



2023 NSS Convention

PROGRAM GUIDE

Elkins, West Virginia



ELKINS, WV
JUNE 26-30, 2023



National Speleological Society 2023 NSS Convention Program Guide

Published by
National Speleological Society
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Front cover: This photo by Cassandra Mosley depicts Carpenter Canyon in the Carpenter-Swago Cave System in Pocahontas County, West Virginia. The Canyon is the bottom of the vertical entrance series on the Carpenter side of the system. This location is near the bottom of the historic rigging of the entrance shaft, although more recent improvements have allowed for a safer detour with less rockfall. You can see indirect daylight from the canyon and it usually takes less than 30 minutes to reach this point for vertically competent cavers.

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Convention Staff

POSITION	NAME	POSITION	NAME
Co-chair	Rich Geisler	Guidebook: Editing	Meredith Hall Weberg
Co-chair	Meredith Hall Weberg	Guidebook: Design, Layout, & Caves Editor	Nikki Fox
Advertisement/Social Media	Amanda Willis	JSS Coordinator	Crystal Biggers, LeighAnn Ernharth
Community Liaison	Rich Geisler	Onsite Registration	Margot Geisler, Alison Chambliss
Fellows and New Members Dessert Reception	Meredith Hall Weberg, Susi Weston	Program	Bob Hoke
Merchandise	Sarah Richards	Sessions	Bob Hoke
Preregistration	Rich Geisler	Transportation	Randy Hurst
Sponsorship	Rich Geisler Miki Manning	Vendor Liaison	Mike Warner, Emily Davis
Website	Rebecca Lagunsad, Pete Johnson	Vertical Section/Gym Operations	Vertical Section
Treasurer	Beth Webb	Volunteer Coordinator	Ken Moore
Vice Chair (School)	Kim Fleischmann	Vice Chair (Campground)	John Vitela
Auctioneer	Kelly Deem	Campground Coordinator	Ken Moore
Auction Coordinator	Carol Tideman	Electrical	Bill Bradwell, Andy Celmer
Banquet	Meredith Hall Weberg, Susi Weston	Grounds	John Harris
BOG Liaison	Janet Tinkham	Plumbing	Jim Forsythe
Caver Co-Op	Terry Chambliss, Alison Chambliss, Myrna Attaway	Campground Staff	Alan Staiman
Communications	Gene Harrison	Cave Trip Coordinators (aka Cave Getters)	Mystik Miller
Radio System Manager	Dave Field	Decon Station	Nikki Fox
“Help Line” Coordinator	Gene Harrison	First Aid	NCKRI
Ham Radio Chief Operator	Sam Rowe	Howdy & Campground Parties	Jane Biggers
Cave Rescue Liaison	Bru Randall	Brew Crew	Meredith Hall Weberg, Susi Weston
Daily Publication: <i>Cow's Tales</i>	Stephanie Stanton	Security	Colin Lynch
Facilities	Dave Field, Bert Ashbrook	Wild Side	Grant “Patch” Adams, Dave Akers, Alan Staiman
Signage	Mitch Berger		Brian Cunningham, Laylin Brown
Geology Field Trip	George Dasher, Rick Lambert, Keith Goggin		



Jim Justice
Governor of West Virginia

GREETINGS FROM GOVERNOR JUSTICE

As Governor, I welcome you to Randolph County, West Virginia for the 2023 National Speleological Society Convention. I'm pleased to see this wonderful event be held in our beautiful state with the Appalachian Mountains to explore and with some of the best caves in the world.

West Virginia is proud of our natural beauty and this convention provides cave enthusiasts with a chance to explore our great outdoors and also learn and share their expertise with other cavers. The convention is for a full week every summer, where cavers come together to cave, learn, socialize, and make new friends. With cave trips, workshops, award ceremonies, and more it can be hard to decide what to do. This convention has something for every cave explorer.

While you are in Randolph County, please take time to explore the National Forest, Durbin & Greenbrier Valley Railroad Train Excursion, Gandy Dancer Theater, Local Shops, Big Timber Brewery, local eateries, and museums. This county has so much to offer you may want to stay a few extra days to take advantage of all of the tourist attractions!

Let me take this opportunity to commend all those involved in bringing the convention to Randolph County. Their hard work and commitment are outstanding, and I value the tremendous economic impact this convention will have on this region. Congratulations on a job well done!

Again, welcome to the 2023 National Speleological Society Convention. I'm sure it will be a wonderful experience for all!

Sincerely,

A handwritten signature in blue ink, which appears to read "Jim Justice".

Jim Justice
Governor

Randolph County Commission



Commissioners

David L. Kesling

Chris See

Christopher Siler

National Speleological Society

Dear NSS Attendees:

We are excited and pleased that you have chosen Randolph County, West Virginia as the destination for your 2023 Speleological Society Convention site. Our county has many points of interest which we hope you will have time to explore and enjoy. We hope you have a safe and wonderful experience during your stay here.

If we can be of assistance in making your convention more enjoyable, please do not hesitate to reach out to us.

Best regards,



Christopher See, President

Randolph County Commission



Jerry Marco
Mayor

CITY OF ELKINS

401 Davis Avenue
Elkins, West Virginia 26241

Greetings,

I'd like to personally welcome each of you to the City of Elkins. We take great pride in our city and we're so glad you're here! Whether you are a verteran spelunker or a relatively new explorer, I hope you make memories that keep you coming back. Hopefully you will bring your family and friends to share in the magical experience in the future.

I would like to thank you for giving us the opportunity to serve the cavers of the National Speleological Society Convention again, and we assure you that we will make it our top priority that everyone has a great time. We hope that you get the chance to visit all of the scenic locations and meet all the wonderful people that make Elkins the amazing town that it is.

Once again, I would like to welcome you to the National Speleological Society Convention and if you need any kind of assistance please do not hesitate to contact me directly at 304-636-1414 x1110. Thank you and hope to see you around.

Sincerely,

Jerry A. Marco
Mayor



February 16, 2023

To the National Speleological Society's 78th Annual Convention,

Welcome to Elkins–Randolph County, WV. Our community is a vibrant place to live, work, play, and stay. We're so glad you're here!

Elkins-Randolph County is a blessed place with friendly people, a thriving business community, and a college and arts scene that adds to the culture and activity for both residents and guests to our “home among the hills.” We are also graced with beautiful topography and scenery for the outdoor enthusiast of every kind.

Please take time to enjoy as many of our restaurants, shops, and activities as you can fit into your already busy schedule. We want you to fully experience our little slice of “almost heaven.”

If the Chamber can be of service to you while you're here, please use the contact information below. Again, welcome to Elkins-Randolph County!

Sincerely,

**Lisa B. Wood, Executive Director
Elkins-Randolph County Chamber**



Elkins Depot Welcome Center CVB, Inc.

Elkins-Randolph County Tourism CVB

315 Railroad Avenue | Elkins, West Virginia

304.635.7803 | elkinswelcomecenter@gmail.com



In June of 2019, we had the pleasure of meeting many of you at the Cookeville, Tennessee National Speleological Society (NSS) Convention. Back in 2018, we started talking about you coming to Elkins, West Virginia and we have been anxiously awaiting your arrival ever since to Elkins and Randolph County. We hope that you are as excited about finally being here as we are to have you as our guests in our beautiful county.

For those of you that have not experienced the beauty that West Virginia has to offer, you are in for a real treat. These exquisite mountains are full of history and the arts that we love to share with visitors like you. The wide array of locally owned eateries, unique shops, and even a few micro-breweries and a distillery are waiting to be explored. The Monongahela National Forest is at your doorstep with a wide variety of hiking and biking trails and fishing spots that you have to experience. On top of (or perhaps we should say below) all these exciting opportunities, Randolph County has over 500 caves, which many of you will get to explore.

Within the City of Elkins, you may find Thursday night music at the Rotary Amphitheatre in Town Square, classic cars by the Depot Welcome Center, excursions trains, the Gandy Dancer Theatre, plus several parks and walking trails. For additional information on any of Randolph County's communities, lodging, activities or restaurants, go to www.elkinsrandolphwv.com.

We hope that you have a delightful visit and make many memories that will entice you to return some day to this wonderful area we are lucky enough to call home.

Your sincerely,

Anne F. Beardslee
Executive Director





Welcome to Elkins!

In our quaint arts community, surrounded by the grandeur of the Allegheny Highlands, you will discover a richness of place, the generosity of people, and the beauty of the natural world.

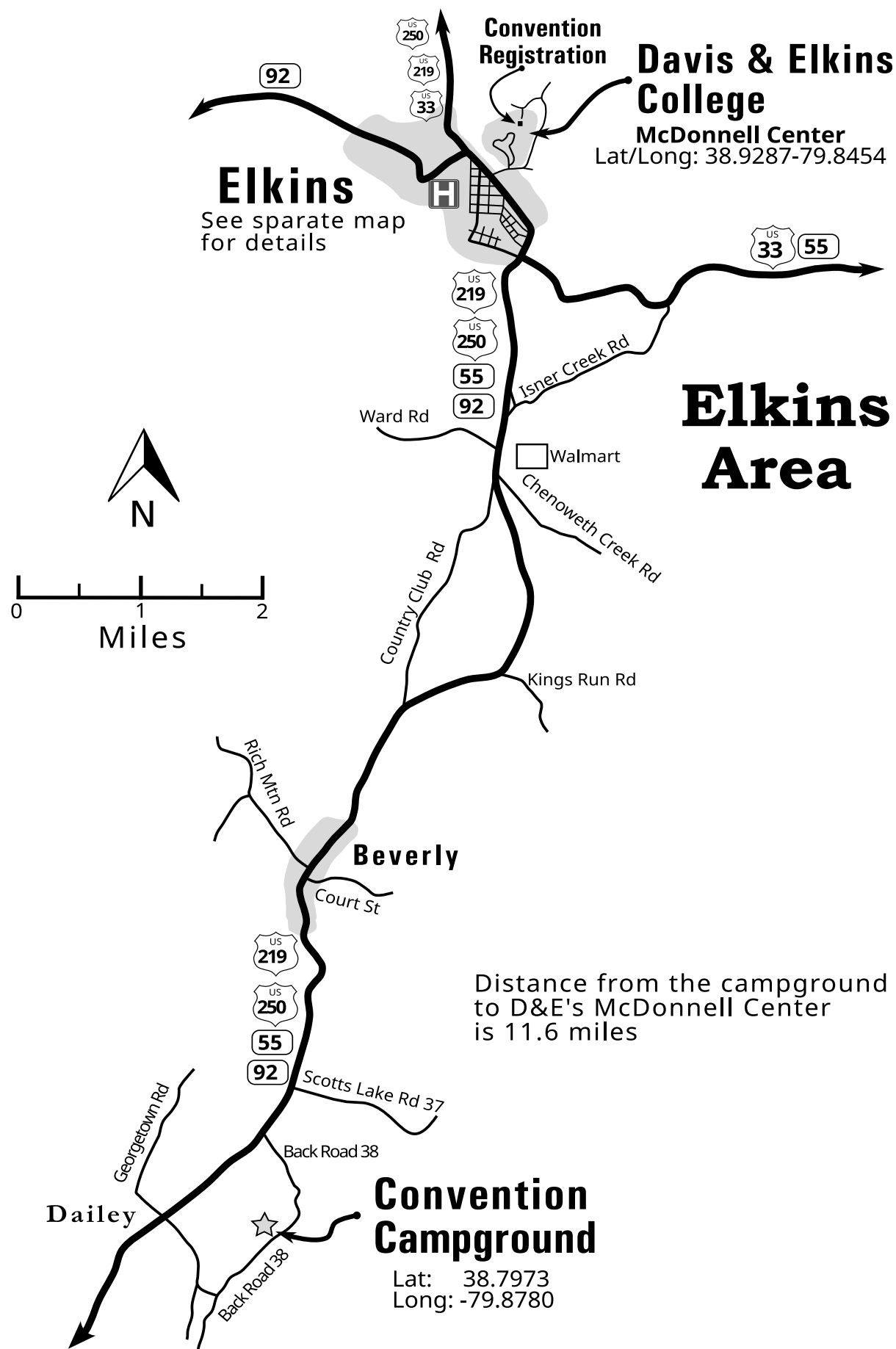
For more than a century, the City of Elkins has been an integral part of student life for our Davis & Elkins College students. A safe, friendly place that feels like an extension of our campus, you'll find Elkins just as warm and welcoming.

We are excited you have selected our area, and our scenic campus, as the destination for your 2023 Speleological Society Convention. We hope you will find time to explore and enjoy.

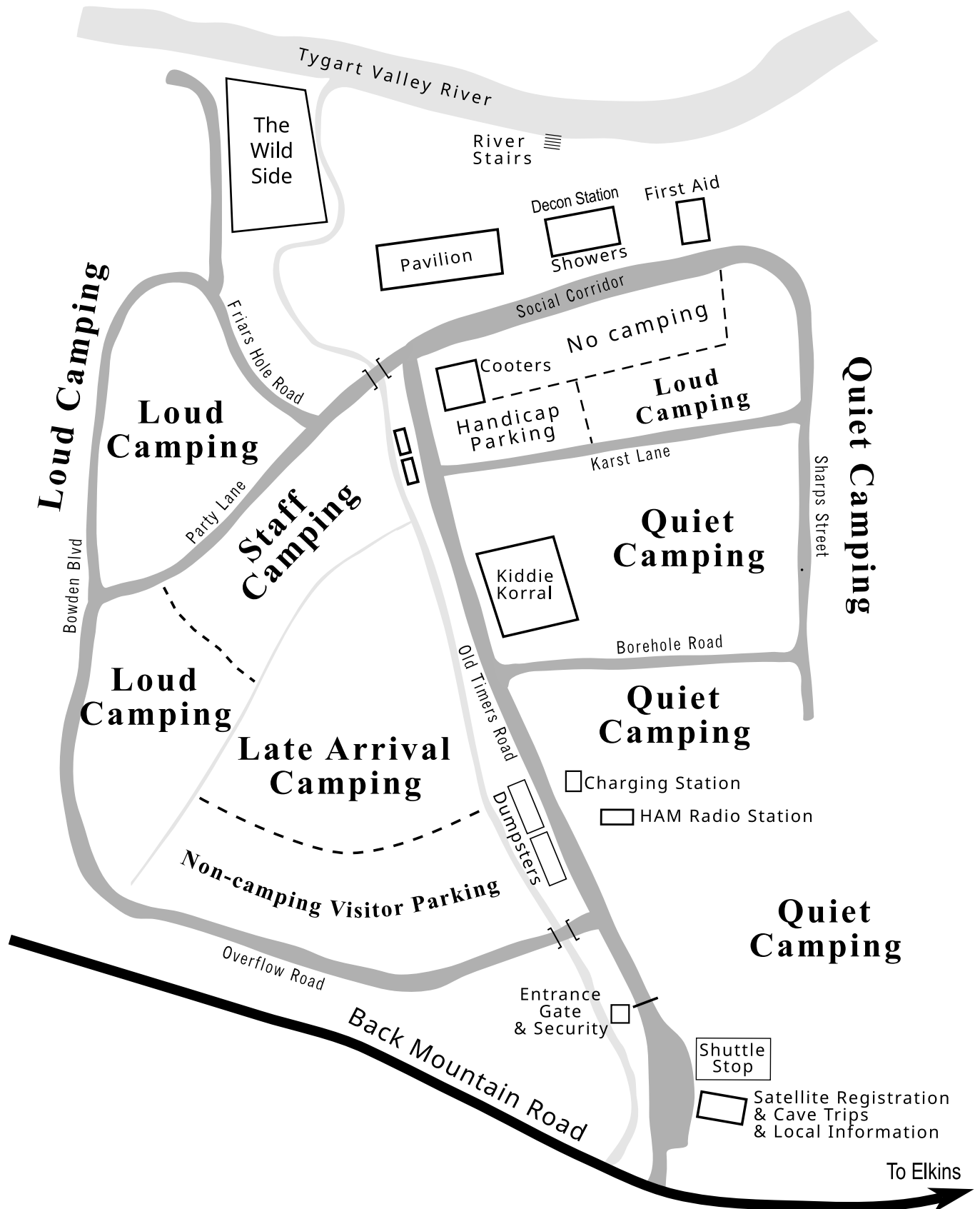
The core of the mission for Davis & Elkins College is preparing and inspiring students for success and thoughtful engagement in the world. Elkins, West Virginia, is a fantastic setting to do just that.

A handwritten signature in black ink, appearing to read 'C. Wood'.

Chris A. Wood
President



Convention Campground



Davis & Elkins College

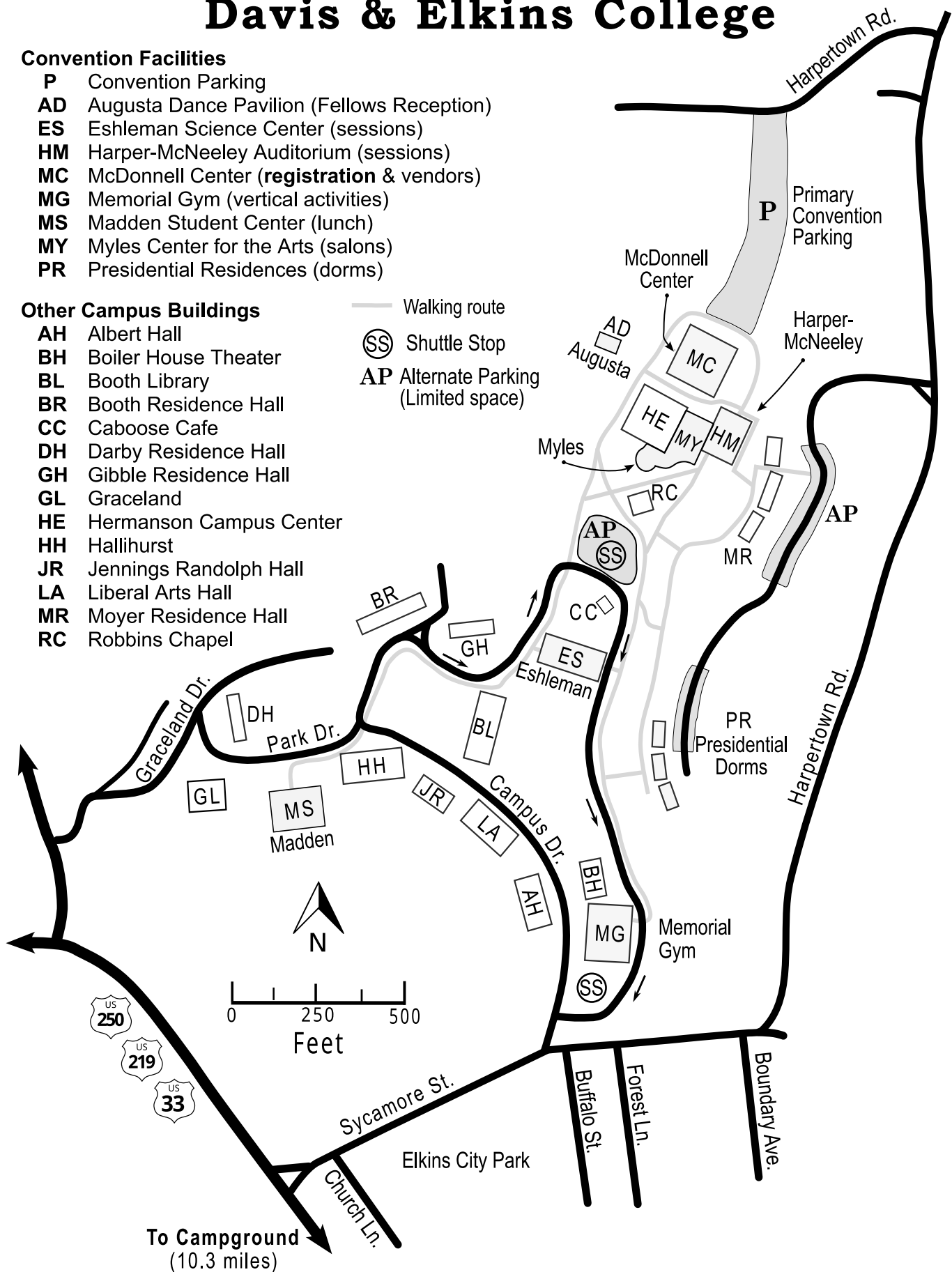
Convention Facilities

- P** Convention Parking
- AD** Augusta Dance Pavilion (Fellows Reception)
- ES** Eshleman Science Center (sessions)
- HM** Harper-McNeeley Auditorium (sessions)
- MC** McDonnell Center (**registration** & vendors)
- MG** Memorial Gym (vertical activities)
- MS** Madden Student Center (lunch)
- MY** Myles Center for the Arts (salons)
- PR** Presidential Residences (dorms)

Other Campus Buildings

- AH** Albert Hall
- BH** Boiler House Theater
- BL** Booth Library
- BR** Booth Residence Hall
- CC** Caboose Cafe
- DH** Darby Residence Hall
- GH** Gible Residence Hall
- GL** Graceland
- HE** Hermanson Campus Center
- HH** Hallihurst
- JR** Jennings Randolph Hall
- LA** Liberal Arts Hall
- MR** Moyer Residence Hall
- RC** Robbins Chapel

- Walking route
- ⓈⓈ Shuttle Stop
- AP Alternate Parking (Limited space)



Caving at the Convention

Welcome to the Alleghany Highlands of north central West Virginia! Caving in West Virginia is some of the best caving anywhere!

