types, 3) robotic exploration, and 4) entirely new methods like muon imaging.

I will discuss case examples including: 1) ground-based infrared camera trials that have been conducted in New Mexico, West Virginia, Missouri, Greece, and the Atacama Desert, Chile, 2) radar imaging of Titan, orbiting Saturn, exhibiting cryovolcanism and subsurface structures, 3) muon imaging efforts to “see through” rock to detect cavities, and 4) robotic concepts like high energy-density polymer “muscle” actuated hopping, self-deploying microbots for subsurface sensing & telemetering networks or unique clinging and climbing robotic mechanisms that are being developed.
Integrating Conceptual and Geochemical Models in Cave Water Research

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Conceptual models have been applied universally to describe specific modes of speleogenesis and to understand the chemical origin and evolution of cave waters. Application of more robust geochemical models can be used to strengthen or validate existing conceptual models, and also provide the capability to quantify a variety of geochemical processes. The objective of this presentation is to provide an overview of studies regarding the integration of geochemical models with conceptual models of karst development and cave pool evolution. Geochemical modeling codes have been used to simulate and quantify corrosion-mixing induced calcite dissolution, and thus allow for temporal and spatial simulation of cave development when used in conjunction with hydrologic models. Modeling codes have also been utilized in studies concerning the origin and geochemical evolution of cave pool waters. Conceptual models are presented for the development of the Dilithium Pool and Briny Pool in Lechuguilla Cave (New Mexico), and subsequent geochemical modeling was conducted using the existing conceptual models as a geochemical framework. Modeling results indicate that gypsum oversaturation in the Dilithium Pool could result from infinitesimal evaporation and/or cooling, and that evapoconcentration of typical Ca-Mg-HCO3 cave pool water can evolve into a Na-Mg-SO4 water which exists in the Briny Pool. In both cases, the modeling results are consistent with existing conceptual models, and exemplify the fundamental processes contributing to their geochemical origin and evolution.

Island Karst Update: Newly Documented Phenomena from Cat Island, Bahamas

Nancy Albury, Michael Lace, Joan Mylroie, John Mylroie
Coastal Cave Survey

During field work on Cat Island Bahamas in February of 2016, 34 caves with 2.8 km of survey were documented from across the island, revealing several unique karst features. Cat’s Cradle, an inland blue hole, is a progradational collapse structure that breached a large dune. The subaerial walls of the collapse are stepped at 3 m elevation above current sea level, the wider upper wall contains a complete ring of flank margin caves that open inward to the blue hole, the first such composite structure documented in the Bahamas. If the mixing model for flank margin speleogenesis is correct, then the blue hole was marine during the 6 m high MIS 5e sea-level highstand.

A 3 km long section of the east coast of the island is a late Pleistocene back-beach breccia facies, indicating strand plain progradation, followed by wave erosion to create back-beach breccia, and subsequent continuing strand plain progradation. The fresh-water lens followed that progradation and created flank margin caves within the breccia facies, indicating the rapidity with which flank margin cave speleogenesis operates; the entire sequence of rock deposition and dissolution was accomplished within the ~ 9 ka long MIS 5e event.

Stepwell Cave, in southern Cat Island, is a complex ramiform flank margin cave with 641 meters of surveyed passage, developed primarily within a single eolianite unit but occasionally migrating upward through a paleosol sequence into a younger eolianite. At these connections, the lower regions of the paleosol are almost entirely composed of uncemented protosol.

The Origin of Jewel Cave and its Relationship to Landscape-scale Processes

Michael E. Wiles, Jewel Cave National Monument
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Purpose: With over 180 miles (290 km) of mapped passages, Jewel Cave is the third longest cave in the world. Previous work has demonstrated an intimate relationship between the cave and the geologic structure, contacts, and topography as they exist today. This is the latest iteration of a paper that explores how and when the cave might have formed.

Results: The distribution of ellipsoidal quartzite clasts – scattered across 1,500 square miles (3,885 km2) of the western and southern flanks of the Black Hills – cross-cuts sedimentary rocks from the Pahasapa Limestone through the Lakota Formation. Additionally, cobbles of an Inyan Kara pebble conglomerate have been transported three miles from west to east, across three
Abstracts

Ely, Nevada

major north-south drainages. These provide a timing element for a Hills-wide event that can be correlated with the cave, because one quartzite clast was emplaced within the cave before the deposition of the calcite spar. A single U-Pb date places the spar at 14.7 Ma, the presumed end of dissolitional flow. A rough estimate of hydrologic properties shows that, under optimal abiotic conditions, there would have been sufficient flow to remove the entire volume of cave in as little as 1.1 million years. The carbon dioxide required for dissolution might have been produced by the interaction of microbes and the organic carbon of shale layers within the confined aquifer, and could have even accelerated the rate of dissolution.

Conclusions: These observations continue to define a framework consistent with geologically recent cave development. More work is needed to determine the source, transport method, and timing of the quartzite clasts. Once the hydrologic parameters of a crucial sandstone unit have been determined, there will be sufficient information to begin computer modeling, to provide valuable insight on how all the observations fit together. Finally, more work is needed on biospeleological processes.

Structural and Lithological Influences on the Tony Grove Alpine Karst System, Bear River Range, North-Central Utah

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The fracture-dominated Tony Grove alpine karst system in the Bear River Range in north-central Utah has caves ranging from 5 m deep, consisting of solution-enlarged single fractures, to the large, 374 m deep, Main Drain Cave, characterized by a series of long vertical drops and large horizontal passages. The caves in the Tony Grove area are developed throughout the 510 m thick Fish Haven and Laketown Dolomites. The Swan Peak Formation, consisting of orthoquartzite and shale, underlies the dolomites.

Geologic mapping determined that there is a southeast-oriented fold pair east of the Logan Peak Syncline, consisting of the Naomi Peak Syncline and the Cottonwood Canyon Anticline. The anticline merges with the Logan Peak Syncline near the head of Cottonwood Canyon. The Naomi Peak Syncline continues north-northeast through the Tony Grove area and may divert water from the Tony Grove area to Wood Camp Hollow Spring in Logan Canyon. The anticline appears to act as a divide between groundwater flowing southwest to Dewitt Spring and south-southeast to Wood Camp Hollow Spring. These folds as well as thousands of northwest-southeast and northeast-southwest oriented fractures are the main structural influences on the Tony Grove system.

Stratigraphic influences on the system include the Swan Peak Formation, which appears to act as a barrier to groundwater movement into the underlying formations, separating the Tony Grove system from any underlying systems. Other influences within the system include cherty layers, seen in Main Drain Cave, that appear to hinder down-cutting of horizontal passages into lower stratigraphic units.

Hydrogeologic Characterization of Karst Flow Systems in the Southeastern Uinta Mountains, Utah

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Results of dye-tracer tests over the past 50 years have shown that surface runoff from the core of the Uinta Mountains abruptly loses into glaciofluvial deposits, caves, and blind valleys along the southeast flank of the mountains where Paleozoic-age limestones crop out. Groundwater from these recharge areas generally moves south-southeast and downdip within the carbonate rocks to discharge as much as 2,000 feet lower at Deep Creek, Dry Fork, Ashley, Red Cliff, and Brush Creek Springs. In the vicinity of Ashley and Brush Creek Springs, the aquifer is confined by as much as 1,000 feet of fractured sandstones that provide an avenue for upward movement of water to the surface. Nonetheless, groundwater travel times within these basins can be less than 3 days. Results of dye tracing also have documented high-water overflow springs and diverging groundwater flow paths.

Ashley Spring provides drinking water for residents of Vernal, Utah, and surrounding communities. Discharge of the spring is highly variable, ranging from about 15 to 90 cubic feet/sec and responds to snowmelt runoff and rainfall events. From May 2013 to April 2015, temperature and specific conductance of the spring were inversely related to discharge and ranged from 6.5 °C and 89 µS/cm (at 25 °C) during snowmelt, to 9.5 °C and 167
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µS/cm at base-flow conditions. Recharge waters to this karst aquifer typically have specific-conductance values less than 50 µS/cm. Analyses of water samples collected from Ashley and other springs indicate that concentrations of major ions, nutrients, and trace elements generally are very low.

Significance of Vadose Perching in Karst

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Perching of vadose water in karst is significant not only to speleogenesis, but also in predicting contaminant dispersion. Structural mapping in various karst regions shows that much vadose water in stratified aquifers follows the local dip of bedding planes, with only local deflections along steeper fractures. Flow directions of perched water commonly deviate greatly from the generalized dip directions shown by structural contours on geologic maps.

These situations are well documented in caves, but they are rarely applied to practical applications such as contaminant transport. Perched water can pass not only beneath topographic divides, but also over groundwater divides. These patterns are almost impossible to detect from well data or geophysical methods. In many places the perched flow and water-table slope are oriented in nearly opposite directions. Dating of cave sediments shows that some perched vadose streams have persisted at elevations up to 50 m above the local water table for more than 1.3 My. Perching is most common atop shale and chert beds, limestone/dolomite interfaces, partings between massive beds, and disconformities.

This phenomenon has a great impact on contaminant dispersion and monitoring of waste facilities. Seemingly odd flow patterns and it can be anticipated or explained from the cave data. A sobering thought is that this can be an unrecognized problem in any prominently bedded rock – not only in cavernous strata.

The Influence of Glaciation on Pseudokarst Development

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Glaciation enhances the development of three categories of pseudokarst: fracture caves, talus caves, and sea caves. Glacial loading and unloading, and the consequent isostatic crustal depression and subsequent rebound, create new fracture patterns and activate existing joints, faults and fractures. In upland areas, glacial scouring of U-shaped valleys increases relief and slope, causing gapping of fractures as rock masses move laterally or downward in response to the new relief, creating extensive fracture cave systems. In massive rocks such as schist, gneiss or granite, valley wall failure of over-steepened slopes creates a talus of giant blocks which contain interstices large enough to admit humans, forming kilometer-long talus caves. Sea or littoral caves form in coastal areas; isostatic glacial rebound preserves them in greater numbers than would occur if local sea level were constant. Glacial lakes are created in abundance, and

Flank Margin Caves of the Turks and Caicos Islands: Implications for Platform Geology

John Mylroie, Joan Mylroie, Mike Lace, Nancy Albury Coastal Cave Survey

The Turks and Caicos Islands (TCI) are the southeastern extension of the Bahamian Archipelago with important subtle tectonic distinctions revealed by their flank margin caves, as illustrated in 20 mapped cave sites and additional reconnaissance in coastal karst areas on four of the principal Caicos Islands. Many caves exhibit pronounced joint control, which is not observed in the simple carbonate islands to the northwest. Dissolutional passages were observed at elevations up to 12 m, twice as high as expected for MIS 5e, 120 ka; other workers report passage elevations to 17 m and stalagmite dates U/Th dates >195 ka. These data contradict prior interpretations from this archipelago that only cave passages from MIS 5e exist. The TCI platforms lie ~100 km from the North American/Caribbean plate boundary and seismic and bathymetric data suggest minor tectonic uplift may have occurred. The common occurrence of joint-oriented passages coupled with the age and elevation of some caves support this interpretation. No data have been found, however, that identify uplifted subtidal deposits older than MIS 5e in the TCI, which implies that karst denudation, at greater values than previously reported, has stripped these deposits from the platform surface. One cave intersects a complex deposit displaying back beach breccia facies and a well-preserved tempestite deposit consisting primarily of the shells of the Queen Conch, Strombus gigas.

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Records of Catastrophic Floods in Caves

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Catastrophic floods are caused either by failure of natural or artificial dams, or by the coincidence of several independent contributing events (e.g., snow melt and heavy rainfall). In caves, evidence for such floods includes transport of large boulders and production of unusually small scallops. Other hints include extensive gravel banks, and drainage grooves emanating from upper levels. Such evidence in surface rivers is quickly destroyed or obscured, but in caves it may persist almost indefinitely. Peak flood discharge is more easily determined in caves than on the surface. Flow velocities can be estimated from scallop lengths, or from the drag force required to lift boulders up slopes by floodwater. Adjusting for velocity distributions across passage cross sections can provide estimates of discharge. Lifting of boulders more than a meter in diameter has been documented in some caves. In Mammoth Cave, Kentucky, evidence for extraordinary floods is common at a particular level dated at more than 1.5 million years by cosmogenic nuclides. Widespread scallops about one centimeter long give evidence for sustained flow of more than 2 m/sec. In places they are superposed on larger scallops having orientations opposite to the normal flow that formed the passages. Piles of large boulders include foreign rock types that had to be carried long distances from the surface. Such evidence can be used to reconstruct events that have left no apparent evidence at the surface, and which may relate to important geomorphic events in the remote past.

A Hydrologic Review of National Park Service Shared Karst Landscapes

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The National Cave and Karst Program is currently developing comprehensive reports for park units that contain portions of larger karst landscapes to assess hydrologically active features, such as sinking streams, caves, sinkholes, and springs. The objective is to develop reports for individual parks that meet these criteria, which requires extensive research into existing information and identifying data gaps to further our understanding of these shared landscapes. This will help provide recommendations for future research and identify potential vulnerabilities from anthropogenic surface activities so that effective responses for current management plans can be implemented. Information acquired will also be useful for developing a framework for future planning efforts designed to provide long-term protection for these fragile environments.

The most crucial aspect of understanding the hydrogeology of an area is to know the location of groundwater basin boundaries and general flow directions. These are often determined through the use of dye tracing, such as a study done by the USGS in the vicinity of Cedar Breaks National Monument that shares groundwater resources with the surrounding Dixie National Forest in southeastern Utah. Results showed that groundwater in the underlying carbonate aquifer is capable of transporting contaminants very rapidly through the system, and that the greatest threats to water quality have the potential to originate from areas outside of the park boundary from highway runoff, agricultural practices, logging, and development. By providing detailed reports for parks that contain these shared landscapes, managers can take appropriate actions to prevent contaminants from impacting important resources.
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Class V Injection Wells as a Means to Drain Swamps in Karst Areas to Reduce the Spread of the Zika Virus and for Recharging Aquifers

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Many areas in flat-lying karstic rocks have swamps that are a result of thin impermeable units that perch surface water. These areas in the Southeast are breeding grounds for mosquitoes. With the rapid spread of the Zika virus, there is a need for a quick and inexpensive solution to drain these low-lying areas. In Rutherford County, Tennessee, the thin shaly Pierce Limestone and Lower Confining Ridley Unit cause our numerous swamps, some of which flood. The author has proposed the use of shallow injection wells to reduce this flooding to government officials but to no avail. These wells would be less than 50 foot deep. Once the Zika virus starts causing deformed children, there will be an outcry to remove these swampy areas. The alternative to injection wells is the massive use of pesticides. Thus the dilemma: reduce the amount of wetlands, often protected, or poison them with chemicals. Draining of swamps using injection wells also has an economical purpose in Rutherford County. Our largest water utility district uses water from a Corp of Engineers lake, and they are charged millions. Dye tracing studies by the author have shown that there are two large spring basins nearly 50 square miles in size in which ground water could be withdrawn from wells. In one basin a deep karst window occurs in which divers have mapped a huge water-filled cave. Draining of swamps will provide significant aquifer recharge to insure vast water quantities can be withdrawn to reduce costly charges by the Corp.

Controls on carbon dioxide dynamics in karst: The answer is blowin' in the wind

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Carbon dioxide (CO₂) is a primary driver of karst processes. However, the controls of CO₂ variability within karst systems are relatively poorly quantified. We use legacy USGS water quality data to examine variations in carbonate system chemistry within streams across the US. These data demonstrate that CO₂ concentration is the primary control of at-a-site variability in calcite dissolution rates within streams. To better understand the factors that contribute to variations in CO₂ concentrations, we utilize in-situ high temporal resolution measurements of dissolved CO₂ in several karst springs and caves. Observations at a karst underflow-overflow system at the Savoy Experimental Watershed suggest that increased ventilation within the overflow portion of the system enables CO₂ degassing that substantially reduces average dissolution rates within the overflow conduit in comparison to the underflow conduit. This pattern may be common, with newly developed phreatic pathways evolving more rapidly than mature karst conduits with free surface streams. Dissolved and gaseous CO₂ time series data at from Blowing Springs Cave were collected alongside cave airflow velocity and direction. At this site, chimney effect airflow patterns are a dominant control on dissolved CO₂ within the stream. Consequently, outside temperature changes drive variability in dissolution rates within the cave. At War Eagle Cavern, we examine the potential influence of a large bat colony on dissolved and gaseous CO₂. Data suggest that organic input from the bat colony results in both higher CO₂ concentrations in the stream and in CO₂ spikes that follow return of bats from feeding.