We have a number of guided and self-led cave trips lined up. A list will be in the Cave Trip Information area in the building at the campground entrance. We're offering many cave trips of all kinds—horizontal, vertical, wet, dry, tourist, survey. You name it, and we probably have it! Cave trips will leave from and return to the campground. Please use the Caver Alert Information Sheet—you got one in your convention bag and they're all over the campground.

Cave Trip Information

Information about cave trips will be available in the building at the entrance to the campground all week. You can get information about open caves, driving directions, and possibly join led trips. Be sure to sign out and complete a Caver Alert Information Sheet (CAIS) and give it to your emergency contact before going caving.

Closed Caves

All open caves are listed in the Guidebook and the list is posted in the Cave Trip Information building in the campground. If a cave is not listed as being open, consider it closed for convention. Even if you, "go to this cave all the time or at OTR," if it's not on the list of open caves, it's closed.

Caves on Private Property

Most of West Virginia's caves are on private property

and have human owners. When you visit any of the caves that are open during the convention, please be respectful of the property and follow any guidelines you are given at Cave Central. Always be careful where you park, leave any gates as you found them, don't disturb any livestock, and leave your parking area cleaner than you found it. If you happen to meet the cave owner or other local residents please be respectful and avoid discussing politics or any other controversial issues.

Caves Within the Monongahela National Forest

Many months of careful negotiations with multiple government agencies have taken place to secure special permission for limited trips during convention. Trips to these caves **MUST** be approved by convention staff and led by a caver with scientific background. All trips are required to fill out and return a cave assessment form while on the trip. Data collected on the observed wildlife, geologic resources, any historic/archeologic/cultural sites and overall condition of the cave will be provided to the Forest Service. Your participation in this caver-driven volunteer assessment program may help dictate future cave resource management and access policy.

WNS Decon

The decontamination (decon) station to prevent the spread of white-nose syndrome (WNS) is located behind the shower houses at the campground. Please follow the instructions there to properly decon your cave gear after each and every cave trip. West Virginia is located within the WNS Endemic Management Area; WNS is considered to be occurring regularly within this region. Any caving gear brought to convention from outside the Endemic Management Area and used caving should not be taken back to its point of origin regardless of having been deconned or not. We do not want the convention to be the supposed cause of any further WNS spread. Thank you for deconning!

Post-Convention Caving Trips

There will be a post-convention field camp at Friars Hole West Virginia and one at the Butler Cave Conservation Society property in Virginia. See the convention website for details.



Let Someone Know Before You Go (Caving, that is)!

You know you should let someone know when and where you are going caving. To make it easier for you, the Eastern Region of the NCRC created a Caver Alert Information Sheet (CAIS). PLEASE fill one out and leave it with your Emergency Contact before you leave on a CAVE TRIP.

The CAIS form is on the next page, but paper copies may be found at the bulletin boards around the campground, the Cave Trip Information area, at Registration, and one copy is in the material you received at Registration.

Your Emergency Contact should be someone reliable who is not going on the cave trip. Once you have exited the cave, you should contact your Emergency Contact to let them know that you are out and that all is well. If they don't hear from you by the time you listed on your CAIS, they should follow the instructions on the sheet.

CAVE SOFTLY!



Welcome to geology's hall of fame.

Baseball has one. Rock and roll has one. And although it took millions of years, the earth has one, too. And with well-lit, well-paved walkways stretching throughout, you can easily stroll through rooms 10 stories high, marvel at the enormous columns and crystal-clear pools, and of course, hear the world's largest musical instrument, the Great Stalacpipe Organ.

It's time to discover the most cavernous caverns on the East Coast. It's time to discover Luray. For a free brochure, call (540) 743-6551 or visit us online at LurayCaverns.com.

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In Virginia's Shenandoah Valley

What will you discover?



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FINALFRONTIERSPORTS.COM

Caver Alert Information Sheet

Please give this complete form to your Emergency Contact (someone who is not on the cave trip)

CAVER INFORMATION (Person Completing the Form) I am the TRIP LEADER ___ Yes ___ No	
Name:	Phone #:
Vehicle Description:	State/Plate:
Medical Information:	
TRIP LEADER & OTHERS ON TRIP (Please write "TL" next to the TRIP LEADER's name)	
Name:	Phone #:
Vehicle Description:	State/Plate:
Name:	Phone #:
Vehicle Description:	State/Plate:
Name:	Phone #:
Vehicle Description:	State/Plate:
CAVE TRIP DATE	
Date of Cave Trip:	Time of Departure:
Expected Return Date:	Expected Return Time:
* ALERT EMERGENCY RESCUERS TIME	
When the Emergency Contact should contact emergency responders to report overdue caver and/or cave trip	
Alert Rescuers Date:	Alert Rescuers Time:
EMERGENCY CONTACT	
Name & Relationship:	Phone #:
CAVE TRIP LOCATION	
Cave Name:	City/County/State:
Vertical Cave? Y / N	Number of Drops Planned:
ADDITIONAL CAVE NAMES & LOCATIONS	
Cave Name:	City/County/State:
Vertical Cave? Y / N	Number of Drops Planned:
ADDITIONAL INFORMATION (Continue on back if needed)	
<p>* CAVER COMPLETING FORM: Please allow ample time to exit the cave and travel to a location where you can contact your Emergency Contact when determining your ALERT EMERGENCY RESCUERS TIME.</p> <p>EMERGENCY CONTACT: If you have not been notified that the cavers are out of the cave by the date and time listed on the ALERT EMERGENCY RESCUERS TIME, the following instructions should be followed:</p> <ol style="list-style-type: none"> 1. Notify anyone on the event Staff that you need to report an overdue caver or cave trip; bring this form with you. 2. The Staff will contact Security or the Cave Rescue Coordinator; they will meet with you to gather more information and organize a rescue, if appropriate. They may also contact Law Enforcement or Fire/Rescue near the cave to check for the vehicles belonging to the overdue cavers. 	

Health Issues in West Virginia

By Dr. Stephen Mosberg

In general, we in West Virginia are blessed with an environment free from many health risks found in larger metropolitan areas or more unusual locales. This is not to say that our beautiful State is free of any health risks. Common sense will go a long way toward making your stay at convention more enjoyable.

Heat, Humidity, Sun: West Virginia in late June tends to have relatively warm and humid nights and hot days. Be prepared for heat and high humidity. As always, be sure to drink plenty of water and dress appropriately. The campground has little shade except in the pavilions and under some trees, so be sure to bring sunscreen as well.

Bugs: Several mild winters in recent years may lead to an increase in “little livestock” in West Virginia.

Ticks: Follow usual precautions to reduce exposure to ticks, especially when cave hunting through the hills. Wear long-sleeved shirts and pants that fit tightly about the wrists and ankles. Use a tick repellent (DEET). Inspect yourself and your children twice daily for ticks. Remember that risk of disease increases with the length of time the tick is attached.

Lyme Disease: Although not common, Lyme Disease has been reported to occur in West Virginia. Following a bite by a deer tick, which is smaller than the usual dog tick, and which must be attached for 24 hours, a rash develops that is usually circular and clears on its own. The rash may develop a few days to a few weeks after the bite. Not all tick bites cause Lyme, and not all tick bites require antibiotics.

Rocky Mountain Spotted Fever: RMSF is not frequently reported by West Virginia residents at fewer than 10 cases per year.

Mosquitos, Encephalitis: Most mosquito bites are minor annoyances. Some mosquitoes can carry a virus that can cause an infection of the brain. In the past few years, researchers at West Virginia University in Morgantown have followed a newer virus called LaCrosse Encephalitis found in higher hardwood forests such as those in north central West Virginia. Carried by a mosquito, the symptoms might include fever, head and body aches, and confusion. Certainly, not all mosquitoes carry viruses, but emergence of these symptoms should prompt one to seek medical attention.

Snakes: Several dangerous snakes are found in West Virginia, including copperheads and Eastern timber rattlers. So, as usual, be careful where you put your hands and feet. Don't step over a log—step up onto it and look down first.

Stinging Nettle: The plant has many hollow stinging hairs on its leaves and stems that act like little needles. These inject histamine and other chemicals that produce a stinging sensation when touched by bare skin. It is often found at moist soil cave entrances. The sting eventually goes away and can be soothed by cool cave water. It is not dangerous and is actually considered an edible plant, rich in vitamins.

Poison Ivy: Very common in all of West Virginia, poison ivy can be recognized by its three leaves. It cannot be spread via the fluid from the blisters of the rash it causes, only through contact with the sap. But the sap can persist on your skin, your clothes, or your pet until it is washed off. Showering with a deodorant soap will not only be appreciated by your tent mates, but it will also remove the oily sap that causes the itchy rash. Treatment is available, but the best treatment is to avoid it: why ruin your Convention week?

Usual Stuff: Just because you're at a Caving Convention, you're not immune to the mundane things that pop up when you're not watching, like all sorts of trauma and car accidents. Should you have an accident or injury, Elkins has a fine hospital to help fix you up.

River Water and Cows: The rivers in the area will be a welcome respite from the heat of June in West Virginia. Don't forget, though, that the river flows from someplace and that someplace has cows that use the river for bathing, etc.

Cave-Related Problems

Histoplasmosis is endemic in the Ohio River Valley area. Most caves in this area are wet and not prone to have a large risk of Histo, but dry, dusty caves may harbor it. So appropriate precautions are in order.

Rabies is not common in West Virginia but not unheard of either. Usual precautions about handling bats are in order. In other words, leave the wildlife alone.

Cave Water: It's safe to assume that cave water flows in from the surface where cows, cavers, and other wildlife have used it to dump waste.

General Information

Registration

Registration will be open on Saturday, June 24 from noon to 9 PM; Sunday from 7 AM to 9 PM; Monday through Thursday from 8 AM to 5 PM; and Friday from 8 AM to noon.

After Hours Registration

If you arrive outside of regular Registration hours on campus, please check in with Security or the Satellite Registration at the campground. You'll get a wristband and be able to camp that night and register at the college in the morning. If you are not staying at the campground, just go to Registration when it's open.

If you are staying in the dorms, you must arrange key pickup with convention staff well ahead of time, days if possible. You may call the Convention Help Line (SPELEOWEB1 (773-536-9321)) to make arrangements.

Badges

Your badge must be visible at all times when you are at the college. Your badge will also be required for entry into the campground, Howdy Party, Fellows and New Members Dessert Reception, Salon Awards Program (Photo Salon), and Banquet.

Car Tags

Car tags will be given to you during registration. These must be displayed in your vehicle's window when you enter the campground.

Parking

Primary convention parking is in the big parking lot near the McDonnell Center on campus. See the college map for directions. There is limited alternate parking in smaller lots near the Moyer dorms and the Eshleman Science Center. If you park in any alternate lot be sure you are not in a faculty or staff parking space to avoid getting a ticker or towed.

Shuttle Buses

Shuttle buses run between the campground and the college. Unfortunately it is not feasible for the shuttle to service the hotels because they're not close together.

Shuttles will start at the campground at 8:00 AM Monday through Friday. They will stop at the corner of Sycamore

Street and Campus Drive and near the Eshleman Science Center.

Shuttles will run from the college to the campground every half hour starting around 9:00 AM until 6:30 PM. Special shuttle schedules will accommodate evening activities on campus.

Any changes to the shuttle route or schedule will be published in the *Cow's Tales* newsletter

Daily Newsletter *Cow's Tales*

Cow's Tales, the 2023 NSS Convention newsletter, will have updates on activities, schedule changes, and other relevant information. You can find *Cow's Tales* on the convention website. A limited number of archival (paper) *Cow's Tales* will be available at Registration each morning. You can also sign up to get *Cow's Tales* and time-sensitive updates via text message on the *Cow's Tales* webpage.

We welcome cavers to submit caving-related content, such as event changes, announcements, assistance requests, trip invitations, shout outs, tributes, and pictures, to *Cow's Tales*. While convention-related content will be given priority, non-convention content may be included at the discretion of the *Cow's Tales* staff. We accept submissions continuously through the Submission Portal. *Cow's Tales: Digital Edition* will be updated throughout the day. For inclusion in *Cow's Tales: Archival Edition*, submit content by 3 PM on the day before the requested publication date. However, inclusion of any content is not guaranteed.

If you have questions about *Cow's Tales*, contact the Editor at dailyrag@caves.org. You'll find content-specific contacts on the *Cow's Tales* webpage. Please remember that submissions are only accepted via the *Cow's Tales* Submission Portal.

Material for *Cow's Tales* can be directed to DailyRag@caves.org.



<https://caves.org/convention/dailyrag/>

Message Boards

There is a Message Board near Registration at the college and in the building at the campground entrance.

Internet Access

The college has a Wi-Fi network that should be available to all convention attendees. It has proven to be available and reliable during our visits, albeit the usage was much lighter at that time than we expect this week. See the convention website or the *Cow's Tales* newsletter for access information.

There is also spotty Wi-Fi at the campground. You may have to walk around to get a good signal.

Breakfast and Lunch

There is a concession stand with light fare in the McDonnell Center, as well as the Caboose with coffee and snacks nearby.

Breakfast and lunch will be available at the Madden Student Center on Monday through Friday. Serving hours are 7-9 AM for breakfast, and 11 AM to 2 PM for lunch. Price of single walk-in breakfast is \$11, and lunch is \$16.

Food and Drink in Rooms

Food and drinks are allowed in the classrooms as long as you don't leave a mess. Please leave the classrooms better than you found them, kind of like caving.

Junior Speleological Society

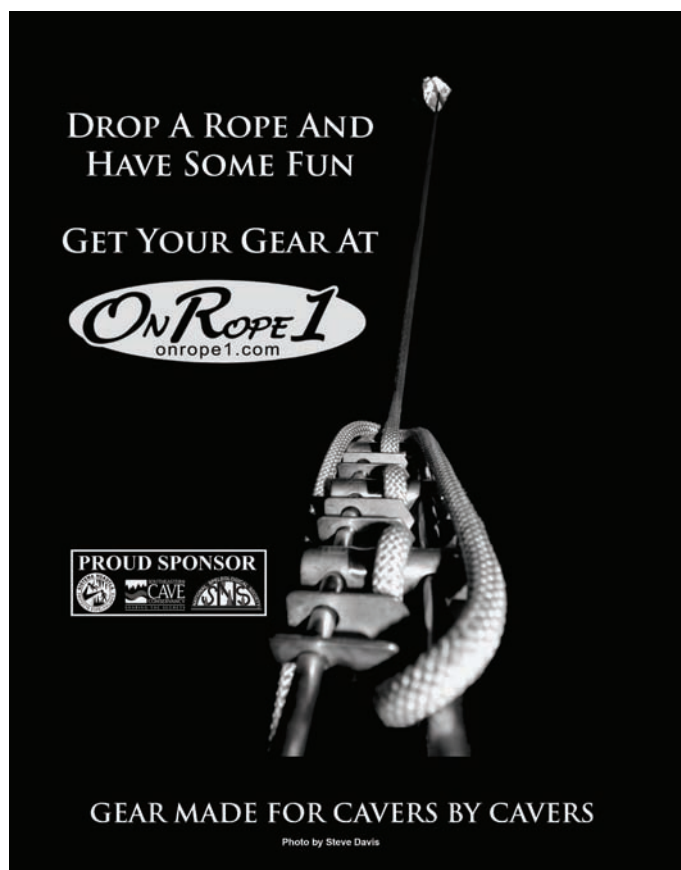
The Junior Speleological Society (JSS) was started to provide structured activities for caver kids. The JSS provides a much-needed service to the kids, to their parents, and to the convention at large. The entire program is handled by the JSS and its adult advisers. This year's coordinators are both experienced cavers as well as educators. JSS participants will have fun while making memories and learning about the world of caving. The JSS convention activities are in themselves a small version of the main convention.

The age range for JSS is 7 to 17; cavers of these ages are automatically registered for JSS. The primary goals of the JSS are age/skill level-appropriate educational activities and enjoyment. Such activities may include (but are not limited to): caving, cartography, computer science, environmental science, first aid training, photography, speleo art, and vertical workshops. Social activities may include (but are not limited to): teen and pre-teen overnights, barbecues, swimming parties, and games.

Details on how to attend will be put in the daily rag, *Cow's Tales* and in the Registration area.

Medical Support

Limited first-aid support is available at the volunteer-staffed medical facility in the campground. However, for minor injuries or illnesses you should go to MedExpress Urgent Care (613 Randolph Ave). For more serious



DROP A ROPE AND
HAVE SOME FUN

GET YOUR GEAR AT

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GEAR MADE FOR CAVERS BY CAVERS

Photo by Steve Davis



ESCAPE THE SINKS

Come to the Escape Room in
Beverly's Old Jail for our **NEW**
Caving-themed Scenario!

— ★ —

Book appointments by phone or email!
(304) 637-7424 | info@beverlyheritagecenter.org

General Information

illness or injury you can go to the Davis Medical Center hospital at 812 Gorman Ave. The location is marked on the town maps.

Emergency Phone Numbers

If you have an emergency please call 911.

If you have an emergency while caving, call 911. Tell the 911 operator that you are attending the Cavers Convention in Elkins. The 911 centers in the counties with caves listed in the convention guidebook have been briefed on the convention and are aware that cave rescue assistance is available there.

If you are an Emergency Contact for a caving trip and have not been notified that your cavers are out of the cave by the date and time listed on their Caver Alert Information Sheet (CAIS) for ALERT EMERGENCY RESCUERS TIME, notify anyone on the event staff that you need to report an overdue caver or cave trip. Bring the CAIS with you.

Getting a Hold of Someone

If you need directions or other essential information you can call SPELEOWEB1 (773-536-9321). This is a cell phone number that will be manned when Registration is open and at some other times.

Vendors

The vendors are located in the McDonnell Center at the college. There are no vendors in the campground. Some vendors will be open on Saturday afternoon and on Sunday. All vendors will be open during the day from about 8:30 AM until around 5 PM on Monday through Thursday and until noon on Friday. The hours for vendors may vary and any changes will be noted in the *Cow's Tales*.

Amateur Radio "Special Event" Station

The NSS amateur radio club, K7NSS, in conjunction with the Electronics & Communications section will be at convention. Station K8C will be on the air from the campground, Saturday starting at noon, going to 8 PM local time; 9 AM to 8 PM Sunday and as available the rest of the week. If you are licensed, stop by and operate with our gear or yours. We will have the antennas and power. If you are not licensed, stop by and operate anyway. Extra class control operators will be present to assist and encourage you.

Academic Awards 2023 - 2024

Undergraduate Scholarship	\$6,000
Master's Fellowship	\$10,000
Doctorate Fellowship	\$20,000



The Cave Conservancy Foundation

has funded karst conservation, education, and scientific research projects since 1995.

Grant requests of \$1,000 or less, can be submitted at any time. Major grant requests must be submitted by March 1st and October 1st, to be considered respectively at the spring and fall Board meetings. Grant application & info about graduate fellowships & undergraduate scholarships are available at www.caveconservancyfoundation.org

Mission Statement

To promote & facilitate conservation, management, & knowledge of cave & karst resources.

Amateur Radio Information

147.480 Mhz is the traditional “Caver Simplex” for Caver Hams everywhere, including in and around Conventions. Call and chat!