International Exploration
(Tuesday morning and afternoon)

The Caves of Cayman Brac, Revisited

Michael J. Lace, Joan R. Mylroie and John E. Mylroie
Coastal Cave Survey

In December of 2014, the Coastal Cave Survey conducted a thorough reconnaissance and cave inventory, which resulted in 34 caves being surveyed across the island. Cayman Brac is one of three carbonate islands in the Cayman Archipelago, located approximately 200 km south of Cuba and 120 km east of Grand Cayman. As a result of tectonics along the Caribbean-North American plate boundary, the island is 19 km long and 1.5 km wide, uplifted to 43 m at the east end, sloping to sea level at the west end. The island core is Miocene Cayman Formation
dolostone, with the Oligocene Brac Formation limestone and dolostone present in the uplifted east end. Surrounding this core and escarpment is the Pleistocene Ironshore Formation limestone. Flank margin caves are developed in all three units at many elevations, with several exceeding 200 meters in surveyed length. Pit caves are also found on the plateau with depths up to 10 m. Cave entrances open on the extensive cliff faces in large numbers; the sharp, jagged nature of the surficial karren on the island plateau make access difficult in many cases. The majority of caves surveyed on this expedition meet the criteria for flank margin caves as a series of globular chambers exhibiting phreatic, slow flow morphologies, restricted to the island perimeter.

The Exploration of Sistema Zumpango, Quintana Roo, Mexico
Angela Morgan

Sistema Zumpango is a 12.7 km long cave system located near the Caribbean Sea in Puerto Aventuras, Quintana Roo. Some above and underwater sections were explored starting in 2009, but most exploration took place in 2015-2016. Initially four separate caves, they were all connected together in December 2015. Other than a short sump, the cave is above water, although unexplored sump leads remain. The cave trends from the continent toward the sea, and caves upstream and downstream of it are clearly related and could connect to it in the future.

Recap of Exploration in Northern Laos
by Matt Oliphant

The Northern Lao-European Cave Project (NLECP) started annual trips in 2000 to explore and document hundreds of caves in the northern provinces of Laos. Americans first joined the NLECP in 2011, and for four years continued the project goals in the provinces of Luang Prabang, Luang Nam Tha, Houaphan, Sayabouli, and Oudomxai. This is a summary of some of the significant caves and karst areas that were visited.

It Takes an Army – 2nd Joint Mindanao Expedition, Philippines
Cyndie Walek and Shane Fryer

In December of 2015, 7 American cavers partnered with the Sarangani Bay Area Outdoor Club (SBAOC) to field the 2nd expedition to Sultan Kudarat province of Mindanao. In 2014 we had reconed the area and were impressed at the potential for a major karst area. Due to the ongoing security problems in the area, few tourists have ventured there and our work was made possible due our partnership with the Pilipino caving club SBAOC, and support from the provincial government, including Pilipino National Police, Marines and Army.

Work continued work on Setuloday cave, both in the upstream direction from the newly connected Golagbok entrance, and to the downstream along the challenging waterfalls, adding about 800 meters to the system. Approximately 1.4 kilometers were mapped in enormous Tenobak cave, and many other smaller caves were also mapped. In order to further the understanding of the importance of conservations of caves, we taught a seminar entitled “Cave and Karst Development and Resource Management” in many communities and to government staff.

The Bellamar Project: Exploring Cuba’s Karst Heritage
Esteban Grau – Sociedad Espeleológica de Cuba

The Bellamar Project began in collaboration with the Italian Speleological Society in 2003. It is dedicated to exploration, research, and documentation of Cuba’s karst heritage. Since then, the project has worked in Cuba’s main karst areas, including those located within important national parks such as Viñales, Guanacabibes, Desembarco del Granma, and Alejandro de Humboldt. The results include research and survey of more than 20 of the most important caves in the country and a bank of 3-D images of the more salient aspects of Cuba’s underground heritage.

Bahamian Update: Field Work 2014-2016
John E. Mylroie Joan R. Mylroie and Michael J. Lace

Fieldwork in the Bahamas during 2014-2016 documented 113 caves on several islands: Cat Island (34), Exumas (43), Long Island (11) New Providence (7), and Rum Cay (18). Many of the cave maps are the first ever produced from some of the islands. Cave types included flank margin caves, pit caves, sea caves, tafoni, and paleosol caves. As is typical for simple carbonate islands, the majority of the caves were small, with Crown Cave, Cat Island the largest surveyed, at 661 meters. The larger caves contain significant bat colonies composed of several species, and on Rum Cay especially, caves are frequented by feral...
goats. Cultural materials include Lucayan petroglyphs, 19th-century guano mining evidence, and modern material that form a complex, long-term pattern of human utilization of Bahamian caves. Paleontological material is present in select caves harboring undisturbed sediments, including vertebrate fossils that extend the known range of extinct species in the archipelago. Flank margin caves in coastal settings offer spectacular vistas while providing critical clues to regional-scale cave development patterns. The data continue to be transferred to the Bahamian authorities to support long-term karst resource management strategies.

**Shi Jia Gou--A Dream Cave in China**
Nancy Pistole

The initial exploration of Shi Jia Gou (a.k.a. Blue Underpants Cave) took place in 2002, when cavers mapped over a kilometer of river passage in a cave that started out 50 meters wide and 40 meters tall. A return trip in 2008 netted several more kilometers of big passage, and ended at a 25-meter waterfall. The final trip in 2013 completed the survey. The result is an 8.2 kilometer through-trip in an amazing river cave. The successful conclusion was brought about by a strong group of motivated cavers, and a substantial dose of good luck.

**(PESH) Proyecto Espeleologico Sistema Huautla Update**
Tommy Shifflett and Bill Steele

Proyecto Espeleologico Sistema Huautla is an NSS Official Project. The PESH 2016 Expedition was the third expedition of a planned ten with goals to explore and map Sistema Huautla to over 100 kilometers of passage, extend the depth to a vertical mile, plus explore and map all caves within the drainage basin, and support Mexican cave scientists in studying the geology, paleontology, biology and other speleological disciplines.

The presentation will cover a focused exploration in the La Grieta section of Sistema Huautla to push the northern limits of the system. We used the EOS Arrow 100 GPS receiver and Laser Tech’s TruePulse 360R for locating cave entrances to a much better accuracy than what previous efforts have been able to achieve. The 50 year history of cave exploration in Huautla will be covered as well as the comprehensive community outreach program, the discovery of the first complete intact skull of the Pleistocene sloth Megolynx Jeffersonii found in Mexico, the discovery of 3.5 km of new cave passages surveyed, bringing the length of Sistema Huautla to 75.4 km (46.9 miles), increasing the depth to 1,560 meters, and the dynamics of 46 people from five countries operating in a remote and isolated Indian village in southern Mexico.

**International Exploration Fund**
Joel Despain

The NSS International Exploration Fund has been supporting U.S. International caving expeditions for decades. Learn where this funding comes from, how it is spent, a brief history of the grants and how you can apply for a grant yourself.

**Sistema Ponderosa: New Discoveries and Caver/Diver Collaboration**
Peter Sprouse

Sistema Ponderosa, located in Puerto Aventuras, Quintana Roo, is a well-known underwater cave system that had a length of approximately 15 km up until 2014. A dry maze cave known as Cech Chen was surveyed to 1.6 km in length and connected to Ponderosa at a large lake known as the Chapel. Dry cavers proceeded to collaborate with cave divers to kick off the creation of a detailed map of the entire system. Additional dry and underwater connections are underway, and regional karst morphology suggests that this system may connect to other cave systems along the Caribbean coast.

**Expedition Cerro Caballero, San Jose Tenango, Oaxaca, Mexico**
Ron Adams, Tony Akers

The purposes of the Proyecto Sierra Mazateca Corporation are to protect, explore, and study the karst ecosystem, and to promote water conservation and Mazatec culture preservation within the Sierra Mazateca, in the state of Oaxaca, Mexico. After last year’s expedition to Rancho Arco Iris, we switched a little further to the northeast, and began our hike in the small town of Cerro Caballero. Two weeks spent up in the cloud forest were fruitful and fun, complete with a jungle camping experience and an enthusiastic group of cavers. We explored areas at several elevations, established a new trail system, a water catch system, and laid the groundwork for continued exploration. A total of 650
meters of vertical depth was both documented and photographed, utilizing experienced riggers and four different sketchers for the surveys. A new member, Thomas Hawkins, a botanist and horticulturalist, documented the areas’ botanical treasures. The expedition was possible due to our friendship and the support of Sergio, Jorge, and their family in Cerro Caballero, proving water and protection.

Surveying the far reaches of the Jaguar Claw System, Quintana Roo, Mexico

Benjamin Schwartz

Sistema Garra de Jaguar (Jaguar Claw) is an extensive, complex, and largely above-water cave system near Playa del Carmen, Quintana Roo, Mexico. Survey efforts from 2013 through April 2015 resulted in a mapped length of 31.5 km, at which point swimming was required in order to continue pushing the cave inland. Underground camps were used to push the far-reaches of the cave in 2014-2016. Inflatable rafts and inner-tubes were used to survey nearly 5 km of passages that were up to 80 m wide, and the cave was extended over 1 km farther into the jungle. Much of this new passage has wall-to-wall water between 2 and 10 m in depth, and the cave appears to be a major flow-path for groundwater in the Paamul area. A number of underwater side passages could be seen leading off and several above-water leads remained to be explored. In March 2016, another 3 km of large and mostly watery passage were mapped, and the farthest known entrance to the system (Far Cry) was reached. The cave passed 43 km in length at the end of the March 2016 expedition, and virgin passage was discovered and left continuing beyond Far Cry. This passage awaits the next camp trip.

Huautla Resurgence Cave 2016 Expedition

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Huautla Resurgence Cave, located in the Rio Santo Domingo Canyon, Oaxaca Mexico is the proven water resurgence for Sistema Huautla located high in the mountains above. Sistema Huautla is currently the deepest cave in the western hemisphere at 1560 meters of depth. A connection between Sistema Huautla and Huautla Resurgence Cave would make the system >1750 meters deep and cover a yet undiscovered 8 kilometers of cave passage. With nearly all known passage located underwater, the cave was previously explored in 1994, 1995 and 2001. This left the cave at 1.05 kilometers long and required dives to 65 meters of water depth to reach the end of exploration.

In March and April of 2016 an international expedition with cave divers from Australia, England and the U.S. established a base camp in Santa Anna Cuauhtemoc and spent a month continuing exploration of the cave using closed circuit rebreathers. Through a series of dives, the cave was relined and Pushed to over 2.2 kilometers with significant underwater and above water discoveries. The above water discoveries include 800 meters of passage including some highly decorated formation areas. Both air filled and underwater leads remain.

Raspberry Rising: Exploration, Science, Logistics, and Adventure in the Canadian Rockies

Diana Kirkwood, Nick Vieira

Raspberry Rising is a multi-faceted cave, the exploration of which involves snow shoeing or skiing in avalanche terrain, sump diving, climbing waterfalls, and horse masks among other things. Being in a Canadian National Park there were several logistical hoops to jump through and more than the usual guidelines to follow. The cave has offered opportunities for scientific research, such as microbial collections working towards potential new antibiotics. There has also been a scientific article written about the stripe karst that it is found in. With the many obstacles inhibiting the exploration of this cave, the team pushed on in spite of these, led by Nick Vieira, to make it one of the 10 longest caves in Canada... and it is still going!

Beyond the Xe Bang Fai: Reconnaissance and Exploration of Other Caves in the Hin Nam No National Protected Area, Laos

Terry Bolger, Cave & Karst Specialist
PO Box 4226, Vientiane, Laos

The Hin Nam No National Protected Area is an 820 km² karst site in central Laos which is best known to cavers for the Xe Bang Fai river cave. However, little is known about the occurrence, extent or significance of other caves in this remote and rugged landscape. Recon work in 2015 identified promising target areas for a survey expedition in early 2016. The expedition team, comprised of 7 international cavers, Lao government officials and local guides, focused on two areas of Hin Nam No and
surveyed over 8 km of passage in 8 caves and 3 cliff shelters during 12 days in the field. A number of significant discoveries were made. Tham Nguyen cave was connected to the Xe Bang Fai cave, extending the Xe Bang Fai cave system to 16 km in length. New species of cave fish were discovered in two caves and another cave was found to contain sandstone sediments and boulders which are significant in terms of understanding the geomorphic history of the area. Two other caves were found to contain human artifacts of archeological or historical interest. The findings of the expedition contribute to the understanding and appreciation of the various heritage values of Hin Nam No caves and their need for preservation and protection.

Eco Touring in the Great Caves of Phong Nha Ke Bang, Vietnam

Dave Bunnell

Vietnam’s Phong Nha Ke Bang has become a major hub of cave eco-touring. The discovery and survey of Hang Son Doong, “world’s largest cave” in 2009 focused lots of attention on the region, where two large cave systems were already known, Vom and Phong Nha. In 2012 another significant portion of the system, Hang Va was found and quickly gained notoriety for its chamber full of 1-2 m high raft cones behind large rimstone dams. Paid tourist trips were begun in Son Doong in 2013 and Va in 2014, with other trips offered to Paradise Cave in the Vom system and another nearby region, the Tu Lan Valley. In March I went with two other NSS members on the very first Photography tour of Son Doong offered by Oxalis Adventure Tours. We also took tours to Paradise, Hang Va, and Tu Lan. We were the only cavers among any of the tour groups and found that Oxalis was doing an admirable job of preserving the caves: keeping people out of sensitive areas, removing all the human waste for composting outside, and limiting tours to 10 people with several guides. We can only hope this model remains as some developers in the country are proposing plans with far greater impact such as a cable car ride through Son Doong.

Nevada: Treasures of the Silver State

(The Monday morning)

The Caves of Nevada

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Over 600 documented caves are known to exist in Nevada, but since the state is sparsely populated, and much of the land is unexplored by cavers, the potential for new discoveries is very high. Most Nevada caves are short in length as compared to other US caves, but many have large rooms and very unique formations. Often this is due to the hypogenic formation processes of a large percentage of Nevada's caves. Note that most Nevada caves require long drives and long hikes to get to the cave entrances, and often the caves are at high elevations that are only accessible during the summer months. Conditions are commonly hot and dry, and high elevations can bring unseasonal storms. Nevada is wild country, and the caves should be visited with appropriate backcountry skills and equipment. During the last four summers our team of cavers worked with the US Forest Service documenting 100 caves located near Ely, Nevada. Our team surveyed and mapped each cave; documented geological, speleological, paleontological and archeological resources; and conducted biological and invertebrate inventories at each site. Many important discoveries were made in each field of inquiry, which were documented in two reports “Cave Resources of the Schell Range & Northern Snake Range, Humboldt-Toiyabe National Forest, White Pine County, Nevada (Part 1 & 2). This talk will cover a variety of statewide Nevada Cave classics, and an overview of our Forest Service Project.
An Introduction to the History and Prehistory of the Great Basin

Eric Stever, Archaeologist
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Humans have lived in the Great Basin for over 13,000 years. Throughout that time they have adapted to changing environments by using new technologies, or by adjusting their hunting strategies and the types of food they ate. This talk will provide an overview of prehistoric lifeways and concludes with a discussion of the 19th century emigrants who came to Nevada in search of silver.

Cave Valley Cave: A Portal to the Past

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The National Speleological Society has proposed to do restoration work within Cave Valley Cave in Cave Valley, Nevada. Before restoration work could begin, a complete cultural resources inventory was conducted within the cave. The inventory resulted in the recording of nearly 500 inscriptions on the cave’s walls, many of which are historic. Further research identified the Cave’s long history in connection with several important historic expeditions, as well as intimate ties to local Native American groups. Cave Valley Cave was first discovered by the Mormon White Mountain Expedition in 1858. Lt. George M. Wheeler next visited the cave during his Reconnaissance of the 100th Parallel in 1869. Both groups, among many others, left behind evidence of their explorations inside Cave Valley Cave. In addition to exploring the cave, many of the expeditions documented the cave’s importance in local Native American mythology. What emerges from the history of Cave Valley Cave is a story filled with mystery, intrigue, and a never-ending array of questions.

Nevada Caves Biology Overview

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Caves in Nevada generally feature guano-based ecosystems. Guano from bats, woodrats, and accidental animals such as chipmunks and mountain lions provide important food sources for cave obligate species. Due to the nature of the Basin and Range Geologic Province that encompasses the state, caves and mountain ranges have been isolated for many millions of years. The resultant island biogeography has resulted in a high level of endemism for both terrestrial and aquatic cave organisms. Several species new to science have been described, and more are likely soon. Given the generally low level of nutrients in the caves, population sizes are small and it can be difficult to spot the cave crickets, millipedes, harvestmen, flies, beetles, amphipods, and pseudoscorpions that make the caves their homes. However, it can be easy to find middens, made by woodrats and passed on from generation to generation. These middens have been an important source of information for what vegetation used to live near the cave entrances. This presentation will show a variety of animals that live in Nevada caves, present their life history, and give tips for finding them.