145.210 MHz (-600 kHz input & tone 162.2 Hz) is a Ham friendly repeater in the Elkins area that we are welcome to use.

Lost and Found

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

Pet Policy

Pets are not allowed in the campground or at the college. However, genuine ADA service animals are allowed. Companion and therapy animals are considered pets and are not allowed. Do not leave pets in vehicles in any parking lot. There are alternative places in town to board pets. See the Elkins Businesses section for more information.

Getting Copies and Presentation Support

Small volume printing and copying can be done at the college. 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.

Local Alcohol Laws

Personal alcohol is allowed in the campground. 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 limit in West Virginia is 0.08%. Please don't drink and drive. Take the convention's shuttle bus instead.

Personal alcohol is prohibited at the college and at the banquet on Friday evening. We plan to have wine at the banquet

Located in northern Virginia: BATS.Caves.org
Proud sponsor of 2023 NSS Convention



Tobacco Restrictions

All tobacco use (including smoking, chewing, and vaping) is prohibited by state law in schools and on school/college property; in restaurants; and in grocery, convenience, and drug stores.

Smoking and vaping is not allowed in any building on the D&E campus, including the dorms, and is not allowed anywhere on the D&E campus grounds. D&E is a smoke free/vape free campus.

Marijuana

Possession and use of recreational marijuana is illegal in West Virginia.

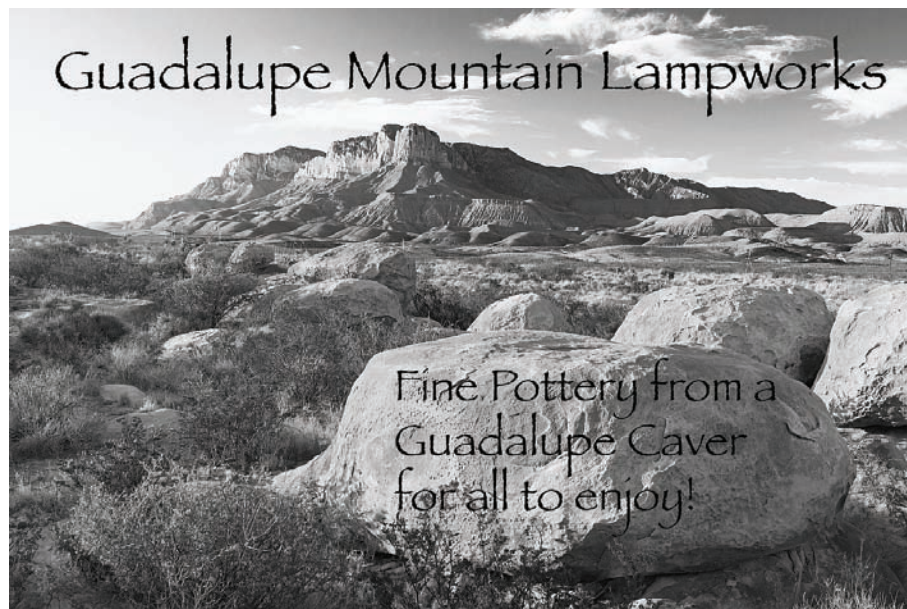
Speed Limits

Please obey the speed limit signs, especially when passing through towns. You will save yourself some money and maintain the caving community's good relationship with the town. Between the college and the campground, it's a notorious speed trap. Plus, the State Police district headquarters is along this stretch of road too.

Firearms

All kinds of guns are totally prohibited at the college, even in the parking lots. If you have questions about any other aspect of West Virginia's firearms laws you should check with the local or state police in Elkins. Guns are not allowed at the campground either

General Information



A black and white photograph of a caver standing on a rock ledge inside a cave, illuminated by a headlamp. The background is dark and textured. The advertisement is surrounded by various logos and text.

Logos and Text:

- CT climbing technology**
- KNO**
- Emi**
- GIBBS PRODUCTS INC.**
- nalgene**
- STENLIGHT**
- PELICAN**
- FIXE**
- BMS RESCUE EQUIPMENT**
- CMC RESCUE**
- ON ROPE 1**
onrope1.com
- ZEBRALIGHT**
- PETZL**
- S|M|C**
- PIGEON MOUNTAIN INDUSTRIES**
- FENIX**
- el spacio**
www.el-spacio.com
- PROUD SPONSOR**
- SIERRA HUNTER**
- SOUTHEASTERN CAVE CONSERVANCY**
SHARING THE SECRETS
- NATIONAL SPELEOLOGICAL SOCIETY**

CUSTOM MADE GEAR FOR CAVERS BY CAVERS
WE CARRY THE QUALITY BRANDS YOU NEED!
(423) 344-4716 WWW.ONROPE1.COM

(Background Photo by Alan Cressler)

Campground Information

The convention campground is at the site of the annual Old Timers Reunion, about 9.5 miles south of Elkins.

Directions from Registration:

1. Leave the McDonnell Center parking lot the way you came in and return to US 219/250 at the iron horse statue.
2. Turn left onto US 219/250. After 8/10 mile go straight at the traffic light at McDonald's.
3. After another 6 miles you will go through the little town of Beverly and then pass the large AHF Flooring Products plant on the right after another 1.7 miles.
4. 7/10 mile after the AHF plant turn left onto Back Road, Route 38.
5. Follow back Road for 9/10 mile and turn right into the campground.

For GPS users, the campground entrance is at 38.7973°, -79.8780°.

Opening and Closing Times

The convention campground opens at noon on Saturday, June 24, and closes at noon on Saturday, July 1. Our contract 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 Elkins Businesses section).

If you arrive outside of regular Registration hours on campus, please check in with Security or the Satellite Registration at the campground or call the Convention Help Line (SPELEOWEB1 (773-536-9321)) if you're not staying at the campground.

Security

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. If it's illegal outside



Smoke Hole
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Perfect for couples, families or groups

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8290 N Fork Hwy. • Cabins, WV 26855
smokehole.com • 800-828-8478

Learn Connect Protect



our gates then it's also illegal inside our campground. Police yourself and your companions and keep everyone safe.

Courtesy

Keep calm, exhibit consideration of your neighbors, and always use common sense. Disruptive obnoxious behavior; profanity; and thievery are not welcome here. Excessive inebriation requiring security or medical intervention is not cool. DO NOT take personal images, email said images, or post said images to any online forum or social media platform without the subject's knowledge, permission, and consent. Offenders may be expelled from the campground.

Car Tags and Badges

Car tags will be given to you during registration. These must be displayed in your vehicle's window whenever you enter the campground. All cars entering the main camping area will pass by a security shelter and all occupants will need to show their convention badges. All attendees are expected to wear their name badges at all times.

Driving & Parking

Please drive the posted speeds on the established or informal roadways and park off the established or informal the roadways leaving ample space for vehicles to pass. State law requires that our roadways be kept open for emergency vehicles. There will be designated event parking for the Howdy Party and Campground Party. There will be designated parking for handicapped vehicles close to the pavilion.

Pets

Pets are not allowed in the campground or at the college. However, genuine ADA service animals are allowed. Companion and therapy animals are considered pets and are not allowed.

Generators and Quiet Hours

Generators may only be operated between 9:00 AM and 9:00 PM. Please notify Security if you have special requirements or if you notice someone is using a generator outside of this 12-hour period. After 11 PM., please respect quiet hours so all can rest up for tomorrow's activities.

Firearms

All types of firearms are totally prohibited in the campground. If you have questions about any other aspect of West Virginia's firearms laws, you should check with the local or state police in Elkins. Guns are not allowed at Davis & Elkins College either.

Fires

"Ground fires" are not allowed in the campground. Be kind to our earth—fires are only permitted in containers or in elevated fire rings. Fires **MUST** be 100% dead out before leaving them unattended.

Quiet, Noisy, & Family Areas

There are designated areas for noisy, quiet, and family camping. Please use your common sense when you choose where to camp. The closer you camp to the social corridor (known at OTR as Vendors Row), the noise levels should be expected to be higher. Unreasonable campsite land grabs are frowned upon.

Water

Piped city water is available at several locations in the campground.

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 dumpsters rather than discarding them on the ground. Dishwashing should be done at your campsite, **not** at the water spigots or in the bath houses.

Trash and Recycling

We will be recycling cans cardboard, paper, and possibly a few other things. Please rinse off all residue (food or otherwise) before placing them into the proper compartment of the recycling trailer.

There is no trash service in the campground. Large Dumpsters are located on the campground entrance road. Please use them for all your trash. Thoroughly clean your campsite and properly deposit all recycling and trash before departing.



Campground Information

Ice

Ice will not be available in the campground. There are several typical stores where ice can be bought between Elkins and the campground. The closest to the campground is located just a bit south past the turn off Route 250 and on the left.

Showers

The campground has “his”, “hers”, and “theirs” showers in the building next to the main pavilion.

Porta-Potties

There are numerous portable toilets, including two that are ADA-compliant, placed strategically around the campground. Of course, there are flush toilets available in the college.

A major campground expense is for Porta-Potties, and any damage carries a heavy fine. We have an important rule, and that is to not affix flyers or tape to them. (Put your information in the *Cow's Tales*.) Do not throw trash in them. Do not write or draw on Porta-Potties. Do not mistreat your Porta-Potties. They are your friends!



Made by Hand, Inspired by Nature

Come see my shop and take a look!

Nancy Lowery Weck . 618-363-7418 . post oakpottery@gmail.com

RV Camping

RVs and large trailers are welcome, but they must be self-contained. There are no electric, water, or sewer hookups in the campground. If you need a dump station, there is a list of local commercial campgrounds in the Elkins Businesses section. They should allow dumping for a nominal fee.

Fireworks and Noise

No fireworks, carbide bombs, sky (Chinese) lanterns, 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.

Electricity

Sorry, but electric power is unavailable for convention attendees, except device charging at the Charging Station. Contact the Campground Co-chairs, Security, or First Aid if you have a medical reason that requires access to electricity or water line hook-up. Permission is required to plug into electric or water lines.

River Activities & Protocol

You wanna get wet? We're fortunate to have a lazy, shallow river where you can splash and play to your heart's delight. Just please use the River Access stairs behind the showers for ingress and egress. For everyone's safety loitering and horseplay are discouraged on the riverside decks and stairways. GLASS or other breakable containers are not permitted in the river. The river defines our property boundary and you **MUST STAY OFF** the opposite side river bank. Lastly, “pack it in/pack it out”: remove all items like coolers, chairs, and trash following any river activities.

First Aid

Located at the end of the social corridor (known at OTR as Vendors Row), the First Aid Station is staffed by experienced and dedicated volunteers from a variety of medical disciplines. Anyone in medical distress or in need of assistance should be brought to the First Aid Station (or contact Security).

Charging Station

The only spot where electricity is available to convention attendees is the Charging Station located on the main entrance road. You can plug your device into an electric outlet, then secure it in a locker while charging (bring

your own charger and lock). Please retrieve your item within a few hours. The Charging Station is designed for typical small devices (phones, tablets, laptops, etc.).

The Charging Station is NOT to be used for electric vehicle charging - the system DOES NOT have the capacity. The convention is not responsible for the security of your device, and we may have to cut off unattended locks after 24 hours.

Wi-Fi

There is limited Wi-Fi at the campground and coverage will be spotty and slow at times. If you are struggling to connect please log off and try again at a later hour. Most cell users should have good service on the campground with AT&T or T-Mobile having a slight edge. The network name is **OTR Wireless**; the router is located in the big building next to the campground entrance gate.

Sauna

In the caving community, the OTR Sauna area is legendary. However, there will be no sauna or hot tub at the Elkins convention. Sorry, folks. It's NSS policy.

The Wild Side

Some dedicated OTR volunteers put their heads and hands to work in developing this foliated spot on our property, where native plant species thrive and birds and bees bide their time bantering with beautiful blue butterflies while babbling with bravado about blossoms, beer and something else beginning with the letter 'B'. This little piece of heaven has trails, nooks and grottos as well as a foot pond where you can relax and soak your feet for a spell. Come take a walk on the Wild Side!

Food Service

A simple grab-n-go ala carte style breakfast will be available in the mornings. Think coffee, juice, muffin, bagel, fruit, etc. Proceeds to benefit the NSS.

Additional Campgrounds

If you wish to stay in the area after the convention, there are several commercial and public campgrounds in the surrounding area. The Elkins Businesses section has a list of these campgrounds. Please don't ask to delay your departure from the convention campground.



Cave and Karst Grant Program

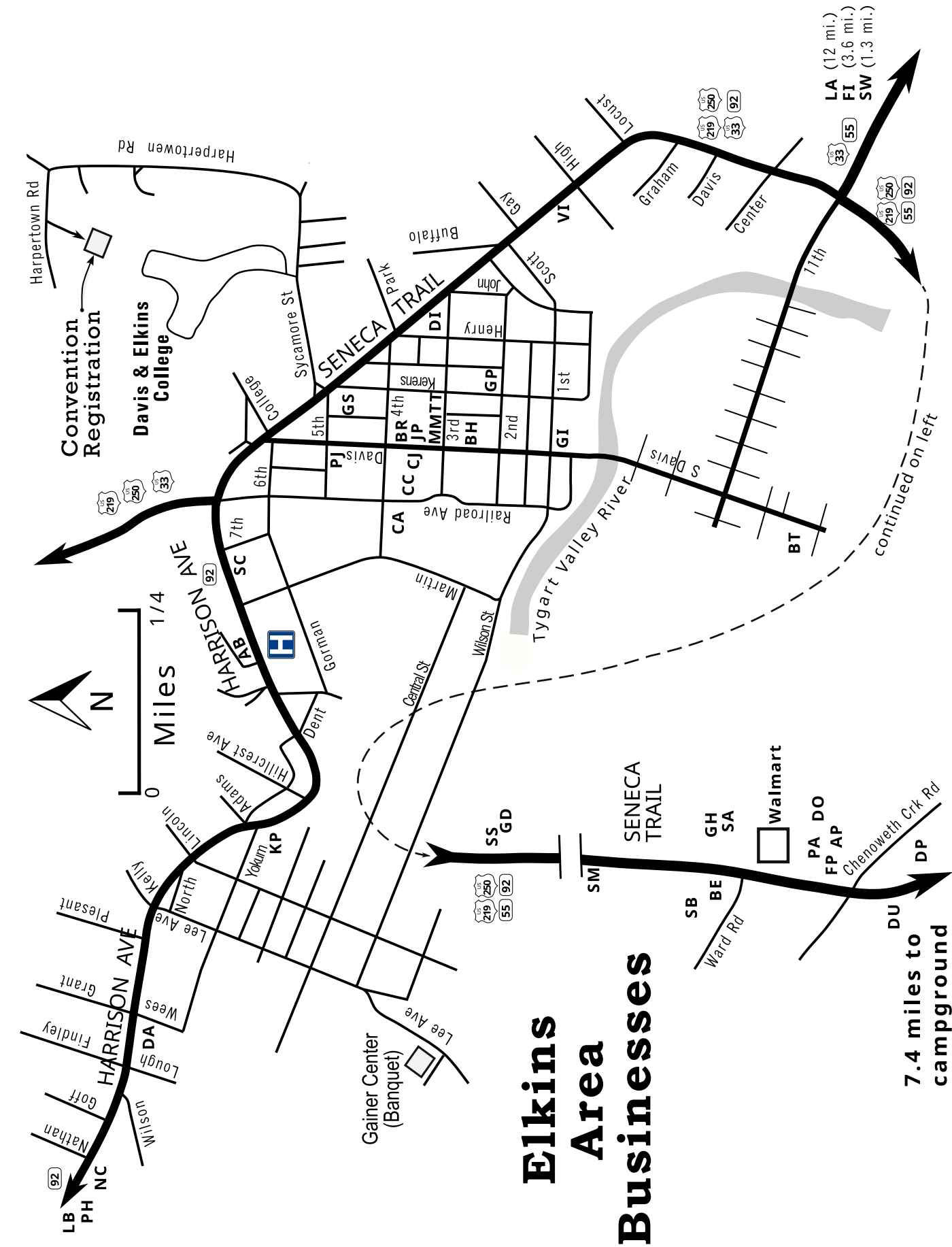
The Cave Conservancy of the Virginias (CCV)
is looking for Grant Proposals

The CCV is looking for proposals seeking funding for cave and karst related projects in Virginia or West Virginia such as:

- ◆ conservation efforts to protect cave and karst resources
- ◆ research projects to promote new discoveries in cave and karst environments
- ◆ education programs to disseminate knowledge on cave and karst systems.

Proposal submission deadlines are January 15 and August 15.

Guidelines for eligibility and proposal preparation are available at <https://caveconservancyofvirginia.org/>. If you have any question, please contact the CCV Grants and Awards Committee Chair, Madeline Schreiber, at mschreib@vt.edu



Elkins Businesses

The following is a reasonably complete list of businesses and services in Elkins 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 point you in the right direction. All the addresses shown are in Elkins unless otherwise noted.

This information was obtained from the various sources. Some entries may be incorrect or obsolete.

Automotive

Advance Auto Parts - 1772 Beverly Pike
AutoZone Auto Parts - 1404 Harrison Ave
AutoZone Auto Parts - 1211 Beverly Pike
Elkins Truck Services - 38 11th St
Fisher Auto Parts - 1089 Beverly Pike
Glofelty Tire - 1080 Beverly Pike
Mufflers Brakes & More - 200 Randolph Ave
NAPA Auto Parts - 1020 Harrison Ave
Pit Stop Quick Lube - 1601 Harrison Ave
Super Car Wash - 451 11th St
Super Splash car wash - 504 S Randolph Ave

Banks

Citizen's Bank of WV - 211 3rd St
Davis Trust Company - 227 Davis Ave
Freedom Bank - 330 Beverly Pike
Huntington National Bank [ATM] - 21 Davis Ave
Huntington National Bank - 420 Davis Ave
Mountain Valley Bank - 317 S Davis Ave

Campgrounds (Commercial)

Alpine Shores Campground - Bowden
Pegasus Farm Campground - 624 Arnold Hill Rd
Revelle's River Resort - 5 Faulkner Rd, Bowden
Shavers Fork Campground - 9 Faulkner Rd, Bowden

Campgrounds (Public)

Bear Heaven Campground [USFS] - 15 miles east of Elkins. Primitive, small, no fee.
Stuart Day Use Area and Campground [USFS] - 5 miles east of Elkins. Crowded. Fee area.

Dining (except fast food)

(Two-letter code indicates location on the town map on the previous page).