Cave Management in Nevada

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In the western US, great swaths of Federal lands exist and are administered by the Federal Government. Generally, these lands fall under the preview of three agencies, the Bureau of Land Management, US Forest Service and the National Park Service. Vast deposits of carbonate and evaporate rocks laid down over geologic time and subjected to interactions of groundwater and other corrosive agents have formed important cave and karst
resources throughout these lands. Management of such resources is one of the important responsibilities bestowed to land management agencies. In this session, representatives from some of the different agencies in the Great Basin area will briefly discuss and describe their cave and karst management programs.

Spelean History
(Thursday Morning)

Devils Hole, Nevada
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Devils Hole, Nevada has been a noted landmark in the Nevada desert long before the white man first recorded it in 1849. This deep thermal aquifer remains a mystery to science. Here the rarest of all fish can be found. The argument over these water rights continues to divide the public needs with those who wish to preserve an endangered species. Death and mystery also plays a role in the history of this small hole where miners would take a bath on Saturday night.

The Quakers Exiled from Pennsylvania in 1777 and Their Strange Visit to Indian Echo Caverns
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As the British army marched toward the City of Philadelphia in the late summer of 1777, Congress and Pennsylvania officials suspected the city’s pacifist Quakers of aiding the enemy. With Congress’s approval, Pennsylvania summarily exiled twenty prominent Philadelphia Quakers who refused to take a loyalty oath, banishing them to Virginia. In the midst of their deportation under an armed guard, the prisoners stopped for a surprising diversion: a visit to the best-known cave in Pennsylvania at the time, now known as Indian Echo Caverns. This paper describes the circumstances of one of the most unusual cave trips in American history, recorded in two of the exiles’ journals.

Henry D. Gilpin and His Caving Trips in Virginia in September 1827
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In September 1827, a young Philadelphia lawyer named Henry D. Gilpin toured the Shenandoah Valley of Virginia and visited Weyer’s and Madison’s Caves and the Natural Bridge. In a series of letters home, Gilpin provides rich descriptions of these caves and the circumstances of his visits, including the names of other famous visitors who signed a register. Gilpin, who would go on to become the Attorney General of the United States, had come to the Shenandoah in 1827 to search for the grave of his grandfather, one of the Quaker exiles who went caving while being deported from Pennsylvania during the Revolutionary War. One of Gilpin’s letters leaves us with a delicious mystery: the identity of a map of Weyer’s Cave that he saw hanging in an inn near the cave.

Special Convention 75th NSS Anniversary Events
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To help celebrate the 75th Anniversary of the NSS, several special events have been planned. First, on Thursday afternoon there will be a special discussion group presentation titled “History and Founding of the Cave Research Foundation (CRF)”. In addition, all week we have sponsored a special NSS History Display Room, containing various older photographs and memorabilia associated with 75 years of NSS activities. This Room will close Friday at noon. In addition, we have prepared a special Diamond Jubilee publication which is being distributed at the convention to advance purchasers of the book.
Mrs. A. Galbreath’s Stereoviews of Manitou Grand Caverns

Michael McEachern
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Women photographers were rare in the 19th Century. Most worked with their husbands and took over the studio when their husbands were absent or had died. Mrs. A. Galbreath was an exception. Anna, who was born in Ohio, owned a boarding home in Manitou Springs called the Ohio House. She bought Thurlow’s studio some time after he died on Christmas day in 1878 and launched a career in the photography business. Four known views of Manitou Grand Caverns were “photographed and published by Mrs. A. Galbreath”. She was associated with several other photographers: H. W. Stromer, James A. Harvey, G. S. Lyles and W. E. Hook. The Stormer stereoviews of Cave of the Winds are not related to W. H. Jackson’s views of the cave. Galbreath apparently hired Hook to take the Manitou Grand Caverns views. Later she sold the studio to Hook, and he was able to publish the view under his own name. Over 50 different stereoviews were made of the Cave of the Winds-Manitou Grand Caverns in the 19th century.

A Medieval Historian’s Interconnected World: Gervase of Tilbury’s Subterranean Passageways

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In the early 13th century, Gervase of Tilbury wrote an encyclopedic medieval history called the Otia Imperialia or Recreation for an Emperor. Divided into 3 sections, Gervase’s Otia covers biblical history, medieval geography, and marvelous stories. More so than many of his contemporaries, Gervase pays particular attention to topography. He describes the layout of each region carefully and attributes many of the marvelous stories about that region to its specific topography. An Englishman by birth, Gervase, like many of his peers, describes England as an island oasis. Gervase, who had an unusually expansive international career, does not imagine England’s insularity as restrictive. Instead, he imagines England connected to the larger world by means of subterranean passageways. These passageways function as more than tunnels between spaces, however, they also cross time. One passage leads from Sicily to King Arthur and then to present day England; another called the “Devil’s Arse” leads from England’s Peak District to the antipodes, the theorized, but undiscovered, land on the other side of the world. Engaging with contemporary cartographers and geographers, Gervase’s Otia presents caves that can cross time and space without disrupting accepted geographic knowledge while simultaneously confirming the theorized. Caves and pseudo-subterranean spaces enable Gervase to create a medieval world where England’s influence reaches across time and space, establishing its relevance and demonstrating its power.

Evolution of the “Eye-Draught of the Mammoth Cave, Warren County, Kentucky”

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(presented by Gordon Smith)

The engraved “Eye-Draught of the Mammoth Cave” in the 1853 edition of Jefferson’s Notes on the State of Virginia is well-known. It was processed from an earlier manuscript version tipped into Jefferson’s personal copy of a 1787 edition and is online today. The University of Virginia Libraries attribute it to “C.W. Short for W. Short”. William Short was the “adoptive son” of Thomas Jefferson. Charles Wilkins Short was a favored nephew of William Short, a founding father of American botany, and an exceptionally skilled sketcher as well as a medical educator in Lexington. The paths of the two Shorts coincided in Philadelphia in 1811-1815 and perhaps in Lexington in autumn 1810. At least two additional manuscript versions of the “Eye-Draught” can be differentiated by title blocks and by hand-written notations. In contrast, the outlines of the cave and of the Green River are so nearly identical that a hand lens is needed to verify that the manuscript versions all are independent sketches, probably made employing a camera lucida. Hand-written annotation on the earliest (“the duPont copy”) immediately preceded construction of large hoppers by Gatewood and Wilkins. The so-called “Ridgely copy” followed completion of the hoppers and the production of the Jefferson manuscript copy. Short may have given the original sketch (lacking title block and annotations) to Ridgely who added his own notations.

Family and Business Linkages in the Mammoth Cave Saltpeter Period

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Abstracts

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(presented by Stanley Sides)

Forty-eight years ago, Harold Meloy and I published a significant article on the early history of Mammoth Cave. Especially it documented the escrow-like clearance of title to the main entrance in 1812 and discussed the lack of documentation of the relatively new tale of a hunter named Houchins and his bear. Much has been learned since that time. Digitization of Gratz family chronicles and an academic biography of William Short augment understandings of the role of a few interconnected families. Meloy was aware of the Gratz chronicles but the lack of digitization limited his utilization of the extensive family and business linkages which they reveal. The Short family originally was Virginian. Thomas Jefferson praised William Short as his “adoptive son”. After serving as Jefferson’s personal secretary, he became an effective American diplomat. His nephew Charles Wilkins Short, M.D. became a father of American botany. A noted sketcher, he prepared the famous “Eye-draught” of Mammoth Cave. Charles Wilkins and Dr. Frederick Ridgely of Lexington married his aunts. Ridgely was a friend of Dr. Samuel Brown who developed Great Saltpeter Cave and Fleming Gatewood installed similar saltpeter works in Mammoth Cave. The Houchins/bear tale, however, was transmogrified to a Davidson/bear tale told at “Oregon Mammoth Cave” in a lesser national monument in the Far West.

The Writing on the Wall

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Lehman Cave was discovered during the boom and bust era of silver and gold mining in eastern Nevada. It was a time of optimism and transition that while not peculiar to this area of the United States is representative of the attitudes and developing ideas of the time. Lehman Caves represents a window into those times through the names written upon the walls. These include names of people who came, stayed, or went; and some whose descendants remain in White Pine County today. The signatures of the early visitors remain as their record, marking their passage through the history of the area and how they may have viewed their visitation to the cave.

Survey and Cartography
(Friday afternoon)

Leave Nothing but Footprints, kill Nothing but Time, Make… Photo-realistic 3D Computer Models

John R. “Jack” Wood1, Robyn Henderek2, Benjamin Tobin2, Chad Hults3 and Blase Lasala4

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Photogrammetry uses multi-image photography to extract 3-dimensional (3D) information to map the surface of an object. The science of photogrammetry is nearly as old as the camera, yet only recently, through advances in camera technology, software, and computing power, has this technique become more common within the physical sciences. Photogrammetry is accessible to the average caver, yet is not widely utilized, even by researchers interested in caves. Cavers are the vanguard of speleology, with notable advances in the fields of geology, paleontology and biology initiated through their discoveries, and which were likely documented through photography. Cave photography has also benefited from increasingly sensitive and high-quality photographic sensors, improved compact optics and progressively smaller and robust housings. We present ideas and methods to show-case how cavers, using freeware and point-and-shoot cameras, can take advantage of photogrammetry to generate photo-realistic 3D representations. These data are useful for documentation of cave resources, especially for locations not easily reached or on specimens that are impractical to recover. Scaling added to images can also create quantitative data, valuable to researchers, especially geoscientists, or those
already engaged with resource photo-monitoring. Broader adaptation of photogrammetric technology by the caving community will further foster the inherent citizen-science aspect of cave exploration and enhance our understanding of caves and the resources contained within.

**Electronics for Better Cave Surveys**

by Bob Buecher

Cheap and sophisticated electronic devices are revolutionizing the way we survey caves. I will demonstrate a small LIDAR system that I have been using to survey caves for the last two years. It can be constructed for less than $350. While much simpler than commercial LIDAR units it does not cost $100,000 and weighs less than 3 pounds. It can perform a complete 360 degree spherical scan in less than 5 minutes. Range of the scanner in caves is up to 40 meters with centimeter accuracy. Data is recorded on an SD card. A separate computer is needed to display the point cloud generated by the scanner.

I will also show how I have constructed and used small micro-barometers / altimeters to determine the elevations in a large cave. In Fort Stanton Cave, the Snowy River passage extends upstream for over 10 miles and the gradient is less than 0.2%. Normal cave survey methods were not able to measure this flat slope, or even confirm that water was indeed flowing downhill. By using up to four micro-barometers the slope and elevations were measured to an accuracy of 2 feet. The accuracy of the barometric elevations was also independently confirmed by a cave radio location and depth measurement.

**Creating a Virtual Model of Timpanogos Cave National Monument**

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In the fall and winter of 2015, the majority of passages that comprise Timpanogos Cave National Monument were digitized with a terrestrial laser scanner. Over 30 formations were also digitized using photogrammetric techniques. While the technology is limited, with price and durability being large factors, what can be achieved with modern hardware might surprise you. This informal talk will be cover how reality capture devices differ from traditional cave survey, the techniques used when working with expensive electronics underground and the unique challenges associated with capturing a highly decorated and fragile cave system. This talk will also be showcasing some examples of what this data can be used for, illustrated with proof of concepts created from the Timpanogos Cave master point cloud.

**New tools, Gadgets and Techniques for Cave Surveying: An Open Opportunity for Show and Tell**

Carol Vesely

This is an informal, open forum for cavers to share new tools, techniques and gadgets for surveying and to learn what other surveyors are using. Do you have a homemade gadget designed to help you survey? Have you tried a different technique for marking stations? Have you discovered a new tool that makes surveying more efficient? Here is your opportunity to share it and to see what new items and techniques other surveyors are using. Your participation is encouraged.
Abstracts

**U.S. Exploration**
(Tuesday morning and afternoon)

**Mapping the North Castle Flow: Lava Beds National Monument**
Scott House, Cave Research Foundation

The North Castle Flow is a flow regime of the Basalt of the Castles, located in a relatively untrammeled area of Lava Beds National Monument, Siskiyou County, California. A serendipitous mapping trip in 2006 led to a more concentrated effort. Building on earlier reconnaissance surveys by Cave Research Foundation and the NPS, a more organized project was begun in 2009 and, after a brief hiatus, was formalized as a research project in 2011, continuing to this date. Originally, approximately 40 caves or cave entrances were located; today there are approximately 100 known in the flow. Almost all of the caves have been surveyed for a total of nearly 14,000 feet of surveyed passage.

**Paul Gibson Cave, Klamath Mountains, California**
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Paul Gibson Cave lies in the Klamath Mountains Geophysical Province of northwestern California. The cave was found by prospector Paul Gibson in the early 1960s in a very remote area, now part of the Trinity Alps Wilderness on the Shasta-Trinity National Forest. The cave has a beautiful stream flowing over bedrock marble, prominent rooms, mazes and many speleothems. In the lower levels, Paul Gibson Cave is dynamic. Sediment filled passages are sometimes exhumed while others may be buried during spring high-water flows.

Early work in the cave included 3,200 feet of survey in the mid-1970s and a quality map completed by R. Pope and Steve Knutson in 1978. Shortly after this, many cavers in the region began to focus on the numerous fine caves and beautiful karst of the Marble Mountains (part of the Klamaths). Paul Gibson Cave was somewhat forgotten, despite the many question marks on the 1978 map.

Following a biological assessment trip to the cave in 2013, Joel Despain, with help from the Klamath Mountains Conservation Task Force and the Shasta Area Grotto, initiated a new survey project in the cave. Despite two forest fires that precluded access to the area for months at a time, several backpacking trips to Paul Gibson have produced approximately 2,000 feet of survey, a new section of the cave and the survey of a second entrance. In 2016, our project to map and document this fun and scenic cave continues.

**Survey of Caves in Grand Canyon, Arizona**
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Since 2006, exploration of the Grand Canyon area has led to the discovery of 150 new caves and the survey of over 56 miles of passage. The most impressive discovery, Double Bopper Cave, measures 27.6 miles and is both the longest and deepest cave in Arizona. Double Bopper Cave contains large walking passage and world-class gypsum formations. Some of the other significant caves surveyed include Leandras Cave at 9.5 miles, Falls Cave at 7 miles, Tse’an Bida at 1.9 miles and Hogwarts Cave at 1.79 miles.

**Recent Exploration in the Sea Caves of Santa Cruz Island, California**
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During the 1980s, I led numerous trips to survey sea caves on Santa Cruz Island, even acquiring a 20-foot power boat, the Island Caver, to facilitate the work. In 1988 I began efforts in some of the other Channel Islands and published a compilation of our Santa Cruz Island work in a book. That book included descriptions of 112 caves that we had explored, and maps for all but about half a dozen of them. Three were submerged caves and three were simply in spots that caught the full prevailing swells and proved difficult to map. The statistics for the island are impressive, with some 30 caves over 300 feet long and over 5 miles of passage surveyed in total.

Four trips made since the book was published have resulted in the identification of several caves missed on the prior surveys, with eight significant new caves surveyed and dozens of prospective cave leads noted. One area had been totally overlooked on the south shore which appears to contain 20+ caves, identified with Google Earth and later field checked by one of our group on a kayaking trip.
A recent trip to the south shore mapped 3 new caves that are quite unusual for this island, having formed along the contact of two sedimentary layers rather than the typical basaltic caves formed on faults. Future survey trips are planned for the Fall months.

Caver Quest: Virtual Reality Cave Simulation and Armchair Exploration
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Not everyone is able to explore the exciting and challenging frontiers of caves. Few in the general public have the physical aptitude or opportunity to do so. White Nose Syndrome has closed some popular caves. The extreme physical requirements of some caves excludes some of us older cavers. Caver Quest is a 3D virtual-reality simulation of Fort Stanton Cave in New Mexico that enables people to experience the feeling of exploration via an avatar that walks through the cave and along Snowy River, seeing the cave beyond what plan-view maps or still photos provide. This presentation briefly describes the steps in producing the 3D virtual simulation, and then gives an extensive demonstration of the simulation. The introduction video shows a bat flying over New Mexico terrain which then becomes transparent to show the underlying cave passage. The bat flies into and through part of the cave, and then the simulation begins. The player chooses an avatar and walks through the cave reading educational new notes to help on the exams at the internal cave gates. He or she has a map with an indicator showing the present location, and a remote control for the cave lights. The cave is constructed via cave map plan views, cross sections, profiles, LIDAR scans, and cave wall photographs. This makes for a fairly realistic and accurate simulation.