AB 1863 Appalachian Bistro (casual) - 830 Harrison Ave
AP Applebee's (chain) - 494 Valley Pointe Dr

BR Beanders Restaurant & Tavern (casual) - 314 Davis Ave
BT Big Timber Brewing Taphouse (beer & food) - 1210 S Davis Ave
BE Bob Evans (casual/chain) - 722 Beverly Pike
BH Byrd's House of Donuts (breakfast) - 224 Davis Ave
CA Caboose Ice Cream Parlor (ice cream) - 200 Depot St
CJ CJ Maggies (casual) - 309 Davis Ave
CC Crossing Coffee Bar (coffee) - 316 Railroad Ave
DA Darren's Pizza Shack (pizza) - 1313 Harrison Ave
DI Dibella's 3rd Street Bar & Grill (casual) - 305 3rd St
DO Dominoes (pizza) - 75 Valley Pointe Dr
DP Don Patron (Mexican) - 981 Beverly Pike
DU Duke's Steakhouse (casual/steak) - 948 Beverly Pike
GS El Gran Sabor (Venezuelan) - 413 Kerens Ave
FI Forks Inn (casual/Fine) - Kelly Mountain Rd
FP Fox's Pizza Den (chain/pizza) - 779 Beverly Pike
GD Gandy Dancer (casual) - 359 Beverly Pike
GI Gino's Pizza & Spaghetti House (chain) - 16 Davis Ave
GH Great Harvest Bakery (bakery) - 60 Plantation Dr
GP Guilty Pleasures Sweet Shop (sweets) - 105 2nd S
JP Jimbo's Place (sports bar)- 302 Davis Ave
KP King's Pizza (pizza)- 989 Harrison Ave
LA Lodge at Alpena (casual) - Rt 33 East, 11979 Allegheny Hwy, Bowden
LB Lunch Box (breakfast & lunch) - 1513 Harrison Ave
MM Mama Mia's (Italian) - 121 3rd St
NC New China Cook (Chinese) - 1511 Harrison Ave
PJ Papa Johns (chain/pizza) - 425 Davis Ave
PA Paula's (sweets) - 773 Beverly Pike
PH Pizza Hut (chain/pizza) - 1513 Harrison Ave
SA Sakura (Japanese) - 54 Stone Mountain Ln
SC Scotties (homestyle/breakfast) - 80 7th St
SW Smoke on the Water (casual/BBQ) - Rt 33 East, 1455 Allegheny Hwy
SM Smoked BBQ (BBQ)- 536 Beverly Pike
SS Steer Steakhouse (casual/Steak) - 359 Beverly Pike
SB Super Buffet (Chinese) - 700 Beverly Pike
TT TipTop Coffee (coffee) - 125 3rd St
VI Vintage (casual/fine/brunch) - 25 Randolph Ave

Fast Food

Burger King - 729 Beverly Pike
Dairy Queen Grill & Chill - 739 Beverly Pike
Hardee's and Red Burrito - 27 Randolph Ave
Long John Silvers - 1513 Harrison Ave

Elkins Businesses

McDonald's - 446 Randolph Ave
Sheetz - 1601 Beverly Pike
Subway - 91 Valley Pointe Dr
Taco Bell - 1509 Harrison Ave
Wendy's - 1503 Harrison Ave

Food Stores

Kroger - corner US 33 & 250
Save A lot - 388 Beverly Pike
Shop 'n Save Express - 1513 Harrison Ave
Walmart - 40 Jett Ln

General Merchandise

Dollar General - 107 3rd St
Dollar General - 1211 Harrison Ave
Dollar General - 8 Camaro Dr, Beverly
Dollar General - US-219, Dailey
Dollar Tree - 36 Stone Mountain Ln
Family Dollar - 388 Beverly Pike
Walmart - 40 Jett Ln

Gifts, Crafts, & Antiques

Artists at Work (gallery) - 329 Davis Ave
Camden Creek Primitives (crafts) - 600 Randolph Ave
Ceramics with Class (pottery) - 203 Davis Ave
Gretel's Moon (gifts) - 769 US-219, Beverly
Historic Beverly Antiques - 769 US-219, Beverly
Rail & Trail Gift Shop (gifts) - 200 Depot St
S&T Bees and More (gift shop) - 119 3rd St
Serendipity Gifts & Toys - 509 Beverly Pike
The Delmonte Market (gift shop) - 314 Railroad Ave
The Mossy Merchant (antiques) - 212 Davis Ave

Hardware

84 Lumber - 2043 Beverly Pike
Elkins Builders Supply - #5 - 11th St
Southern States - 1200 S Davis Ave
Tractor Supply Co. - 800 Beverly Pike
Trickett Hardware - 209 Davis Ave

Laundromats

Mary's Maytag Laundry & Clean - 274 Country Club Rd
Sis's Clothes Spin - 201 Henry Ave

Libraries

Elkins-Randolph County Public Library - 416 Davis Ave and 214 3rd St

Medical & Pharmacy

CVS (pharmacy) - 505 Randolph Ave
Davis Medical center (hospital) - 812 Gorman Ave
MedExpress Urgent Care - 613 Randolph Ave
Walgreens (pharmacy) - 615 Randolph Ave

Miscellaneous

B&J Music and Pawnshop - 313 Third St
Coming Around Again (used clothing) - 119 Third St
Elkins Depot Welcome Center - 315 Railroad Ave
Good Shepherd Clothing (used clothing) - 105 1st St
Gun Mart (pawn shop) - 1604 Harrison Ave
Joey's Bike Shop - 19 3rd St
Phillips & Sons Pawnbrokers - 201 Davis Ave
Pro TV and Audio - 1066 Harrison Ave

Museums

Appalachian Forest Discovery Center - 101 Railroad Ave
Beverly Heritage Center - 4 Court St - Beverly
Randolph County Museum - Court St, Beverly
Stirrup Gallery - Myles Center on D&E campus
West Virginia Railroad Museum - 2 Railroad Ave

Office Supplies & Services

Office Products, Inc. - 101 S Davis Ave

Pet Boarding

Appalachian Animal Hospital - 1627 Harrison Ave

Post Offices and Shipping

Pack n Ship - 103 Randolph Ave
UPS Store - 1869 Beverly Pike
U.S. Post Office - 300 3rd St
U.S. Post Office - 290 Court St, Beverly
U.S. Post Office - US-219, Dailey

Religious

Church of Jesus Christ of Latter-day Saints - US 250 & Hwy 219 - Beverly
Davis Memorial Presbyterian - 450 Randolph Ave
First Church of Christ - 300 Main St
First United Methodist Church - 315 Kerens Ave
Landmark Baptist Church - 1514 Harrison Ave
Saint Brendan Catholic Church - US 250

Special Events – All Week

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. The vendors are in D&E’s McDonnell Center.

Some vendors may be opening as early as noon on Saturday (June 24) for your shopping convenience. All vendors will be open on Monday morning and will remain open during the day through about noon on Friday (June 30). The varied daily hours will be posted at the door of the vendor area and in the *Cow’s Tale* each day.

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 West Virginia is 6%.

Caver Co-op (Consignment)

The Caver Co-op (also known as Consignment Sales) is located with the vendors and 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. 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.

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 is welcome.

The **Cave Ballad Salon** is a competition for cave-related songs and music. Entries are classified in two categories: Traditional (new words written to an existing song) and Original (completely original words and music). The winning and first-runner-up entries will be played during the Salon Awards Program and there is also recognition for “Caver’s Choice.” There is a Friday session to review all of the Salon entries. Successful entrants later receive a professional CD of all accepted entries. If there are questions or concerns at any time, cavers are urged to address the Cave Ballad Chair.

The **Fine Arts Salon** is the NSS venue for exhibiting speleologically inspired artwork. Artwork can be in any



Special Events – All Week

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. Winners will be announced at the Thursday evening Salon Awards Program.

The Salon will be opened with a small reception on Monday at noon. The Fine Arts Salon will be closed until noon on Monday for judging.

The **Graphic Arts Salon** exhibits and encourages excellence in the design of cover art (photographic & non-photographic) from cave-related newsletters and publications, PPB (posters, postcards, brochures, stickers, calendars), and caver ham radio call sign cards/badges. These categories are judged pre-convention and separately. Items Accepted for Show will be on display during the convention. Winners will be announced at the Thursday evening Salon Awards Program. Awards Certificates, ribbons and plaques will be presented at Convention. The Salon Awards will be available for pick up Friday morning of Convention in the Salons area.

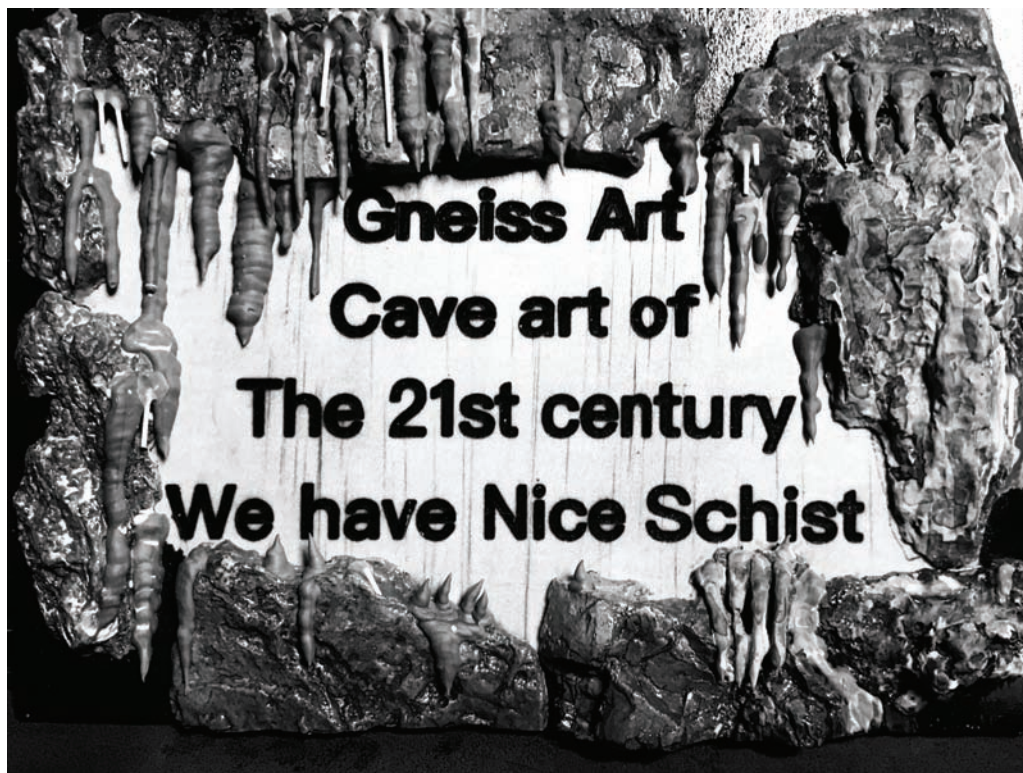
The **MultiMedia Salon** displays multiple-image computer presentations less than 15 minutes in length, which can include music, narration, animations, or video. The winning MultiMedia Program Salon presentation will be presented during the Salon Awards Program.

The **Photo Salon** celebrates the ethereal beauty of caves and caving with photography. These cave-related images have been judged by a panel selected from peers in the cave photography community. Images that have been Accepted for Show are shown during the Thursday night Salon Awards Program, along with the Honorable Mention and Merit Award winners. The top award, called the Best of Show, is presented at the end of the presentation. The Photo Salon is the oldest of the NSS Salons; it is the longest portion of the Salon Awards Program.

The **Print Salon** displays the best of cave photographic prints submitted. Print Salon entries judged Accepted for Show are displayed during convention week. Winners of prizes greater than Accepted for Show will be announced at the Thursday evening Salon Awards Program at Convention, and later in the *NSS News*.

The **Symbolic Emblems Salon** is a judged exhibition of symbolic emblems (patches, pins, decals, coins, 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. Winners will be announced at the Thursday evening Salon Awards Program.

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. Winners will be announced at the Thursday evening Salon Awards Program.



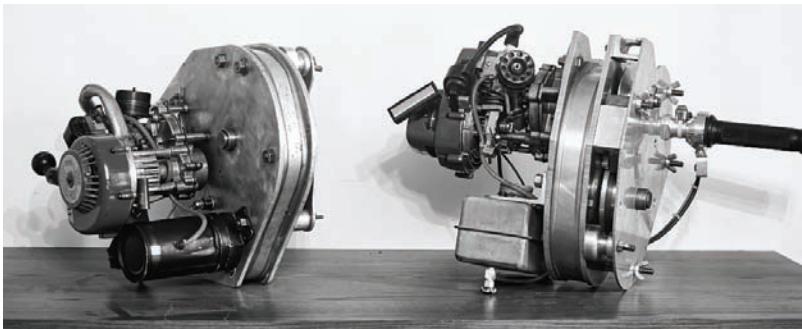
The **Video Salon** is a competition among producers of moving-image depictions related to caves, cavers, caving, and cave conservation/restoration. Time permitting, all entries will be shown at the Convention. Short vignettes of all entries will be shown, along with the winners, at the Thursday evening Salon Awards Program. The Video Salon will show all entries during the week at the Self-Serve Video Kiosk.

Vertical Equipment Devices Display

(Monday through Thursday)

Don't miss Gary Storricks display over 3,000 superb, standard, silly, and stupid examples of ascenders, descenders, belayers, and miscellaneous devices for caving, climbing, canyoneering, industrial, military, police, and rescue use and abuse.

Two of the more unusual items on display are Motorized Ascending Devices (MADs). One was a 21-pound mechanical contraption Nevin Davis built in the 1970s to allow effortless ascent on rope. The other is a similar device built from Davis' plans by James Wells. Davis' device worked, but never progressed beyond the prototype stage. Wells' device apparently never operated.



Nevin Davis' Motorized Ascending Device (left) and James Wells' version. Both devices will be on display.

Photo from www.verticalmuseum.com © Gary Storricks

Gary started collecting ascenders and descenders half a century ago to decide, first-hand, which would be the "best" for caving. Which one is best? Gary will let you know after he acquires and test all the ones that he doesn't have.

Cavers worldwide recognize this Vertical Museum as the world's premier collection of this type of equipment. Last displayed at the 2009 UIS / NSS Convention in 2009, the effort involved in preparing the display suggests that this will likely be your last chance to see this at a convention. Gary has a website dedicated to his massive collection at <http://www.verticalmuseum.com>. It's well worth a visit.

Conservancy Displays

Several cave conservancies have displays set up in the salon area in Myles Atrium. Please stop by and see what these groups are doing to promote cave conservation

and research, and to keep caves open for the caving community.

A conservancy is allowed to solicit membership and can give token gifts in return for joining or donating, but they cannot sell items like t-shirts, mugs, etc. without registering as a vendor.

CaveSim

Come explore CaveSim, located outside the McDonnell Center. The mobile cave is free for convention attendees and the public to explore, and is open from 9 AM–5 PM, Monday–Friday. If you've seen CaveSim before, check out what they've added (which includes air conditioning!). CaveSim comes to you all the way from Colorado, and contains 60 feet of surveyed passage filled with stalactites, stalagmites, and many other speleothems, along with cave paintings, artifacts, and cave critters. They have loaner helmets, lights, and pads (or you can bring your own), and you're invited to explore the cave while trying to avoid touching the cave formations, artifacts, and critters. The CaveSim computer system tracks your interactions with the cave, and you can check your soft caving score on the computer after your trip. Other activities are also available, including vertical caving, squeezebox, cave rescue practice with sked, and more. You're also welcome to come by and just watch, or hear about all of the conservation education that they've done with CaveSim in the last year. Many generous individuals, grottos, and other organizations sponsored CaveSim to bring the mobile cave from Colorado, so please stop by and take advantage of this free opportunity to try a unique caving experience.

Old Cavin' Haven Display

Old Cavin' Haven is an exhibit about historic cave exploration in Randolph County, West Virginia. The exhibit recognizes the remarkable contributions of cavers to the body of cave knowledge in the area. Old Cavin' Haven shares the history of some of our area's notable caves and their explorers with NSS Convention 2023 visitors.

Enter Old Cavin' Haven by upright walk-in or crawl-through entry. The backdrops for the information presented are whimsically painted, "decorated" cave walls. A highlight of Old Cavin' Haven's walls is the

Special Events – All Week

hand painted mural of the upstream entrance to the Sinks of Gandy by Alice-Gervais Sabatino. Gaze at this mural visible through the window on the right as you enter the Myles Center from the rear parking lot.

Amateur Radio Station K7NSS

The NSS amateur radio club, K7NSS in conjunction with the Electronics & Communications section will be at convention. Special event station K8C will be on the air from the campground on Saturday starting at noon, going to 5 PM local time; 9 AM to 5 PM Sunday and as available the rest of the week.

If you are licensed, stop by and operate with our gear or yours. We will have the antennas and power. If you are not licensed, stop by and operate anyway. We will have extra class control operators present to assist and encourage you.

147.480 is the traditional caver's simplex for around the campground communications.

145.2100 is a repeater in the Elkins area that we are welcome to use.

Sketching Contest

Everyone is welcome to compete in the sketching contest! We supply the data and you go to the cave to sketch it. This just-for-fun activity (including prizes!) provides cartographic feedback to both seasoned and

neophyte sketchers. You can find the detailed instructions at the Cartographic Salon in the McDonnell Balcony. For inspiration you can gaze at amazing cave maps while you are there. Questions? Ask Andrea Futrell, Mike Futrell, and Andy Armstrong. Sharpen that pencil and stylus and give it a try!

Beverly Escape Room

Although not part of the convention, the Beverly Heritage Center has a cave-oriented escape room that will be open during the convention. **Escape the Sinks** is an escape room based on an 1870s historic tale of misadventure that befell an early traveler to the well-known Randolph County cave, the Sinks of Gandy. Join with a few friends and come to Beverly to solve the mysteries of Dick Rattlebrain's predicament and Escape the Sinks!

The Escape Room is on Walnut Avenue at the Beverly Heritage Center, 4 Court Street, in Beverly. During the convention it is open daily 10 AM to 5 PM. The cost is \$20 per person, \$18 for individuals with proof of attending the convention. Children 12 years and younger free. You can book your escape room adventure through the Beverly Heritage Center Facebook page: <https://www.facebook.com/beverlyheritagecenter>, or by calling the Center 304-637-7424.



If your Grotto or Region is looking for great caves to explore in the Virginia area, RASS can offer a complimentary place to camp in Bath County, VA.

We also offer grants in support of cave conservation, education and research.



Contact us at RASSmail2016@gmail.com!

www.caveRVA.org

Special Events – Sunday

Geology Field Trip

7:30 AM–5:00 PM

Departs from the McDonnell Center parking lot

The NSS Geology Field Trip will stop at four locations. The first three of these will be at the Bowden quarry area to discuss the Greenbrier Group Mississippian stratigraphy, at Smoke Hole Caverns to tour the cave and discuss the Helderberg and Tonoloway Silurian-Devonian rock units, and at Seneca Rocks for lunch and to discuss the Wills Mountain Anticline. We will then drive the length of Germany Valley and our final stop will be at Hellhole, where we will discuss the karst in the valley, the exploration that has taken place there, and the Ordovician stratigraphy.

The tour participants will receive an 84-page color guidebook that will include several auxiliary stops (if you want to redo the field trip in your car). These additional stops will include the Hopeville Anticline, the Germany Valley Overlook on U.S. Route 33, and Nelson Rocks. This guidebook will also be available for non-participants from the NSS Bookstore and the West Virginia Speleological Survey.

Preregistration is required. Late tickets may be available at Registration.

Vendors Open on Sunday

McDonnell Center

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 McDonnell Center.

Self-Guided Activities

Sunday, on your own

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



Maps, Travel Guides & More

Stop by the Elkins Depot Welcome Center for visitor information.

315 Railroad Ave, Elkins, WV 26241
ElkinsRandolphWV.com

Special Events – Monday

Fine Arts Opening Reception

Noon, Myles Atrium

The Fine Arts Salons will host an Opening Reception starting at noon to celebrate the public opening of the Salons. Please do not visit the Salons before the reception as this interferes with the judging process.

Speleology for Cavers

All day, Room 413

Come learn the difference between the strike and the dip, vadose and phreatic, and the birds and the bats. Bring home with you the geologic differences between caves in the Black Hills and those in the Appalachians, 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 and includes lunch and extensive course notes on a USB drive. The fee is \$55 and can be paid at Registration if you didn't preregister.

Howdy Party

6–10 PM, Campground

The Howdy Party will be at the campground. We have a delicious dinner catered by **Fish Hawk Acres**. YUM! There will be plenty of shelter in the campground pavilion and several canopies because you just know it might rain, right? Come renew friendships and meet new friends. Chat, eat, and dance to the amazing local band, **Crandall Creek** (<https://www.crandallcreek.com/>).

The menu looks great:

Fish Hawk Acres Signature Garden Salad with Fresh Local Greens, Tomatoes, Cucumbers, Carrots, Bell Peppers and Red Onions (Vegetarian) With Dill Buttermilk and House Vinaigrette Dressings

Tuscan Roasted Chicken with Fresh Herbs, Lemon & EVOO

(Vegetarian Option: Vegetarian Moussaka)

Roasted Fingerling Potatoes (Vegetarian)

Haricot Verts with Caramelized Onions (Vegetarian)

Focaccia Bread



SAVE YOUR CAVES

Powered by Southeastern Cave Conservancy, Inc.

Special Events – Tuesday

Luminary Series I

George R. Dasher (NSS 16643) (OS, FE, CM, AL)

“He knows the difference between a Cave and a Hole in the Ground (maybe)”

Tuesday, 12:30–1:30, Harper-McNeely Auditorium



George Dasher grew up on a cattle farm that was swallowed by Columbia, Maryland. His early life was roaming the outdoors, and his teenage years were working on the farm and showing beef cattle in 4H. His father would take the kids who had worked for him on multi-day camping trips in Pendleton County, West Virginia after all the

summer work was finished. These were fun trips, and often involved exploring a 6-mile-long river gap on the South Fork River.