Groaning Cave, Colorado – Survey and Exploration
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Groaning Cave is the longest in Colorado at 13.4 miles in surveyed length. The cave was discovered by cavers nearly 50 years ago and the cartography and survey leadership has changed hands several times over the decades. The cave was closed by the USFS due to WNS concerns from 2010 through 2013, but seasonal access has now been restored. Over the past couple of summers a new generation of cavers has been busy adding to the survey and making new discoveries on a regular basis. The project has been a successful platform for repairing the relationship with the White River National Forest following the unpopular closure in 2010, and introducing new cavers to the techniques and rewards of project caving. This work will include a tour of the cave while highlighting new discoveries, and talk about the challenges of surveying in a very cold and complex cave.

Caving Where We Shouldn’t: Mount Emory Cave, Big Bend National Park, Texas
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No cave should have been there, and certainly no significant cave. The rock is rhyolite, dense, hard, and igneous—not known as a cave-forming lithology. But the release of stresses within the highest peak of Big Bend National Park fractured the rock, creating a relatively complex tectonic cave. Graffiti sets the remote cave’s earliest exploration to 1859. It was known to bat biologists in the 1930s, its roost home to the now-endangered Mexican long-nosed bat, one of only two known roosts in the US. In 2002, the detailed exploration and survey of the cave began, along with a geological study and investigation of its invertebrate biology. The effort was expected to wrap-up during that one trip, but each trip kept finding more to explore. In 2006, the project went on a 9-year hiatus as the park decided whether and how to allow access because of White-nose Syndrome. Returning in 2016, celebrating the National Park Service’s centennial, the exploration trend reversed when the promising remaining leads ended quickly. The less promising leads ended too, closing the survey with 325 meters of hard-earned passages and the 16th deepest cave in Texas at 85.8 meters. Sincere appreciation is extended to the NSS for supporting this project through the Sara Corrie Memorial Fund.

Continuing Exploration Beyond the Southwest Splinter, Jewel Cave, South Dakota
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Exploration has continued at a steady pace beyond the Southwest Splinter in Jewel Cave. Since July of 2015,
volunteer cavers have added several more miles of passages to the Splinter section and have made major new discoveries.

Cavers and park management staff were shocked when, in October 2015, an exploration trip reported finding the first subterranean lake at a depth of 724 feet. A month later, another lake was discovered just a short distance from the first. The lakes submerge passages that can be seen continuing deep below the surface of the water, and it is highly probable that the water is the Madison Aquifer. Numerous upcoming scientific endeavors have been generated by the discovery of the lakes.

While the cave dips below the water table in this location, the vertical extent of the passages and signs of airflow indicate that the air-filled portion of the cave extends far beyond the lakes. In fact, cavers are routinely traveling more than an hour from the lakes to arrive in the further reaches of the cave, with no sign of an end.

As of June, 2016, more than 10 miles of passages have now been discovered beyond the Splinter, with 5 of those miles having been surveyed since July of 2015 on 17 exploration trips. Jewel Cave is now more than 182 miles in length, and each successive exploration trip to this new area adds more leads to be checked on future trips.

Maxwelton Sink Cave-Thunder Dome

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Maxwelton Sink Cave of Greenbrier County, West Virginia is one of the classic caves in the area and is currently at 13 miles long. With the only two entrances physically closed-(the Greenbrier Airport paved over the Airport Entrance and a hurricane silted shut the Cove Creek Entrance), a massive digging effort began to reopen the cave. In late 2002, cavers finally broke into the Heaven Passage of Maxwelton Sink Cave and placed a 40 feet vertical culvert to allow for continued access. The resurvey of the cave began in earnest in 2004. Now the resurvey is nearly complete. Some new cave has been found, but for the past twelve years, no large breakthroughs have been discovered.

As part of the resurvey effort, in 2015 it was decided to bolt-climb up a dome at the end of a section called Thunder Hall. “Thunder Dome”, is a 90 foot high circular dome with a waterfall coming out of the top. It is about a four hour commute to this area of the cave, and it took a total of three trips to bolt up Thunder Dome. On the fourth trip, we finally had a break-through into a massive breakdown chamber. This presentation will talk about the different trips to bolt up Thunder Dome, as well as the continued exploration. There are two excellent leads at the top, and the current plan is to return in early June 2016 to continue the survey effort.

Lechuguilla Cave, New Mexico – The Discovery and Exploration of Neuland

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The Neuland area of Lechuguilla Cave is in the Southwest branch and was discovered and fully explored over two week-long camps in late 2014 and 2015. These represent the two most recent expeditions during a period of significant management changes in Carlsbad Caverns National Park. This most recent major breakthrough was made during a resurvey of a crawl above Lake Lebarge. The area is a vertically complex series of large passages and rooms that are well decorated with gypsum. Several pits were explored as well as a number of technical aid climbs, including the 200 foot Polar Circus dome. This talk will cover the discovery and exploration of this exciting new area of one of the world’s great caves.

New Discoveries in Vermont

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Recent work by the Berkshire Area Diggers’ Association (B.A.D.Ass.) has led to multiple significant cave discoveries in Vermont. The state had about 26,000 feet of recorded solutional passage when we began working on Vermont projects seriously in 2012. In the past four years, we’ve discovered an additional 9,000 feet. These include the 2nd and 3rd longest caves in the state (Vermonster and Windy River respectively), as well as the 8th longest (Carthusian). Both Vermonster and Carthusian are contact-zone stream caves with complex multi-level passages, and depth potential of over 1,000 feet. Windy River, by contrast, is a pre-glacial, low gradient cave, with rare formations for Vermont, including cave pearls and the only known calcite rafts in New England. We’ve also discovered some shorter caves which are ongoing projects, two of which we expect to lead to significant passage based on their locations (Red Tail Brook and Mr Toad’s Wild Ride). B.A.D.Ass.’ success in Vermont has been largely due to dedicated regular dig efforts, extensive
recon, and use of LiDar data to identify promising areas. We’ve also focused our efforts in areas with 300-1,200 feet of potential depth. We expect these strategies to continue paying off, and hope to push Vermont’s known cave past 50,000 feet in coming years.

**Continuing Sea Cave Exploration in Southeast Alaska**

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Southeast Alaska consists of approximately 16,000 kilometers (10,000 miles) of coastline, and volunteer cavers, the U.S. Forest Service, and the Tongass Cave Project have mapped over 75 sea caves in this area since the early 1990s. In recent focused surveys, Alaskan sea caves have gained importance as data for development of a paleoshoreline predictive model that illuminates the tectonic history of southeast Alaska and is instrumental in Forest Service archaeological surveys. In 2010, a team mapped 17 caves, and it was demonstrated by measuring elevation above mean low lowest water (MLLW) and average ceiling height that these caves began forming approximately 10,000 radiocarbon years before present (RYBP). In 2015 the team returned to continue mapping sea caves along the southeastern Alaska coast on Heceta Island west of Prince of Wales Island, and on smaller islands east of Prince of Wales. High winds and rough seas made accessing coastal areas difficult, however the team was still able to access and map five sea caves, with the longest cave mapped at 156.3 meters (512.9 feet).

**Searching for Lava Caves – A Rapid Method**

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Searching for lava caves by traditional means can involve challenges and limitations such as (a) hiking (“ridge-walking”), which can include negotiating rugged terrain, (b) aerial spotting with either an airplane or helicopter, which can be costly, and require prior scheduling, and (c) the use of software such as Google Earth, which does not provide high-resolution photos nor extreme close-up views. In the case of an airplane, observations may be difficult due to the higher elevation. Use of a helicopter can also be somewhat problematic. Also, with these aerial approaches it is not feasible to closely observe, or enter, a lava pit or collapse for further assessment.

We offer an alternative to the above approaches with the use of a drone and high resolution video camera, operated by an individual with remote-control and a monitor. The equipment can be carried into the field, is not cost prohibitive, nor requires extensive planning. With the drone and the mounted camera, essentially all directional axes can be achieved for successful viewing.

In this presentation we will demonstrate, with photos and video examples, the rapid use of the drone in a search for lava caves on the Big Island of Hawaii, during two different visits. Once entrance collapses/pits or suspected leads have been spotted and initially assessed, actual exploration can commence. This technique should also be of utility, to some extent, for other types of caves.

**John Henry Cave - Following the Trail of Tires**

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The survey of John Henry Cave is a story of land owner and conservation success. Twenty-five years ago Greater Cincinnati Grotto members found the entrance to this little visited, but large cave, and surveyed 3,000 feet that ended in going, but grim crawlway. New stuff was popping up all over the county at the time, and the cave was never finished.