George had always wanted to try mountaineering, rock climbing, and backpacking, but had been banned from hiking on the nearby Appalachian Trail because a group of kids had been caught there smoking marijuana. A full-

length movie on the National Leadership School aired in 1969, and George managed to talk his parents into allowing him to attend. A problem, however, arose in that every other kid in the United States had seen the movie and also wanted to attend.

George was able, fortunately, to secure a spot in the first ever NOLS East class, and so—after graduating high school in 1970—he boarded a bus and traveled, via New York City, to Waterford, Connecticut. The 5-week class was incredible. It involved rock climbing and white-water canoeing in Connecticut and New Brunswick, climbing Mount Katahdin, and backpacking across the entirety of the White Mountains. The end result was that George, despite being one of the youngest members of the class, was asked to stay on and teach. However, with four 1,100-pound shorthorn-angus steers waiting for him in Maryland, there was little he could do other than decline.

College was at Capital University in Columbus, Ohio, where George majored in geology. Ohio is a strange place, because any sport that is not done with a ball is unheard of, so there was no backpacking, etc. until the winter of George’s senior year, when he and four others designed a class where they would backpack the AT through the Great Smoky Mountain National Park. The college approved this class, and then canceled it on day one—without telling any of the participants. Bet they are not getting any donations from at least one graduate.

George had always wanted to try caving, so in 1975, after college and back in Maryland, he contacted the Baltimore Grotto. This resulted in Bob Gulden inviting George on a caving trip to Greenbrier County, West Virginia, where they visited Organ Cave. George ultimately chose to participate in the survey of this cave, which was then the longest in West Virginia. George liked all the aspects of cave surveying, as well as always exploring something new on each trip. He also joined the Greenbrier Grotto and began surveying several other nearby caves, such as Foxhole, Cricket, Patton, and Laurel Creek Caves.

George also began a process that would follow him all of his life—losing jobs and having to move. His first job was with the City of Baltimore. His next job was in Casper, Wyoming, and he was then employed as a geologist in Bluefield, West Virginia. Next was



a job in Buckhannon, as an oil-and-gas geologist, and his last job was in Charleston, with the West Virginia Department of Environmental Protection. He lost all of these jobs because his position was eliminated or that particular office was closed. He is now retired.

His last job was the one he held the longest, as he worked with the DEP's Groundwater Program to remediate soil and groundwater contamination. He also worked, while in Buckhannon, as both an EMT and then as a paramedic, and he assisted the DEP with their Project WET (Water Education for Teachers) and was on the DEP's dive team. He continued caving and surveyed a number of caves, including Sharps, Elkhorn Mountain, and Buckeye Creek Caves, as well as the Sinks of Gandy, the last two maps of which were presented with the Medal Award at the NSS's annual Cartography Salon. He has mapped 73 caves to date, all but three of which are in West Virginia.

George, during his time in Bluefield, began to edit the Greenbrier Grotto's every-other-month newsletter, *The Carabiner Wrap Up*. This went belly up within 3 years, thanks to rising postal costs, but it evolved into *The West Virginia Caver*, which was then supported by five caving organizations and could afford a bulk rate. He also, in the mid 1990s, edited and put together the book, *On Station*, the NSS's publication on cave surveying. This was followed by a second edition, as well as a myriad of West Virginia Speleological Survey bulletins. All told, George has been the editor, author, or subordinate author for 13 WVASS bulletins and one monograph, the longest of which is over 400 pages, with two more bulletins in the works. He has also continued to edit *The West Virginia Caver*, which is now in its 41st year, and he is currently the Executive Director of WVASS.

That's about it, other than George has written 10 sci-fi and fantasy books, which he has proven a complete failure at promoting and selling. So if anyone knows any way out of this dilemma, please let George know. Strong women characters are his forte.

Paint With Cheryl Kids Workshop

11 AM–1 PM, Room 404

Join Cheryl Suitor (caver, artist, and teacher) for a morning of fun while learning how to paint an easy but



beautiful bat-themed picture on canvas. Leave with your own masterpiece. No experience necessary! Kids under 12 should be accompanied by an older sibling or other family member. This is NOT a part of the JSS. The fee is \$20 and can be paid at Registration if you didn't preregister.

Paint with Cheryl Adults Workshop

2–4 PM, Room 404

Join Cheryl Suitor, caver, artist, and teacher, for an afternoon of fun while learning how to paint an easy but beautiful bat-themed picture on canvas. Leave with your own masterpiece. No experience necessary! The fee is \$30 and can be paid at Registration if you didn't preregister.

Amateur Radio Exams

Tuesday, 5 PM, at the Ham Station in the campground

If you want to become a licensed amateur radio operator (Ham), we will have FCC amateur radio exams Tuesday evening at 5 PM in the campground. We may have other times and locations available. Prior study is required. We have review manuals for the first level and the Technician class available. Sample exams are on the Internet. See Sam Rowe, KG9NG, NSS 7839 for more information on how to pass your test. You can check at

Special Events – Tuesday

the amateur radio station in the campground for more information.

In Tennessee we had six candidates with several getting or upgrading their license. The ARRL (American Radio Relay League) sanctioned tests are given by ham NSS members who are VEs (volunteer examiners.) The exam fee is \$15.

Fellows and New Members Dessert Reception

7–8:30 PM, Augusta Dance Pavilion

All NSS Fellows and new NSS members who have joined since the previous convention are invited to a meet-and-greet dessert reception at the Augusta Pavilion, near the McDonnell Center at D&E College. Fellows and New members will get a ticket at registration. Special shuttles to the campground will run until 11. Please, if you plan to drink, have a designated driver or ride the shuttle. This is for Fellows and new members only—no “plus ones.”

Thailand Cave Rescue Presentation

9–10:30 PM, Harper-McNeely Auditorium

Rick Stanton is a British cave diver who was intimately involved with the famous 2018 rescue of 13 kids from a flooded cave in Thailand. He was the person who first located the group and then planned and assembled the rescue team. This talk will include items of specific interest to cavers, such as pumping and water diversion activities. Special shuttles to the campground will run until 11.

Rick wrote a book, *Aquanaut*, about the rescue and there will be book signing on Wednesday from 12:30 to 2:00 PM at Speleobooks in the vendor area.



The National Speleological Foundation is a not-for-profit 501(c)(3) corporation organized to provide long term financial services for the NSS and many other organizations. The foundation also awards grants for a wide variety of caving and research activities.

SpeleoFoundation.org

Special Events – Wednesday

Luminary Series II

Annette Summers Engel (NSS 31319 JM, SC, FE)

“For the World”

Wednesday, 12:30–1:30, Harper-McNeely Auditorium



Annette grew up collecting rocks and spending her days running wild in the woods of Ohio or roaming mountains with her cousins in West Virginia. At 12 years old, while away at summer camp at Carter Caves State Resort Park in Kentucky, Annette realized she wanted to be a geology professor, captivated by

the idea after meeting college students and their biology professor, Dr. Horton Hobbs III. The group was from Wittenberg University in Springfield, Ohio, and logically, Annette had to attend Wittenberg, too, and major in geology.

As an undergraduate student, she spent nearly every weekend doing research across the eastern US and TAG with Dr. Hobbs and members of the Wittenberg University Speleological Society (the WUSSes). They mapped cave passages, measured water chemistry, and looked for and inventoried cave life, from crayfish to bats, and spiders to beetles. Pseudoscorpions were her favorite. The research and adventures made Annette realize that she would not be happy siloed into a single discipline, and she embraced becoming an interdisciplinary scientist. Annette also soon realized how important serendipity was to the scientific enterprise.

Serendipity came in many ways to Annette, from the people she met and the cross-disciplinary research projects she joined or led, to momentous world events, or from a curiosity to know more about the places in which she lived. Most importantly, she allowed her research to move in new directions because of the desire to do something that mattered, “for the world.”

Annette met Serban Sarbu in 1994, after asking him to give a grotto talk. He was working on his dissertation at the University of Cincinnati that focused on the unusual (at the time) Movile Cave ecosystem in Romania, which is supported by chemosynthetic microorganisms. Since the late 1970s, discoveries at deep-sea hydrothermal vents revealed bacteria capable of converting chemicals, like hydrogen sulfide or methane, into energy and carbon that could sustain marine animals. But, back then, there had been almost no research on chemosynthetic bacteria in other dark environments, like caves or aquifers. Annette was hooked and asked to join the project.

In 1995, she jetted off to Romania with Serban and after joining him at the University of Cincinnati to pursue a Master’s degree, although she would be in the Department of Geology. This trip was also after she and Scott announced a “save the date” for their wedding later that year. Soon, serendipity would strike again, spurred by NASA’s reports about squiggles in a Martian meteorite being bacteria. A new scientific discipline was emerging, geomicrobiology. Annette quickly considered this “her field.”

Doing geology research in Movile Cave, Annette was repeatedly astonished about how little research there was on acid-producing bacteria in caves, and especially those associated with sulfuric acid speleogenesis. She asked one of the Movile Cave project professors, Dr. Brian Kinkle, if she could pursue a second Master’s degree in biology. He said yes, and Annette’s research expanded from the acid-producers in Movile Cave to include those from the Frasassi caves in Italy, Cesspool Cave in Virginia, and Lower Kane Cave in Wyoming. In 1999, Annette decided to focus her doctorate work on Lower Kane Cave and asked Dr. Philip Bennet, in the Department of Geological Sciences at The University of Texas at Austin, if this was interesting to him, too. He said yes, and they would go on to make discoveries about the microbes that cause sulfuric acid speleogenesis and sustain cave and karst aquifer ecosystems without sunlight. This research also attracted the attention of children’s book authors and TV networks like PBS (Mysterious Life of Caves) and BBC (The Secret Life of Caves).

After becoming a professor of geomicrobiology in the Departments of Geology and Geophysics and Biological Sciences at Louisiana State University in Baton Rouge, and then a geochemistry professor in the Department of Earth and Planetary Sciences at the University of

Special Events – Wednesday

Tennessee, Knoxville, Annette took advantage of serendipitous opportunities to lead scientific expeditions around the world, as well as to diversify her research portfolio into new directions. Sometimes this research took her away from caves, but she never strayed too far. Recently, Annette joined biospeleology teams to discover new cave life in eastern Tennessee and uncover ecosystem processes in Hawaiian lava tubes, which has recently been featured in a PBS Nature documentary (Living Volcanoes). From her work in Hawai'i, she has added cave-adapted, thread-legged bugs to her list of favorite cave animals.

Over the years, to ensure wide impact from her work, Annette and her collaborators have published their findings as dozens of scientific papers and in books, including *Microbial Life of Cave Systems*. Moreover, for her efforts and discoveries, Annette has been honored by the NSS, the International Union of Speleology, the Explorers Club, the Karst Waters Institute, the American Association for the Advancement of Science, and other organizations.

Along the way, Annette has been a long-serving volunteer for, and leader within, caving grottos and nonprofit organizations like the Karst Waters Institute, the Cave Conservancy of the Virginias, and the Cave Conservancy of Hawai'i. She is currently coordinating the Cave Conservancy Foundation's Graduate Fellowship in Karst Studies program. Much like her desire to conduct research that is relevant, service is also an important responsibility "for the world." Annette encourages others to get involved to help conserve and protect the environment, assist others in challenging times, develop more inclusive practices in our institutions and workplaces, and educate and inspire the next generation.

Cave Formation Repair Workshop

Morning classroom session

Afternoon demonstration is a local cave

There are untold numbers of broken cave formations in the world's caves. The majority of these were caused by human impact, with a small amount resulting from natural causes. We, as cavers and scientists, want to do as much as possible to repair, restore and conserve these damaged resources. This Cave Formation Repair and Restoration Workshop will help train and educate people on techniques and tools that we use to make formation repairs.

The workshop consists of a classroom session in the morning followed by an in-cave portion in the afternoon. The cost is \$30 and can be paid at Registration if you didn't preregister. The cost includes a copy of Mike Mansur's book, *The Cave Formation Repair Project: Restoring the Beauty of America's Great Caves*. This will be used as a guide for the workshop participants.

Vertical Techniques Workshop

8:30 AM–4:00 PM (with 30 minute lunch break)

The Vertical Section's Annual Vertical Techniques Workshop is one of the most popular and fun learning events offered at the NSS Convention! Please reserve your slot before the event is full, and be sure to arrive early Wednesday morning!

No previous vertical experience is necessary to attend this workshop. It provides all cavers—beginner through experienced—with a basic overview of American-style Single Rope Techniques (SRT) in a safe and controlled environment. The workshop is NOT intended as a complete training course, which should be obtained via local grottos or other caving groups, etc. There are hands-on practical sessions in knot tying, belaying, cable ladder work, rappelling with the rappel rack and Petzl Stop descenders, and the basic use of the most popular and useful vertical rope ascending systems.

All participants MUST provide properly fitted climbing/caving approved gear, including as a minimum: helmet, seat harness with an appropriate load-bearing fastening, a locking carabiner, and rope-suitable gloves. Do not wear tank tops, excessively loose clothing, short pants, or anything else that might interfere with ropes or maneuvers. Avoid sandals, flip-flops, slip-ons, and other non-supportive footwear. Boots are recommended, although laced sneakers may be allowed. Participants with long hair should have a way to secure it away from rope/gear involvements. No home-made gear is allowed without instructor approval. All other equipment is provided. Participants are advised to bring their own lunch.

PROMPT ARRIVAL & PROPER EQUIPMENT: All participants MUST be at the workshop site promptly before 8:30 AM to sign in and attend the mandatory Safety Briefing. All participants must have previously signed the NSS Convention Liability Releases. Minors must have written parental permission. Wait listees wishing to participate must also arrive promptly (and bring your fee, just in case!), in order to acquire any

available open slots surrendered by no-show or improperly equipped registrants.

To attend this workshop, all participants must sign up in advance at the Convention Registration Desk if they did not preregister. Attendance is limited to 35 participants, so please register early. The first 35 registrants pay a fee of \$60. If registration becomes full, a waiting list will be maintained. These additional wait listees do not yet pay a fee, pending event slot availability. Since this event must follow both safety protocols and a tight time schedule, tardy or improperly equipped participants may be declined, and their slots may be given to ready and properly equipped wait listees. Paying registrants who are unable to participate may be eligible for a refund.

Book Signing

12:30–2:00 PM, Vendor area

Rick Stanton will be autographing copies of his book, *Aquanaut*, from 12:30 to 2:00 PM on Wednesday at Speleobooks in the vendor area. Copies of the book will be available for sale.

Pottery Demonstration by Peter Jones

1–4 PM, Ceramics Room in Myles Atrium Basement

Peter Jones has been a caver/cave photographer for 54 years and a potter for 52 years. He's been blending his two passions in life together for all those years. Many people have seen his finished work in Vendors Row at conventions and Old Timer's Reunions for many years, but very few have seen how his work is produced on the potters wheel. Come watch Peter perform alchemy and turn a lump of clay into a beautiful piece of functional artwork. Of course you can come see him in the Vendor Area as well, but seeing the work being produced on the wheel is almost like seeing magic!! The demonstration will last at least 2 hours, but longer if interest is sufficient. See you there!

Auction

7:00 PM, Harper-McNeely Auditorium

Come out and join us for the annual NSS Auction and Fundraiser. Bring cash, your checkbook, or your credit card and bid on the many speleo-treasures that will be

offered. All proceeds go to a fund designated by the NSS unless you specify where they should go on the donation form. Items for the auction can be dropped off at the NSS Bookstore prior to Wednesday at 5 PM. Many auction items will be on display before the event at the NSS Bookstore.

Donations of items that will interest cavers and sell competitively are encouraged. Vintage items such as *NSS News* and *Bulletins* prior to 1950 may be highly sought after. *NSS News* and grotto newsletters must be at least 40 years old. Artistic bat memorabilia may sell for some value. Carbide lamps, caving equipment, old commercial cave souvenirs, cave-related jewelry, and artwork. If it is of interest to you it may be of interest to someone else.

The NSS office will send a donation letter for tax purposes.

Campground Party

7:00 PM until at least 11 PM, Campground

By now you are having a good time at convention. Let's step it up a bit and have a fun night of music and dancing and hanging out with old and new friends! The Terminal Syphons will rock us throughout the night. We might have a surprise for you before they go on stage. There will be some snacks and beer, soda, and water.

CAVER CO-OP

(Consignment Sales)

**Get great bargains
on caver-supplied**

- Cave gear
- Publications
- Crafts
- Memorabilia
- Other great stuff

Special Events – Thursday

Digital and Analog Cave Sketching Class

Morning class

Afternoon workshop in a local cave

Students will learn the basics of plotting and drawing a plan view, profile view, and cross section sketch of a cave from established survey data. Both analog (pencil and paper) techniques and Topodroid techniques will be shown—students may select one or the other. Cave protractor, pencils, and survey paper will be provided. Digital students will need to arrive with their own device with Topodroid installed. We will assist in configuring Topodroid as part of the class, so no experience is necessary with the software. In the afternoon, students will move to the same cave that they sketched from photos during the morning classroom session and continue in the cave environment. It is recommended that students have had experience on a survey team previously as something other than a sketcher, as we will not cover gathering plot data in the class. The cost is \$20 and can be paid at Registration if you didn't preregister.

Cave Photography Workshop

Morning presentation in the Photography Session

Afternoon trip to a local cave

Following a presentation in the Cave Photography Session on Thursday morning, Dave Bunnell will lead an in-cave Photography Workshop in a local cave that will focus on flash and LED lighting. Bring a camera that has manual settings and ideally a hotshoe, or a cellphone with a low light capture mode like Nightsight. A tripod could be useful but not essential. Flashes and LEDs provided, but bring your own if you wish. The trip leaves at 1:00 PM and is limited to 12 people. The \$10 fee for the cave trip can be paid at Registration if you didn't preregister.

Storytelling Contest

7:30 PM, Campground Pavilion

The storytelling contest is a largely free-form contest where people get up on stage and have 5 minutes to tell a caving-related story. There will be a microphone but no other props. The story can be from any aspect of caving,

including travel to or from the cave, the people involved, the cave itself, or the aftermath of the trip. The story is supposed to be true, although how would anyone know if only the storyteller survived the incident? There is a 5-minute time limit, and there is a limit of one story per contestant. People can sign up in advance, although last-minute entries are solicited and encouraged. The excitement of the moment often inspires people to tell a story. A panel of judges will determine the winner, and there will be a prize. The contest will run until we run out of entrants, usually after 2 or 3 hours.

Thursday Evening Salon Awards Show (Photo Salon)

Harper-McNeely Auditorium

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, but without award and salon chair presentations. The award winners will be announced. 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.

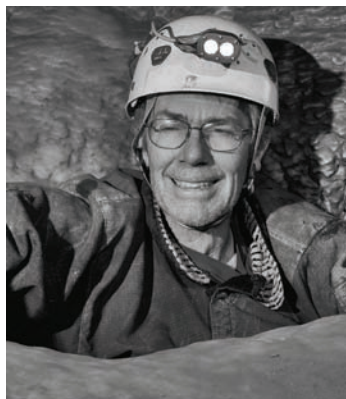
Special Events – Friday

Luminary Series III

David E. Bunnell
(NSS 14760 OS, FE)

“All the World’s a Cave”

Friday, 12:30–1:30, Harper-McNeely Auditorium



Dave Bunnell was born and raised in Delaware, and caves weren’t on his radar until visiting Anemone Cave in Acadia National Park as a child. His first limestone cave was Crystal Sequoia in California, which he visited on his first trip to the western USA at age 16.

Dave’s real start as a caver was in his undergrad years at the University of Delaware. He was active in the Outing Club and they offered a trip to Pennsylvania caves. The deep blue pools and sculpted passages had an otherworldly appeal that captivated him. Soon, he was going on trips to West Virginia, got into vertical caving, and visited both Hellhole and Schoolhouse Caves. He founded the Caveless State Grotto, though Delaware had one small cave.

Dave attended UVA in Charlottesville, getting a PhD in Psychophysiology. At a grotto meeting he met Ron Simmons who became his main caving companion. Their caving was mostly in West Virginia, and especially the Friar’s Hole System. At the 1978 Texas Convention, Dave met Carol Vesely with whom he later did lots of caving. He did the first of many trips to Mexico, to Golondrinas. They experienced a fabulous sunbeam in the pit and his photos were the first he had published in a book by Michel Siffre.

In 1980, Dave began a postdoc at UC Santa Barbara in sleep research. He continued caving extensively, and more international trips. In 1982 Carol and Dave took part in an expedition to Papua New Guinea. He did a number of underground camps in the Sistema

Purificacion in Mexico. In 1986, he joined an expedition to the Chiquibul Cave system in Belize.

Dave’s two biggest caving projects began during this period. The book *Caves of California* mentioned extensive sea caves in the Channel Islands and along the California coast. After a trip to Shell Beach to find the “Caverns of Mystery”, Carol and Dave initiated the California Sea Cave survey. They visited Painted Cave on Santa Cruz island and were impressed by that and the many large cave entrances nearby. Enough so that he bought a 20-foot cabin cruiser, and christened it the Island Caver. Dave made some three dozen trips to Santa Cruz Island with friends, and in 1988 published his first book, *Sea Caves of Santa Cruz Island*. They also did numerous surveys of coastal caves from Baja up to Santa Cruz.

The second great project was Lechuguilla. Dave attended an early expedition in 1986, and did over a dozen weeklong expeditions. He was in on some great discoveries, and conducted the first cave dives there.

In 1988, Dave took a postdoc at UC Santa Cruz and spent 10 years there. In 1991, he attended a Vulcanospeleology conference in Hawaii and discovered a few caves. This started the first of many trips there, working on caves on Mauna Loa and Kona with Doug Medville, Bob Richards and others.

In 1995 and 1996, Dave participated in expeditions to Gunung Buda in Borneo, near Mulu. He got his first taste of publishing a book with digital photo preparation, and put together two reports.

In 1995, Dave’s companion Djuna and he produced the “Virtual Cave” website, a guide to cave formations. It has been maintained and expanded, and he and is currently working on a version for the new NSS website so hopefully it will live on after Dave.

In 1996, Dave was offered editorship of the NSS News. Caving was always a competitor to his scientific career as



Special Events – Friday

a sleep researcher. By choosing this path, caving won out forever.

In 1998, Dave met his future wife Elizabeth and moved to Angels Camp, in the Mother Lode cave country. Since then, Dave has caved all around the world, notably in Asia, Europe, Mexico, and Central America. He has worked with all four local California show caves, the highlight was a survey of helictite-rich Black Chasm with Hazel Barton.

Last year, Dave retired from the NSS News after 26 years. He has been blessed to work with so many wonderful people in the caving family who encouraged his continued work on it. Along with his cave photography, it opened many doors for cave visits around the world.

Dave plans to work on more books, especially one on the great Sea Caves of the world.

Awards Banquet

Friday, 7:00 Phil Gainer Community Center

The Awards Banquet is the final big event of the 2023 NSS Convention. It will be held at the Phil Gainer Community Center in Elkins, not at the college. The Gainer Center is about a 2-mile drive from the McDonnell Center parking lot. There is limited parking so shuttle buses will be available to and from both campus and the campground before and after the banquet.

There will be an after-banquet party at the campground.

FUNDRAISER

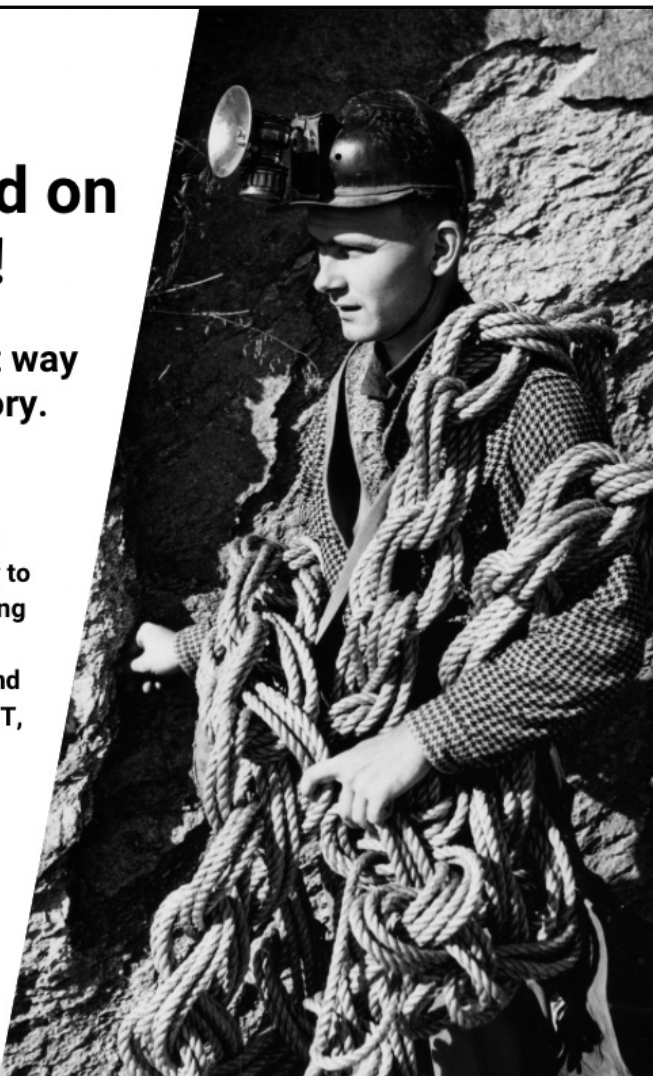
Help us break ground on Vertical Bill's Tower!

This training tower is the perfect way to honor Bill Cuddington's memory.



Our hope is to create a premier outdoor education facility that draws cavers from all over the country to our beautiful HQ. The tower will offer a safe learning environment where any number of organizations such as, the NCRC, VTC, Internal Organizations, and even the Boy Scouts, will be able to educate on SRT, alpine rigging, and rescue training in a controlled environment.

CONTRIBUTE TODAY by visiting [CAVES.ORG](https://caves.org), clicking "DONATE" and selecting "VERTICAL TOWER."



Sunday Schedule

Geology Trip

See page 36 for information.

Vendors

Many vendors will be open on Sunday in the vendor area in the McDonnell Center.



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NIGHT'S AWARD BANQUET**

 **National
Speleological
Foundation**

Monday Schedule

Monday Morning

Opening Ceremony

Monday, 8:15–8:45

Plaza in front of Myles Center

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 Elkins and Randolph County.

West Virginia Exploration

Monday, 9:00–12:00

Harper-McNeely Auditorium Nikki Fox

West Virginia is home to 12 caves over 10 miles in length, two of which are over 50 miles. Many of these large cave systems are currently being explored and mapped by groups such as the Germany Valley Karst Survey and the West Virginia Association for Cave Studies. Talks during this session will mostly emphasize the exploration of some of these systems, with some presentations including the geology and hydrology. Come learn what makes West Virginia caving unique and listen to the distinct challenges of state's project caving scene.

9:00 **An Updated Geologic Map of Monroe County, West Virginia: Improved Mapping of the Greenbrier Group and its Geologic Structure as a Guide for Future Cave Exploration** (p. 105)

Daniel Doctor

9:20 **de Tour de West Virginia 2020** (p. 105)

George Dasher

9:40 **Memorial Day Cave: A 2023 Update on Exploration and Survey** (p. 105)

Rick Royer

10:00 **Recent Advances in Shoveleater Cave** (p.106)

Mark Minton

10:20 Break

10:30 **Hellhole's TARDIS – It's Bigger on the Inside** (p. 106)

Reilly Blackwell & Nikki Fox

10:50 **The Exploration of Kimble Pit** (p. 106)

Corey Hackley

11:10 **The Survey of Cave Hollow Arbogast, Tucker County, West Virginia** (p. 107)

Dave Socky & Dave West

11:30 **Surveying and Exploration in the Cheat River Canyon, West Virginia** (p. 107)

Greg Springer

Board of Governors Meeting (Open)

Monday, 9:00–12:00

Paull Gallery in Myles Janet Tinkham

The Board of Governors sets the 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. Members will have the opportunity to bring up issues or ask questions of the board after the officer reports. The agenda will continue with other items of business until around 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 to motions after the board members have commented at the direction of the President or at the request of a Board member.

Vertical Climbing Contests

Monday, 11:00 AM–5:00 PM

Tuesday, 9:00 AM–5:00 PM

Memorial Gym Amy Bern

One of the highlights at each NSS Convention is the Vertical Climbing Contest, where rope climbers of every age group can test their skills and equipment for ascending 11mm caving rope using Single Rope Techniques (SRT). This continues our 53 year Vertical Caving Tradition!

Monday Schedule

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. Additional attempts in each category (up to three) may be considered by the Vertical Section, time permitting.

There is also 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 gender.

ARRIVAL: The Contests run from about 12:00 PM to 4:00 PM on Monday and from 9:00 AM to 4:00 PM on Tuesday. Climbers, Please come early!! **NEW:** We will have a QR code or similar electronic sign-up system this year. Hopefully, this will provide a smoother competitive experience!

Participants may join us at any time during the day, and we appreciate Support and Coaches! All persons must have signed the NSS Convention Liability Releases. Minors must have written parental permission.

NOTE: Please use the sign-up sheet to sign up for a time and arrive a few minutes early to sign in, gear up, wait for turn, climb, learn and enjoy! We may have some first-come first serve spaces for runs, but sign in early to secure yours! All Climbers must be ready to promptly rig in & climb when called, or you will be bypassed by the next Ready Climber!

Everyone is Welcome to come, participate, watch, cheer and learn!

Speleology for Cavers

Monday, all day
Room 413 Steve Stokowski

See page 37 for information

Cave Diving Session

Monday, all day
Room 319 Jason Richards

The Cave Diving Session provides the opportunity for Cave Divers and Sump Divers to present their projects and new techniques and equipment in a smaller format than the US or International Exploration Sessions. Typically the session has consisted of US sump divers giving short format (10-15 minute) presentations on their

ongoing exploration projects. This year we will branch out with an update about diving and mapping Wookey Hole in the UK, diving a 600 foot deep uranium mine in Poland, Updates to exploration in Proyecto Purificacion in Mexico, The push to bring Canada's deepest underwater cave to 450 feet, Hot Spring diving in the western United States, an update to underwater cave rescue training efforts in the United States, and many more. As usual, there will be an equipment layout and show and tell, and we encourage explorers to bring their cutting edge equipment for an unstructured discussion period following the formal presentations. No project is too small, if you want to give a short talk, please contact Jason Richards at rchrds.caver@gmail.com.

9:00 Introduction and welcome.
Update on local projects

9:30 **The Continued Exploration at Wookey Hole** (p. 73)
Duncan Price

10:00 **Kowary Uranium Mine** (p. 73)
Marcin Stempniewicz

10:30 **New Exploration at Proyecto Purificacion** (p. 73)
Osama Gobara and Zeb Lilly

11:00 **Pushing Canada to 450 feet: Hole in the Wall British Columbia** (p. 74)
Jason Richards

NPS Cave Management Meeting (closed)

Monday, 9:00–11:00
Room 318 Pat Seiser

This is a closed meeting for National Park Service personnel.

Monday Lunch

Fine Arts Opening Reception

Monday, Noon
Myles Atrium Carolina Shrewsbury

The Arts Salons will host an Opening Reception starting at noon to celebrate the public opening of the Salons. Please do not visit the Salons before the reception as this interferes with the judging process.

Communications and Electronics Section Lunch

Monday, 12:30
Room 100 John Deroo

- 12:30 BYO Lunch. Catch up with other CES members, discuss new projects, reminisce about The Good Old Days, etc.
- 1:15 CES Annual Meeting. Approve minutes from last year, officer reports, Old and New Business, and Executive Committee Elections.

Cave Diving Section Lunch

Monday, noon
Room 319 Jason Richards

Speleology for Cavers Class Lunch

Monday, noon
Room 413 Steve Stokowski

This is a closed lunch for participants in the Speleology for Cavers Class. The lunch is included in the registration fee for the class.

Monday Afternoon

West Virginia Exploration (continued)

Monday, 2:00–5:00
Harper-McNeely Auditorium Nikki Fox

- 1:50 **Scooped, Lost, and Found: Progress along the Randolph Pocahontas County Line, West Virginia** (p. 107)
Hunter Campbell
- 2:10 **Howli Mowli Breakthrough in Friars Hole Cave System** (p. 108)
Keely Owens
- 2:30 **Exploration of the Historic Section of Maxwellton Sink Cave** (p. 108)
Greg Springer
- 2:50 **McClung Cave, West Virginia – 23 Miles in 4 years** (p. 108)
Dave Socky

- 3:10 **Great Savannah Cave System's Sweetwater River Update** (p. 108)
Nikki Fox
- 3:30 Break
- 3:40 **Dry Cave, West Virginia: Anything but Dry** (p. 109)
Greg Springer
- 4:00 **The Geology of Burntwood Cave** (p. 109)
Corey Hackley
- 4:20 **Discovery and Exploration of Burntwood Cave** (p. 109)
Bruce Fries
- 4:40 **The West Virginia Speleological Survey** (p. 110)
George Dasher

Cave Diving Session (continued)

Monday, 1:00–5:00
Room 319 Jason Richards

- 1:00 **Systema Paloma, Ambergris Caye, Belize** (p. 74)
Ben Popik, Arielle Ginsberg
- 1:30 **KUR and the Exploration of the Florida Aquifer** (p. 74)
Brett Hemphill
- 2:00 **Applying diving concepts to caves with hazardous gas environments** (p. 74)
Katie Graham
- 2:30 **Diving Hot Springs in Wyoming** (p. 74)
Kevin Blackwood
- 3:00 **Minnesota Sump Diving Update** (p. 74)
Michael Raymond
- 3:30 **Remembering Ron Simmons' Florida Explorations** (p. 75)
Michael Poucher
- 4:00 Gear layout and question and answer period.

Monday Schedule

Communications and Electronics Session

Monday, 2:00–5:00
Room 100 John DeRoo

The Communications and Electronics Session covers all applications of electronics in caving including surveying, photography, wired and wireless communications, lighting, data logging, and radiolocation. Amateur Ham radio may also be used in the pursuit of these goals. Informal talks and demonstrations will follow the formal presentations.

- 2:00 Sam Rowe will discuss the NSS Convention Amateur Radio Special Events Station at this year's convention and show the QSL cards he received from previous year's conventions. He will also provide updates on the Amateur Radio Licensing Exam that will be held during convention.
- 2:15 **Improvements to BuecherNet, a Low Power Data Network in Fort Stanton Cave, NM** (p. 77)
John Lyles
- 2:45 **Radiolocation and Communications on Bill Stone's 2023 Expedition to Sistema Cheve in Oaxaca, Mexico** (p. 77)
Brian Pease
- 3:15 **CO2 Mitigation Experiments at Edgewood Cavern, NM** (p. 78) and **Digital High Frequency Communication Experiments in Fort Stanton Cave, NM** (p. 78)
John Lyles
- 4:00 **A Cheap & Solidly Performing Cave Radio Kit on the Horizon** (p. 78)
Ken Smith
- 4:15 Last minute presentations, lightning talks, and show&tell..

NCRC Meeting

Monday, 2:00–5:00
Room 318 Gretchen Baker

The National Cave Rescue Commission (NCRC) will discuss recent activities and upcoming events. All are welcome.

Board of Governors Closed Meeting

Monday, 2:00–5:00
Paull Gallery in Myles Janet Tinkham

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

Vertical Climbing Contests (continued)

Monday, 2:00–5:00
Memorial Gym Amy Bern

Speleology for Cavers (continued)

Monday, 2:00–5:00
Room 413 Steve Stokowski

Monday Evening

Howdy Party

Monday, 6:00 PM–Whenever
Campground Meredith Weberg

See page 37 for information



Tuesday Schedule

Tuesday Morning

U.S. Exploration Session

Tuesday, all day

Harper McNeely Auditorium Derek Bristol

The U.S. Exploration Session presents exploration and survey conducted in caves and karst of the U.S.

- 9:00 **Cave Exploration on Prince of Wales Island (Alaska)** (p. 101)
Amelia Fatykhova, John Dunham
- 9:20 **Revenge Takes Time: Continuing Exploration in Wind Cave (South Dakota)** (p. 102)
Hazel A. Barton, Nick Anderson, Derek Bristol, Adam Weaver
- 9:40 **Exploration under the South Cirque of Silvertip (Montana)** (p. 102)
Irina Tabarana, Georgia Schneider
- 10:00 **Tears of the Turtle - Deepest Limestone Cave in the US (Montana)** (p. 102)
Pete Johnson
- 10:20 Break
- 10:30 **The Kamapua'a Cave System, Big Island (Hawaii)** (p. 102)
Pat Kambesis, John Pollack, David Sawatzky
- 10:50 **Exploration in Carlsbad Cavern (New Mexico)** (p. 103)
Derek Bristol
- 11:10 **Continuing the Exploration of Loaded Dice Cave (Wyoming)** (p. 103)
Pete Johnson
- 11:30 **Cave Exploration in the House Range (Utah)** (p. 103)
Matt Paulson

Conservation and Management Session

Tuesday, all day

Room 400 Adam Weaver & Val Hildreth Werker

The Conservation Tuesday Talks remind us that everything in caving is conservation. The session will include cave and karst conservation and management talks on minimum-impact-science-based decisions, conservation minded exploration, stewardship, karst aquifer watershed protection, spelean habitat ecosystem findings, bat study updates, clean-caving ethics, WNS decon systems, as well as advancements in cave restoration, speleothem repair, and low-impact caving methods. Join us for lively speleological presentations and discussions exploring state-of-the art conservation solutions and current best practices.

- 8:30 **Updates on the NPS CKRIT Cave Database** (p. 79)
Georgia Schneider
- 9:00 **New Dye Trace Efforts in the Hidden River Cave System, Horse Cave, Kentucky** (p. 79)
Mykah Carden, Pat Kambesis, and Lee Anne Bledsoe
- 9:25 **Management of a Long-term International Speleological Project** (p. 79)
Bill Steele
- 10:10 **Paleontological Inventory of Caves in White Pine County, Nevada** (p. 80)
Peter Druschke, Gretchen Baker and Doug Powell
- 10:30 **Evaluating Risk Pathways for Groundwater Contaminants on a Karstic Carbonate Landscape** (p. 80)
Zach Normile
- 10:55 **A Video Essay of the Scientific Inventory of Caves in White Pine County, Nevada** (p. 81)
Jean Krejca, Gretchen Baker and Doug Powell
- 11:30 **The Urgent Need for Extraterrestrial Subterranean Conservation** (p. 80)
Ceth Parker

Executive Director Presentation

Tuesday, 10:00

Room 100 Christine Ebrey

After decades of looking into employing an Executive Director the NSS is finally in the position to make a move in that direction. This is a big step and change is

Tuesday Schedule

never easy. Teams have been working on the by-laws and board acts preparing for the restructuring of the organization's management structure. We will be moving away from a totally volunteer-run organization to one with a paid professional responsible for not only the running of the office and bookstore, but also for seeing that all the committees are functioning in a productive manner.

This meeting gives you the opportunity to learn what changes are planned, ask questions, and offer feedback and suggestions.

Geology & Geography Posters

Tuesday, 11 AM – Friday, 11:30 AM
Room 405 Katherine Schmid

In addition to the traditional Geology and Geography Session on Friday, a number of relevant posters will be on display in room 405 starting on Tuesday morning. The authors will be present from 11:00 until noon to discuss their posters and answer any questions. The posters will remain up until 11:30 on Friday morning.

Automated Sinkhole Mapping in Mifflin County, Pennsylvania: A Test Case for an Updated, Statewide Karst Feature-density Map (p. 91)
Rose-Anna Behr

Deciphering the Karst Hydrogeology of Castlewood, VA: A Work in Progress (p. #91)
Teresa L. Brown, Robert W. Hunter, C. Kyle Kennedy, Esau G. Byrd, Paula L. Hall, Isabella J. Maggard, Olivia S. Salazar, Brandi J. Shaffer, Rachael C. Sproles, Madison K. Stewart

Improving Digital Geologic Data Access for the State of West Virginia (p. 92)
J. Wayne Perkins Jr.

Caves as Geoheritage Sites in Pennsylvania (p. 92)
Katie Schmid

Vertical Climbing Contests (continued)

Tuesday, all day
Memorial Gym Amy Bern

This is a continuation of the Vertical Climbing Contests that started on Monday Morning.

Vertical Reblay Course

Tuesday, 10:00 AM–5 PM
Memorial Gym Rachel Saker

The Reblay Course focuses on alpine style of rope rigging-- the use of rebelay, deviations, and reanchors. The workshop provides demonstrations of alpine ropework, instruction for both beginner and experienced cavers, and a ropes course on which to practice.