Several years later, the cave was gated by the Kentucky Nature Conservancy, the key was ‘thrown away’ and the cave fell from common knowledge. Subsequent requests were routinely refused. The property was sold to a private individual, and TNC still held the entrance easement and the key.

In 2014 I met the new landowner. He was interested in the cave, and concerned a local gravel mine caused damage to the property. Working together we were successful in enlisting TNC support to open the cave for survey trips. In three trips, 8,000 feet of survey was generated, maps, notes, and reports shared with all.

As we met neighboring landowners and shared our plots, we heard “that comes close to a hole on MY property”. Subsequently we have found a 100 foot-deep climb/pit, and a swallet which are being mapped and connected.

John Henry Cave (1.65 miles) is the longest cave in the county. The new entrances are not yet added in, but should bring the cave to 3 miles or more. We have been
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following a trail of tires from the swallet, to the main cave as our unofficial dye trace!

Hitting the Wall – New Discoveries on Isla de Mona

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Since 1998, Proyecto Isla de Mona has been documenting the extensive flank margin caves that ring the island at the contact between the Lirio limestone and the Mona dolomite. For most of that time we had been ignoring the large cave entrances located on the north cliff walls of the island – mostly because the caves are in dolomite where significant passage development is not expected and accessing the caves would be a challenge since they tend to occur approximately 40 meters down the cliff walls. With the diminishing number of flank margin caves left to be documented, exploration has finally focused on the large cliff side entrances. Much to our surprise, there are indeed cave passages beyond the large entrance chambers and even more intriguing is substantial evidence of Taino activity and the guano mining. Evidence for both is in the form of rock art from the former, and extensive mining of passage sediment and mining artifacts for the latter. How each group actually accessed the sea caves is a bit of an enigma since the seas are very rough on the north cliffs and the cliff walls measure 80 meters from island surface to ocean water. Even with SRT a substantial pendulum is required to access the entrances. A visual inventory via boat indicates that there may be up to 20 additional cliff-side entrances remaining to be explored.
Notes
## 2016 Convention Schedule

### Ongoing Events:
- Vendors (until about noon on Friday) (Ven)
- CaveSim (Lot)
- Amateur Radio Special Event Station (Lot)
- History of the NSS (309)
- Self-service Videos (except Friday) (lib)
- Display Salons (starts 2.00 Monday) (Lib)

### Monday
<table>
<thead>
<tr>
<th>Morning</th>
<th>Lunch</th>
<th>Afternoon</th>
<th>Evening</th>
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</thead>
<tbody>
<tr>
<td>Opening Ceremony (8:30)</td>
<td>U.S. Exploration (8:45) MPR</td>
<td>U.S. Exploration (2:15) MPR</td>
<td>Howdy Party (7:00) Campgnd</td>
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<tr>
<td>Geology &amp; Geography Session (8:00) MPR</td>
<td>Conservation Tuesday 401</td>
<td>Conservation Tuesday 401</td>
<td>Geology Train Ride (4:30) NNRy</td>
</tr>
<tr>
<td>Board of Governors Meeting (open) 401</td>
<td>NCRC Presentation 305</td>
<td>Congress of Grottos 401</td>
<td>Fellows &amp; New Members Recep. (5-8) NNRy</td>
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<tr>
<td>Nevada: Treasures of the Silver State 305</td>
<td>Speleophilatelic Section Meeting 312</td>
<td>Biospeleology Session (2:15) 311</td>
<td>Geology Train Ride (7:30) NNRy</td>
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<tr>
<td>Communication &amp; Electronics Session 311</td>
<td>SpeleoArt Workshop 301</td>
<td>National Speleological Foundation Mtg 305</td>
<td>Campground Party (7:00-?) Campgnd</td>
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<tr>
<td>Video Section Meeting 301</td>
<td>Climbing Contests Gym</td>
<td>National Park Service Meeting (closed) 310</td>
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<tr>
<td>Fine Arts Judging (Salons closed) Lib</td>
<td>Rebelay Course (10:00) Gym</td>
<td>Cave &amp; Karst Management Sess. (1:00) 305</td>
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<tr>
<td>Climbing contests (starting at 11:00) Gym</td>
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<td>Convention Planning 311</td>
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<tr>
<td>Opening Ceremony (8:30)</td>
<td>Luminary Series (Penelope Boston) MPR</td>
<td>Luminary Series (Donald Davis) MPR</td>
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<tr>
<td>Geology &amp; Geography Lunch</td>
<td>Conservation Lunch &amp; WNS Roundtable 401</td>
<td>Conservation Lunch &amp; WNS Roundtable 401</td>
<td>Lightning Talks MPR</td>
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<tr>
<td>Board of Governors Lunch (Closed) 401</td>
<td>A Light Lunch 305</td>
<td>Arts and Letters Section Meeting 312</td>
<td>Board of Governors Meeting (if needed) 401</td>
</tr>
<tr>
<td>Communication &amp; Electronics Lunch 311</td>
<td>OSS Office Status &amp; Refinance Briefing 312</td>
<td>Biology Section Lunch 311</td>
<td>Survey &amp; Cartography Session 305</td>
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<tr>
<td>Fine Arts Opening Reception Lib</td>
<td>Climbing Contests Gym</td>
<td>Lecture Series 312</td>
<td>Cave Conservancy Roundtable (1.00) 311</td>
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<tr>
<td>Climbing Contests Gym</td>
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<td>NSS Office Status &amp; Refinance Briefing 312</td>
<td>Speleology for Cavers Class 312</td>
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<td>Opening Ceremony (8:30)</td>
<td>International Exploration MPR</td>
<td>Founding &amp; History of CCF MPR</td>
<td>Awards Banquet (starts at 7:00) Campgnd</td>
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<tr>
<td>Geology &amp; Geography Session MPR</td>
<td>Cave Photography Workshop (8:00) 312</td>
<td>Cave Diving Session 312</td>
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<tr>
<td>Board of Governors Meeting (open) 401</td>
<td>Cave Photography Section Lunch 401</td>
<td>Using Group Linament Analysis Off</td>
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<tr>
<td>Canyoneering for Cavers Workshop 312</td>
<td>Congress of Grottos 401</td>
<td>Human Sciences Session 311</td>
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<tr>
<td>Disto X2 Session &amp; Workshop 203</td>
<td>Congress of Grottos 401</td>
<td>NSS Nature Preserves Meeting (3:00) 311</td>
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<tr>
<td>Convention Planning 311</td>
<td>National Speleological Foundation Mtg 305</td>
<td>Convention Debrief 313</td>
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<tr>
<td>SpeleoArt Workshop Setup 301</td>
<td>Cave Photography Workshop (cont.) Off</td>
<td>Poetry Corner / Writer’s Workshop 304</td>
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<tr>
<td>Climbing Contests until 4.00 Gym</td>
<td>SpeleoArt Workshop 301</td>
<td>Western Region Business Meeting 301</td>
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<td></td>
<td>Drawing Cave Maps with Illustrator 203</td>
<td>Speleology for Cavers Class 312</td>
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<td>Speleography History Session MPR</td>
<td>Using Group Linament Analysis Off</td>
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<td>Geology &amp; Geography Session MPR</td>
<td>Cave Photography Session 401</td>
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<td>Nat. Speleological Found. Mtg. (closed) 305</td>
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<td>Medical Section Meeting 311</td>
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<td>Awards Committee Meeting 312</td>
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<td>National Park Service Meeting (closed) 304</td>
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<td>Climbing Contests until 4.00 Gym</td>
<td>Vertical Techniques Workshop (9:30) Gym</td>
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<td>Video Salon Showing 305</td>
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<td>Coop Caver &amp; Pub Lands Mgr Projects 311</td>
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<td>Vert. Sect. Bus. Mtg &amp; Session (10:00) 301</td>
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<td>NSS Finance Committee (closed mtg.) 105A</td>
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### Notes:
- Unless otherwise noted, morning events run from 9:00 to 12:00 and afternoon events run from 2:00 to 5:00.
- Event locations are listed next to the event. Abbreviations used:
  - Cen: Central Theater (145 W 15th St.)
  - Com: Commons area in the school
  - Gym: Gymnasium
  - Lib: Library (Room 105)
  - Lot: School parking lot
  - Hall: Hallways near gym and showers
  - NNRy: Nevada Northern Railway
  - MPR: Multi-Purpose Room
  - Ven: Vendor rooms in the school
- Please check the more detailed schedule in the Program for additional details about events.
- Revisions and additions to this schedule will appear in *Off the Rails* each day.

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