It is open to all vertical cavers and it is free to participate.

Instructors will be available throughout the day to assist participants in learning and practicing the techniques necessary to negotiate rebelay safely and efficiently. While the course is open, participants may come by at any time to watch others, demonstrate their own techniques, argue about why their method is probably better, or simply practice.

Participants should bring their own SRT gear, which must include cowstails. Homemade gear is subject to approval by the instructors. All gear will be evaluated by the instructors for safety, setup, and be “tuned” if needed. The workshop runs concurrent with the Vertical Climbing Contests, however it is just for fun-- i.e., noncompetitive and not timed.

ARRIVAL: Participants may join us at any time during the day. Climbers should arrive well before about 3:00 PM to allow time to sign-in, prepare to climb, and perform their ropework. All persons must have signed the NSS Convention Liability Releases. Minors must have written parental permission

Paint With Cheryl Kids Workshop

Tuesday, 11:00–1:00
Room 404 Cheryl Suitor

See page 39 for information

SpeleoArt Workshop

Tuesday, 10:00–12:00
Myles Painting & Drawing Studio Carolina Shrembsbury

Every year we have a SpeleoArt course in art and caving presented by leading speleo-artists and cavers. It costs just \$10 to participate. There we learn how to work in the caving environment, chose subjects and how to sketch subjects when caving.

At convention we work with subjects in speleology—2023 will feature life drawing with caver in action with gear on!

There will also be a Collaborative Painting, where people come up to make their mark on a large paper or canvas sheet that folks can gather around and doodle with anything from felt tips to paint. Subject . . . anything caving. Often involves . . . something seen, heard, or experienced over convention week. People come in between sessions to do this.

Tuesday Lunch

Luminary Series I George Dasher

*Tuesday, 12:30–1:30
Harper-McNeely Auditorium*

See page 38 for biographical information.

Conservation Section Lunch

*Tuesday, noon-1:00
Room 400 Adam Weaver & Val Hildreth-Werker*

An open and informal discussion of folks about cave conservation and management ideas and practices over lunch. The room may change so a note will be posted on the Room 400 door if that happens.

Vertical Climbing Contests (continued)

Memorial Gym

Tuesday Afternoon

U.S. Exploration Session (continued)

*Tuesday, 2:00–5:00
Harper-McNeely Auditorium Andrea Futrell*

2:00 **Standing on the Shoulders of Giants – Fern Cave Survey (Alabama)** (p. 103)
Rand Heazlitt, Marion Ziemons

- 2:20 **Exploring the Caves of Tazewell County (Virginia)** (p. 104)
Mike Futrell, Andrea Futrell
- 2:40 **Sarah Furnace Cave: Perhaps the Maziest Maze Cave in the World? (Pennsylvania)** (p. 104)
Bert Ashbrook
- 3:10 Break
- 3:20 **Cave Mapping and Inventory in the Daniel Boone National Forest (Kentucky)** (p. 104)
Ben Tobin, Chelsea Parada, Maaz Fareedi
- 3:40 **New Explorations in and Around the Whippistle Cave System (Kentucky)** (p. 104)
Pat Kambesis
- 4:00 **Exploration in the Fisher Ridge Cave System (Kentucky)** (p. 105)
Sean Lewis

Conservation & Management Session (continued)

*Tuesday, 1:00–5:00
Room 400 Adam Weaver & Val Hildreth-Werker*

- 1:00 **Cave Conservation at the National Cave Karst Research Institute** (no abstract)
Ron Kerbo
- 1:35 **Coordinating the Dream Team to Inventory Caves in White Pine County, Nevada** (p. 81)
By Gretchen Baker and Doug Powell
- 2:00 **Microplastics in Karst** (p. 81)
Jeremy M. Weremeichik, PhD.
- 2:30 **Sinkhole Cleanup in New Mexico – Initiation, Implementation & Communication** (p. 82)
Issam Bou Jaoude, Knutt Peterson, Michael Moffit & Devra Heyer
- 2:55 **What do You Know about Cave Protection Laws?** (p. 82)
Patricia Seiser
- 3:20 **Significant Caves Designation Call for National Forest System Lands** (p. 82)
Limaris (Lima) Soto, Chad Harrold and Michael Fracasso
- 3:50 **Meet the Feds Panel – A town hall with the Cave and Karst Program Leads of Federal Agencies and other Federal Land Managers.** A

Tuesday Schedule

great chance to meet the people who are managing the nations caves and karst, and to ask questions.

Vertical Training Commission Meeting

Tuesday, 2:00–5:00
Room 100 Ron Miller

This is the annual business meeting of the NSS Vertical Training Commission (VTC). Chartered in December 2021, VTC's mission is to develop and implement a national vertical training program for U.S. cavers. At the annual meeting, we will provide an update on our progress and plans for the next few years, and will solicit input and feedback from NSS members. Everyone is welcome to attend.

Convention Development

Tuesday, 2:00–5:00
Room 300 Carol Tiderman

If you are planning a future NSS Convention or considering planning one, it is important that you attend this meeting. You'll be able to learn from the experiences of those who have organized past conventions or are working on near-future conventions. You can ask questions you know that you need to be answered and, even better, discover important information you hadn't realized you needed.

Paint With Cheryl Adults Workshop

Tuesday 2:00–4:00
Room 404 Cheryl Suitor

See page 39 for information.

Vertical Climbing Contests (continued)

Memorial Gym

Vertical Rebelay Course (continued)

Memorial Gym

Tuesday Evening

Amateur Radio Exams

Tuesday, 5:00 PM
Ham radio station in the campground Sam Rowe

See page 39 for details.

Fellows & New Members Dessert Reception

Tuesdays, 7:00–8:30 PM
Augusta Dance Pavilion at the College Meredith Weberg

See page 40 for information.

“Open Mic” in the Campground

Tuesday, 7:30 PM
Campground Pavilion Roland Vineyard

The campground's stage and PA will be open for cavers who would like to perform up to three musical pieces at a time. Stick around afterwards for additional turns as we rotate among those that sign up. We will continue the evening as long that there is interest from performers and audience, up until quiet hours (or midnight) kicks in. You will find a great variety of music, and performances from amateurish to professional quality, always fun.

The Thailand Cave Rescue

Tuesday, 9:00–10:30 PM
Harper-McNeely Auditorium Rick Stanton

See page 40 for information.

Wednesday Schedule

Wednesday Morning

International Exploration Session

Wednesday, all day

Harper-McNeely Auditorium Andrea Futrell

The International Exploration Session features presentations on current exploration, mapping, and scientific studies of caves outside of the U.S. This year's presentations feature caves and projects from all over the world, including Canada, Mexico, Haiti, Belize, Lebanon, France, Austria, Vietnam, Malaysia, Laos, Tonga, and the Philippines.

9:00 **Rolland and Pete Caving Expeditions**
Exploration of Sotano Mina De Arena #1,
Mexico (p. 92)
Rolland Moore

9:20 **Panti Pit, Belize: Good Air Brings Big**
Breakthroughs (p. 93)
Carol Vesely

9:40 **The State of Cave Exploration in Haiti** (p. 93)
Pat Kambesis

10:00 **Proyecto Espeleologico Sistema Huautla**
(PESH) 2023 Expedition, Mexico (p. 93)
Tommy Shifflett

10:20 **Exploration of Cueva del Arroyo Durmiente in**
Múzquiz, Coahuila, Mexico (p. 94)
Aubri Jenson

10:40 **Expedition Cheve, 2023, Mexico** (p. 94)
Corey Hackley

11:10 **Descent into Fire and Ice: The Mount Meager**
Volcano Project, British Columbia, Canada (p.
94)
Christian Stenner and Katie Graham

11:40 **First Objective Achieved – Update on**
DEEP23 (Dara Expedition for Exploration
and Protection 2023), Lebanon (p. 95)
Issam Bou Jaoude, Wael Karanouh, and Firas
Fayad

Cave Digging Session

Wednesday, 9:00–12:00

Room 400 Benjamin Brown

The meeting is open to anyone interested in finding new and expanding existing caves. There will be a short business meeting and election of section officers followed by presentations on a variety of dig projects.

In addition to the scheduled presentations, time will be allocated for short pop-up presentations and an informal question and answer section at the end. Presentations on any topic regarding cave discovery and digging are welcome. Learn about LIDAR for cave discovery, digging and hauling, shoring techniques, how to make rocks smaller, and much more.

9:00 Business Meeting / Election of Officers

9:20 **Burroughs Cave Dig, Essex County, NY** (p.
73)
Ben Brown

9:40 Any cave digger walk-in presentations.
Presentations up to 20 minutes are allowed.
Welcome topics include:

- Your successful dig project
- Your unsuccessful dig project (failure is often a better lesson than success)
- Selecting a dig location
- Shoring techniques
- Hauling systems
- Rock breaking solutions
- Dealing with dynamic water conditions

Cave Formation Repair Workshop

Wednesday, 9:00–12:00

Room 103 Michael Mansur

See page 42 for workshop description.

Wednesday Schedule

Cave Conservancy Roundtable

Wednesday, 9:00–12:00
Room 318 Kim Federick

This is a networking and information sharing session of Cave Conservancy partners and institutional members of the NSS to discuss best practices and recent projects.

Vertical Techniques Workshop

Wednesday, 8:30–4:00
Memorial Gym Kurt Waldron

See page 42 for detailed information.

NSF Closed Meeting

Wednesday, 9:00–12:00
Room 300 Doug Soroka

This is a closed meeting of the National Speleological Foundation.

Wednesday Lunch

Luminary Series II Annette Summers Engel

Wednesday, 12:30–1:30
Harper-McNeely Auditorium

See page 41 for biographical information

AVP All Hands Luncheon

Wednesday, 12:00–2:00
Room 319 Emily P. Davis

This is a networking and luncheon gathering of the volunteers across the four departments under the NSS Administrative Vice President (AVP): Cave Management, Conservation, Convention & Education. Hosted by the AVP. Pizza lunch will be provided.

Speleobooks 50-year Anniversary

Wednesday, noon
McDonnell Center Vendor Area

Speleobooks will be celebrating 50 years of business at noon on Wednesday in the vendor area.

Vertical Techniques Workshop (continued)

Memorial Gym

Wednesday Afternoon

International Exploration Session (continued)

Harper McNeely Auditorium

- 2:00 **Loser Plateau, Austria** (p. 95)
Paul Walko
- 2:30 **The evolving relationship between the NSS, Hanoi Caving Club, and Vietnam's Ministry of Natural Resources and Environment** (p. 96)
Steve Frye and Pham Van Manh
- 3:00 **Highlights of caving in Vietnam** (p. 96)
Kevin Ditamore
- 3:25 **Anahulu Cave, Island of Tongatapu, Kingdom of Tonga** (p. 96)
Pat Kambesis
- 3:45 **A decade of partnership yields great caves in Sultan Kudarat Province, Mindanao, Philippines** (p. 97)
Cyndie Walck and Shane Fryer
- 4:10 **Exploring the Karst and Caves of Phou Hin Poun Protected Area, Laos** (p. 97)
Terry Bolger
- 4:40 **The Mulu Caves 2022 Expedition** (p. 97)
Hazel Barton, Derek Bristol, and Max Koether
- 5:00 **Adventures at the International Congress of Speleology, France** (p. 98)
Mark Minton and Yvonne Droms

Congress of Grottos

Wednesday, 2:00–5:00
Room 400 Craig Hindman

The Congress of Grottos (COG) is the annual meeting of NSS Internal Organizations (IOs), including grottos,

sections, regional associations, and surveys. The COG is made up of delegates from the IOs and functions as an 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.

Cultures of Caves, Cavers and Caving Session

Wednesday, 2:00–5:10
Room 319 Maria Perez

Whenever “anthropology” and “caves” are mentioned together, it is usually in the context of archaeology. There is good reason for this, since caves have been and continue to be important sites to examine the past, not just of humans and their ancestors, but also of other living beings and even of the earth itself. Yet, caves continue to be very active spaces of human cultural activity. We suggest that a focus on caving itself, including speleological research, be examined as a cultural activity, and that this examination be put in the broader context of the study of humans and caves (See Pérez’s Chapter 26 of the 4th edition of *Caving Basics* for a more thorough exposition on this view). Cavers explore, they discover. Most cavers survey and map while doing so. They also gather into groups, they tinker with and design their tools, and they establish certain rules (explicitly or implicitly) about who to share their information with and how. On this point, cavers sometimes fight with each other. The many ways cavers deal with territorial politics is a fascinating and complex area that is teeming with insights into how humans establish relationships among each other and the earth. Caver ideas on conservation and cave modification are intriguing evidence of the complex ways humans behave culturally and shape nature. In other words, cavers have culture, or, to be more precise, cavers cave *culturally*. This session is an invitation to think of caving itself from a cultural and historical perspective, and to examine what has changed and what has remained the same when it comes to humans exploring cave passages. After almost three years of an ongoing pandemic and the rise of creative uses of virtual and other technologies—many in support of the International Year of Caves and Karst—it is a good time to stop, reflect, and ponder on new ways to expand/change the ways we cave, together.

- 2:00 - Session Introduction
María A. Pérez and Kai Bosworth
- 2:10 - **We Are James** (p. 83)
Catherine Bishop
- 2:30 - **Succession Planning: The Devil’s Canyon Caving Team (or Caving with High Schoolers)** (p. 83)
Cordelia Ross
- 2:50 - **Exploring the Intersection of Geological, Historical, and Economical Legacies at Grand Caverns, Virginia, using the Geoheritage Framework as a Theoretical Lens** (p. 84)
Ángel A. García Jr., Austin Shank, and Lindsay Caesar
- 3:10 - Break
- 3:30 - **Preparing Future Cave Scientists: Lessons from the incorporation of undergraduate researchers to an expedition in the Tongass National Forest** (p. 84)
Devra Heyer
- 3:50 - **Situationism in the Sewers? Urban Caving versus Urban Exploration** (p. 84)
Greg Brick (may submit recorded talk or Zoom in)
- 4:10 - **Herb and Jan Conn’s Geopoetics** (p. 85)
Kai Bosworth
- 4:30 - Break
- 4:50 - **Karst Protection Guidelines: How Do We Go from Words to Action?** (p. 85)
Katarina Kosič Ficco and María A. Pérez
- 5:10 - General Q/A Session Discussion

NSF Open Meeting

Wednesday, 2:00–5:00
Room 300 Dong Soroka

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.

Wednesday Schedule

Vertical Techniques Workshop (continued)

Thursday, 2:00–4:00
Memorial Gym

Peter Jones' Pottery Demonstration

Wednesday, 1:00–4:00
Pottery Room in Myles Atrium Basement Peter Jones

See page 43 for more information.

Cave Formation Repair Workshop (continued)

Wednesday afternoon
at a local cave Mike Mansur

This is a follow-up to the Morning's classroom session. The group will go to a local cave to see a hands-on demonstration of formation repair techniques. Travel arrangements will be made at the morning session.

Wednesday Evening

Auction

Wednesday, 7:00 PM
Harper-McNeely Auditorium Carol Tiderman

See page 43 for more information.

Campground Party

Wednesday, 7:00 PM–Whenever
Campground Meredith Weberg

See page 43 for information.



Thursday Schedule

Thursday Morning

Spelean History Session

Thursday, 9:00–12:00

Room 400 Dean Snyder

This 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.

The American Spelean History Association's annual Business Meeting will follow the session's presentations in the same room.

9:00 **Russell Trall Neville – “The Cave Man”** (p. 98)
Dean R. Karau and Dean H. Snyder

9:30 **What Really Happened - Theories on the Mystery Surrounding Pete Hauer** (p. 98)
Roland Vinyard

10:00 **NO, Part of Mammoth Cave Was NOT Named after Part of the Female Anatomy** (p. 98)
Bert Ashbrook

10:20 **From Russia with Love: Charles Cramer and His Improbable 1837 Book about American Caves** (p. 99)
Bert Ashbrook

10:45 Break

10:55 **American Spelean History Association Business Meeting**
Dean Snyder

Biospeleology Session

Thursday, all day

Room 413 Sarah Keenan

The Biospeleology Session will include oral and poster presentations highlighting the latest research in cave biology from around the world. Topics will cover all aspects cave biology related research including: species descriptions, behavioral observations, microbial ecology, ecosystem-scale studies, and outreach activities.

9:00 Introduction and Welcome

9:10 **What's Missing – Natural History Implications of Taxa Absent from Certain Caves and Karst Areas?** (p. 70)
Wil Orndorff

9:30 **Drossites: Novel speleothems Associated with Magnesium Deposition from Cueva Cheve** (p. 70)
Riley Blackwell

9:50 **Invertebrate Mark and Recapture, and Application for Learning About Endemic Species** (p. 71)
Shiloh McCollum

10:10 Break

10:30 **Reproductive isolation and Genetics of Albinism in Two Populations of Cave-dwelling Snails in Southwestern Illinois** (p. 71)
Bob Weck

10:50 **Biological Influences on Secondary Passage Enlargement in the Caves of Gunung Mulu National Park, Borneo** (p. 71)
Max Koether

11:10 **Examining the Physicochemical Conditions and Microbiology Driving Aragonite Frostwork Formation** (p. 72)
George Breley

11:30 **Filling in the Gaps for the Cavernicolous Species Records of Hawai'i** (p. 72)
Annette Summers Engel

11:50 NSS Biology Section Updates

Cave Photography Session

Thursday, 9:00–12:00

Room 100 Eugene Vale

The Cave Photography Session contains talks about new gear, techniques (both photographic and post-processing), and ideas about photographing caves. 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.

Thursday Schedule

- 9:00 **Cave Photography with Cellphones 201: Newer Tech Makes for Better Results** (p. 75)
Dave Bunnell
- 9:20 **Get Creative by Combining AI Art with Your Cave Photography** (p. 75)
Dave Bunnell
- 9:40 **A 1983 Photo Shoot in Powderhouse Cave with Chip Clark** (p. 76)
Chuck Hoffman
- 10:00 **Digital Asset Management, or How To Find the Picture You Took 10 Years Ago** (p. 76)
Kenneth Ingham
- 10:20 **Digital Camera Dynamic Range: Understanding How It Affects Your Cave Photography** (p. 76)
Dan Legnini
- 10:40 **Alexander Caverns Then and Now, a Photo Essay** (p. 76)
Ryan Maurer
- 11:00 **Back To The Future with Analog (PHOTOGRAPHY)** (p. 76)
Ryan Maurer
- 11:20 **Cave Photography in Pits and Vertical Spaces** (p. 77)
Jacob Lieber
- 11:40 **Photography Section Business Meeting**
Eugene Vale

Vertical Section Business Meeting

Thursday, 10:30–11:30
Room 319 John Bowling

During the Annual Vertical Section Business Meeting, the membership will formally conduct the official business of the Vertical Section. This continues our 51 year Vertical Section Tradition!

The meeting includes reports about the Section's financial posture, activities, new initiatives, and the annual election of Officers and Executive Committee Members.

Vertical Climbing Contests Awards Ceremony

Thursday, 11:30
Room 319 John Bowling

Please join the Vertical Section in congratulating the winners of the 2023 Vertical Climbing Contests.

In this formal ceremony, the winners will be recognized for their achievements and presented their hard-won and treasured Award Certificates, plus Prizes! Each Category and Age Group will be presented.

Award Winners must be present, or send a representative, to receive their prizes.

Everyone is welcome to come, participate, and congratulate participants in our continuing our 54 year vertical caving tradition!

NSS Awards Committee Meeting

Thursday, 9:00–11:00
Room 103 Bill Steele

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.

Cave Writer's Workshop

Thursday, 10:00–4:00
Room 300 Michael Ray Taylor & Jo Schaper

Have you considered writing a book about the discovery and exploration of your favorite project cave? Or an article for your local newspaper on your grotto's conservation work? Do you have cave poetry or fiction you'd like to share before a live audience? Bring your ideas and manuscripts to a day of short workshops on writing about caves, directed by widely published cave authors Michael Ray Taylor and Jo Schaper. There will be special guest authors, live writing exercises, readings from new books, and a celebration of the work of the late Red Watson. Between scheduled talks will be time slots for open readings, where anyone can share a story or poem with the group.

Join the Arts and Letter Salon to participate in the annual Salon lunch at noon. Or come and join there! For more information contact Jo Schaper at

jo.a.schaper@gmail.com or Kim Fleishmann (Treasurer) kfleisch@juno.com. Subscribers to *Illuminations* become part of the Salon.

Cartography Class (Classroom Portion)

Thursday, 9:00–12:00
Room 318 Jason Richards

Students will learn the basics of plotting and drawing a plan view, profile view, and cross section sketch of a cave from established survey data. Both Analog (pencil and paper) techniques and Topodroid techniques will be shown—students may select one or the other. Cave protractor, pencils, and survey paper will be provided. Digital students will need to arrive with their own device with Topodroid installed. We will assist in configuring Topodroid as part of the class, so no experience is necessary with the software. In the afternoon, students will move to the same cave that they sketched from photos during the morning classroom session and continue in the cave environment. It is recommended that students have had experience on a survey team previously as something other than a sketcher, as we will not cover gathering plot data in the class. The cost is \$20 and can be paid at Registration if you are not preregistered.

Thursday Lunch

Biospeleology Section Lunch

Thursday, 12:00–2:00
Room 413 Sarah Keenan

Speleophilatelic Section Lunch

Thursday, 12:00–2:00
Room 317 Roger McClure

The Speleophilatelic Section of the NSS combines two hobbies, caving and philately – the collection and study of postage and stamps. The Section is particularly interested in speleology-related aspects of postage, envelopes, and postmarks which include cave themes, fauna, geology, and history. The session is highly informal. Attendees are encouraged to bring examples from their collections and items for exchange or sale.

Anyone interested in speleo-philatelics is welcome to attend.

NCKMS Steering Committee Lunch Meeting

Thursday, 12:00–1:00
room 103 Jim Kennedy

The annual meeting of the National Cave and Karst Management Symposium (NCKMS) Steering Committee will take place during the lunch break on Thursday. We'll have a summary of last year's very successful Symposium in San Marcos, Texas, hear plans for this year's Symposium in Chattanooga, Tennessee, and discuss plans for 2025 and 2027. All Steering Committee representatives should plan to attend. This meeting is also open to all other interested cavers.

The meeting starts at noon and will finish in time to get lunch before the afternoon sessions start.

Survey & Cartography Section Lunch

Thursday, 1:00–2:00
Room 318 Carol Vesely

The meeting starts at 1:00 so eat lunch first or bring it to the meeting.

Arts & Letters Salon Meeting

Thursday, 12:00–1:00
Room 300 Jo Schaper

Join the Arts and Letters Salon for lunch at noon in the same place as the Writer's Workshop. All interested in cave-related fine arts or writing are welcome. For more information contact Jo Schaper at jo.a.schaper@gmail.com or Kim Fleishmann (Treasurer) at kfleisch@juno.com. Subscribers to *Illuminations* become part of the Salon.

Thursday Schedule

Thursday Afternoon

Archeology & Paleontology Session

Thursday, 2:00–5:00
Room 400 Joe Douglas

The Archaeology and Paleontology Session highlights recent discoveries and scientific research in archaeology and paleontology in caves and karst environments. The session is relatively informal and is open to presentations from all geographic regions and chronological eras. Cavers and other researchers will have an opportunity to discuss their various finds and projects with the NSS community, foster understanding, and build bridges between people interested in caves, their human and non-human life histories, their past cultural and biological features, and their preservation.

2:00 Session Introduction

2:05 Indigenous Gypsum Mining in Hoton Canyon Cave, Indiana (p. 69)

Joseph C. Douglas and John M. Benton

2:25 PRIOVAC: A Paleontological Resource Inventory of Virginia Caves (p. 69)

David A. Hubbard, Jr. and Frederick Grady

2:50 New Research at 15Ed23: Chronology and Parietal Art of a Kentucky Cave (p. 69)

Joseph C. Douglas, Kristen Bobo, and James R. Honaker

3:15 The Patton Cave Bone Dig (p. 70)

George Dasher

NSS Nature Preserves Meeting

Thursday, 2:00–5:00
Room 319 Tom Griffin & Julie Schenck-Brown

Did you know you can access 24 NSS Preserves that are managed by a dedicated group of volunteers who serve as the public interface between the NSS and our caving community? This annual meeting of NSS Preserve Managers will include discussions related to our NSS Preserves such as cave conservation, education, research, capital improvements, access and overall management. All NSS members are welcome to join us and learn about the daily operations and overall management of our NSS Preserves.

Carlsbad Caverns Volunteer Meeting

Thursday, 2:00–5:00
Room 100 Erin Lynch

The Carlsbad Caverns National Park Volunteer Meeting will be a PowerPoint presentation about the volunteer projects that have been conducted over the previous year and a listing of upcoming volunteer opportunities. This will be followed by a question-and-answer session.

Speleophilatelic Section Meeting

Thursday, 2:00–5:00
Room 317 Roger McClure

This is a continuation of the Speleophilatelic Section meeting that started at 12:00.

Convention Debrief

Thursday, 2:00–5:00
Room 103 Carol Tideman

At this meeting, the organizers will discuss what worked, failed, and needed adjustment. They will describe good and bad surprises and how they think they could have improved things. They will explain why they made certain decisions. Then they will listen to you: your questions, concerns, complaints, and, they hope, some praises. The intention is that time spent at this meeting, talking and listening, will help improve future Conventions. So if you are planning a future Convention, are considering planning one, or want to help with them, it is important that you attend this meeting.

Cave Photography Workshop

Thursday, afternoon
at a local cave Dave Bunnell

Following a presentation in the Cave Photography Session on Thursday morning, Dave Bunnell will lead an in-cave Photography Workshop in a local cave that will focus on flash and LED lighting. Bring a camera that has manual settings and ideally a hotshoe, or a cellphone with a low light capture mode like Nightsight. A tripod could be useful but not essential. Flashes and LEDs provided, but bring your own if you wish. The trip leaves at 1:00 PM and is limited to 12 people. The \$10 fee for the cave trip can be paid at Registration if you have not preregistered.

Cartography Class (continued)

*Thursday, afternoon
at a local cave Jason Richards*

This is an in-cave follow-up to the classroom class held in the morning. Travel arrangements to the local cave will be arranged in the morning class.

Cave Writer's Workshop (continued)

*Thursday, 2:00–4:00
Room 300 Michael Ray Taylor & Jo Schaper*

Thursday Evening

Salon Awards Program – Short Show

*Thursday, 5:30–7:00
Harper-McNeely Auditorium*

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 Program – Long Show

*Thursday, 7:30–9:30
Harper-McNeely Auditorium*

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 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.

Storytelling Contest

*Thursday, 7:30
Campground Pavilion Mark Minton*

The storytelling contest is a largely free-form contest where people get up on stage and have 5 minutes to tell a caving-related story. There will be a microphone but no other props. The story can be from any aspect of caving, including travel to or from the cave, the people involved, the cave itself, or the aftermath of the trip. The story is supposed to be true, although how would anyone know if only the storyteller survived the incident? There is a five-minute time limit, and there is a limit of one story per contestant. People can sign up in advance, although last-minute entries are solicited and encouraged. The excitement of the moment often inspires people to tell a story. A panel of judges will determine the winner, and there will be a prize. The contest will run until we run out of entrants, usually after two or three hours.

When the cave is calling and you don't feel like crawling...
EXPLORE ENDLESS CAVERNS
New Market, VA
NSS members receive \$5 off their cave tour!
endlesscaverns.com

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Friday Schedule

Friday Morning

Geology and Geography Session

Friday, 9:00–12:00

Harper-McNeely Auditorium Katherine Schmid

The Geology and Geography Session includes a variety of topics on caves and karst including karst hydrogeology, speleogenesis, cave morphologies, cave meteorology, geochemistry, and cave inventory and monitoring and geological education.

8:00 Set-up

9:00 **Hydrogeological Characterization of a High-Discharge Coastal Freshwater Spring System: Ayuyu Cave, Northwest, Guam** (p. 86)
Maria Jhonnie Villareal

9:20 **Recent Hydrologic Trends in Tumbling Rock Cave, Alabama: Water Chemistry and Fluvial Geomorphology of an Underground Stream System** (p. 86)
Jay Mrazek

9:40 **New Dye Trace Efforts in the Hidden River Cave System, Horse Cave, Kentucky** (p. 86)
Mykah Carden

10:00 **Cave and Karst Development in the Republic of Haiti** (p. 87)
Pat Kambesis

10:20 **Carbon Dioxide in Caves Revisited – Texas and Virginia** (p. 87)
Wil Orndorff

10:40 Geology and Geography posters will be on display in room 405 in the Eshleman Science Building until the Section Lunch starts at 11:30 (and ends at 12:30) in room 100. The session Lunch will be from 11:30 to 12:30 and the Session will resume at 2:00 in the auditorium.

Lightning Talks

Friday, 9:00–12:00

Room 400 Meredith Weberg

Put the Lightning Talks session on your schedule for Friday morning. You'll be glad you did. It's the session

that's planned to be unplanned. It's cavers doing the thing they do best: showing off. Please, feel free to participate with a five minute (or so) presentation. Or just attend and enjoy. The atmosphere is casual and friendly.

A lightning talk can be about almost anything. Show us a cool thing you found. Tell us a little about a big project, or a lot about a little project. Regale us with a humble brag or an atrocious anecdote. It doesn't have to be really true, but we request that you keep it pretty short. You may be on the professional speaking tour, or this may be the first time you've talked at an NSS Convention. Awesome! Come on down! You've got five minutes (or so). No pre-registration necessary. We will have screen, computer, and laser clicker for displaying PowerPoint or similar from USB media.

Board of Governors Open Meeting

Friday, 9:00–12:00

Paull Gallery in Myles Janet Tinkham

This is an open meeting of the NSS Board of Governors. Everyone is welcome to attend.

Video Viewing Session

Friday, 9:00–12:00

Room 100 Dave Socky

Watch the full-length programs from the Video Salon on a big screen. All programs will be shown and repeated as time allows. Viewing will take place from 9 to noon on Friday.

Fine Arts Salon Critique

Friday, 10:00–11:00

Myles Atrium Carolina Shrevsbury

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. After Critique, it will be time to remove and pack up the Salon.

Print Salon Critique

Friday, 10:00

Myles Atrium Cady Souk up

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

Photo Salon Critique

Friday, 11:00–12:00

Room 413 Nikki Fox

This will be an open discussion explaining the process and criteria for selecting the winning photos shown in last night's 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.

Cartographic Salon Critique

Friday, 9:00

Myles Atrium Pat Kambesis & Jason Richards

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.

Cave Ballad Salon Critique

Friday, 9:00

Myles Atrium Roland Vineyard

This is your chance to visit with the chair and learn what the judges thought of your entry, both good and bad. If you wish to submit in the future or to get a turn as a judge, you have a chance to discuss this in person ahead of time. Or if you have suggestions on ways to improve the Salon, we want to listen. Please do not be too late. The Salon Chair will happily stay as long as people want, but will eventually leave if it appears no one else is coming.

Friday Lunch

Luminary Series III

David E. Bunnell

Friday, 12:30–1:30

Harper-McNeely Auditorium

See page 45 for biographical information.

Geology and Geography Section Lunch

Friday, 11:30-12:30

Room 405 Katherine Schmid

Note that the lunch is the Eshleman Science Building, about a 5-minute walk from the auditorium. The lunch meeting will start at 11:30 and end at 12:30 (to leave time for attending the Luminary Presentation)

Friday Afternoon

Geology and Geography Session (continued)

Friday, 2:00–5:00

Harper-McNeely Auditorium Katherine Schmid

This is a continuation of the morning's Geology and Geography Session

- 2:00 **On the Definition of a Cave in Solar System Exploration** (p. 87)
John Mylroie
- 2:20 **Breakdown in the Friars Hole Cave System** (p. 88)
Roy A. Jameson
- 2:40 **A Maze Puzzle: Hypogene Cave Formation in Carbonate Rocks by Cooling Hydrothermal Fluids** (p. 88)
Roi Roded
- 3:00 **Speleological Evolution of Phreatic Paleokarst of Ghar Kriz Cave, Jbel Chetlou (Tellian Tunisia)** (p. 89)
Emna Sbei
- 3:20 Break

Friday Schedule

- 3:40 **Is this Desiccated Moonmilk? And Why is it Common in the Snake Range Cave of Eastern Nevada?** (p. 89)
Louise D. Hose or Harvey R. DuChene
- 4:00 **A 12.5 Ma Mammary Deposit: What Will Mammarys Reveal in Eastern Nevada?** (p. 90)
Louise D. Hose
- 4:20 **Microfacies Analysis of an Early Silurian Carbonate** (p. 90)
Marissa Loftus
- 4:40 **Photogrammetry in the Dark: Methods and Applications for Small-Scale Structure from Motion in Cave Environments** (p. 90)
Ryan Palmer

Survey & Cartography Session

Friday, 2:00–5:00
Room 400 Carol Vesely

The Survey and Cartography Session includes presentations on a variety of topics of interest to cave surveyors such as drafting techniques, survey tips, and new surveying instruments and data management programs.

- 2:00 **Electromagnetic Location: An Accuracy Evaluation** (p. 99)
Charles S. Bishop
- 2:20 **Simplicity is a Fantasy** (p. 100)
Ryan R. Maurer and Hope Brooks
- 2:40 **Remapping Friar's Hole** (p. 100)
Ryan R. Maurer
- 3:00 **Data Management for Expeditions and Large Projects – What Works, What Doesn't Work** (p. 100)
Mike Futrell
- 3:20 **Update on Exploration and Survey of caves in or Near the Tiger Cave System, Phong Nha-Kẻ Bàng National Park, Vietnam** (p. 100)
Dean A. Wiseman
- 3:40 **Static to Searchable – Making Cave Maps More Useful** (p. 101)
Mykah Carden and Pat Kambesis

- 4:00 **Mobile LiDAR as a Tool for Planetary Exploration and Terrestrial Cave Survey and Study** (p. 101)
W. E. King, M. R. Zanetti, E. G. Hayward, K. A. Miller

BOG Open Meeting (if needed)

Friday, 2:00–5:00
Paull Gallery in Myles Janet Tinkham

This will be a continuation of Friday Morning's BOG meeting if it is needed.

Friday Evening

Awards Banquet

Friday, 7:00
Phil Gainer Community Center Meredith Weberg

The Awards Banquet is the final big event of the 2023 NSS Convention. It will be held at the Gainer Center in Elkins, not at the college. The Gainer Center is about a 2-mile drive from the McDonnell Center parking lot and there is ample parking. Shuttle buses will go from the campground starting at 5 PM and from campus around then as well.

Please use convention shuttles or carpool. Parking is limited. Personal alcohol is NOT allowed at the Gainer Center, but we plan to have wine.

Directions to the Gainer Center will be posted in Friday's Cow's Tales newsletter.

After-Banquet Party . . . The Last Hurrah!!

Friday after the banquet
Campground

Come back down to the campground after the banquet is over to dance one last dance—or five! The caver band, **Muchos Garcias**, will play until who knows when! You've heard them at the last several conventions; you know they are good! Perhaps we will even have the beer taps open again . . . **hurrah!**

Abstracts

Archeology and Paleontology

(Thursday afternoon)

Indigenous Gypsum Mining in Hoton Canyon Cave, Indiana

Joseph C. Douglas and John M. Benton

One significant development in the history of the Indigenous peoples of eastern North America was the remarkable florescence of gypsum mining in deep caves during the Early Woodland Period, starting around 3000 BP and ending around 2200 BP. A sulfate mineral, gypsum is presumed to have been primarily used for pigments. This paper introduces Hoton Canyon Cave in Crawford County, Indiana, which was mined for gypsum, likely during the Early Woodland Period. Indiana caver Larry McCarty discovered the gypsum mining in 1988 but his report fell through the scholarly cracks. In 2010 cavers John Benton and Gordon Smith rediscovered the gypsum removal. The present authors conducted field research on April 23rd, 2022, making observations, notes, and photographs of the underground activity. Although modest in length at 172.2 meters (565 feet), Hoton Canyon Cave contains strong evidence, including bash marks, for the removal of gypsum plate from the limestone walls by people using hammerstones. While there are several gypsum mined caves in Kentucky and Tennessee, and nearby Wyandotte Cave was mined for aragonite, chert, and probably epsomite, this is the first confirmed gypsum mined cave in Indiana and extends the activity into the karst region north of the Ohio River. An Accelerator Mass Spectroscopy (AMS) radiocarbon assay (D-AMS 047329) on a piece of oak torch found above the large dome-pit returned a recent Conventional Radiocarbon Age (139 +/- 20 years BP), representing historic cave exploration rather than the Indigenous mineral mining.

PRIOVAC: A Paleontological Resource Inventory of Virginia Caves

David A. Hubbard, Jr. and Frederick Grady

An inventory of the paleontological resources in Virginia caves was initiated by the authors in 1996. Invertebrate and vertebrate fossil occurrences were examined to recognize the range and scope of fossils present in caves in the Commonwealth to better determine what should

constitute a significant cave fossil w.r.t. the documentation of paleontological resources for Virginia's Significant Cave List. The study reviewed known vertebrate fossil records from caves and analyzed sites for evidence of their relational setting or context. Another 229 Virginia caves were examined for exposed fossils for a conservative index of the percentage of caves that contain paleontological resources. A selection of vertebrate cave fossils were dated. PRIOVAC was recognized as an NSS Project from 2001 through 2006 and talks were presented at NSS Conventions in 1995, 1997, 1998, 2000, 2001, 2002, 2006, 2007 and the 1997 (Switzerland), 2001 (Brazil), and 2009 (US) UIS Congresses with abstracts published in the *NSS Journal of Cave and Karst Studies* and papers in the *UIS Proceedings*. This is a summary report on PRIOVAC and the first publication of some of our bone dates.

New Research at 15Ed23: Chronology and Parietal Art of a Kentucky Cave

Joseph C. Douglas, Kristen Bobo, and James R. Honaker

This paper presents recent research at 15Ed23, a large maze cave known for its endangered bats and deep pits in the Mammoth Cave area. Although disturbed by subsequent historic and commercial activities, the site continues to reveal evidence of prehistoric visitation and usage. An Early Woodland Period site with cave art, mineral (gypsum) mining, and mortuary components, we describe two new rectilinear petroglyphs, and a possible third, located near the previously described art in the Left-hand Maze. We also describe a pictograph panel of arranged black dots in a mid-level section, the Bat Passage, the first pictographs in the cave. A new radiocarbon assay (D-AMS 041431) from cane charcoal in the Bat Passage gave a Late Archaic Period date (3480 +/- 28 BP) and expands the chronology of the site deeper into the past. Two previously unpublished Late Woodland radiocarbon dates from the Right-hand Maze are also presented, courtesy of George Crothers. Indigenous people explored 15Ed23 for 1000 years. In 2022, two new art panels were discovered a short distance into the Right-hand Maze, an area not known to

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contain art, which complicates ideas about underground activity areas. We also note that stream erosion in the entrance passage has exposed several stone tools, especially scrapers. 15Ed23 is the seventh well-documented cave art site, and one of eight known gypsum-mined caves, in Kentucky. Regionally, it is one of a growing number of Late Archaic and Early Woodland period deep cave sites now known in eastern North America.

The Patton Cave Bone Dig

George Dasher

A late 1970s clean-up and graffiti-removal trip into Patton Cave in Monroe County, West Virginia, led to a resurvey of the cave by the Greenbrier Grotto. This, at

its conclusion, resulted in the discovery of a virgin pit in the very back of the cave. The pit was crevice like, and a little over 30 feet deep. When dropped, the pit was found to contain a large number of bones, which were subsequently identified as belonging to a dozen or more individuals of Pleistocene flat-head peccary, *Platygonus compressus*. Twenty-one individuals of the Greenbrier and the District of Columbia Grottos subsequently excavated and removed the skulls and bones of approximately one dozen individuals of peccary, which were dated to 13,000 years before present. Some of these are currently on display at the West Virginia Geological and Economic Survey's museum in Morgantown and in Cincinnati's Museum of Natural History. This talk will describe this project.

Biospeleology

(Thursday morning and afternoon)

What's Missing – Natural History Implications of Taxa Absent from Certain Caves and Karst Areas?

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In biogeography, the absence of taxa may be as informative as its presence, and in some cases more puzzling. Three examples from Virginia come to mind. The first is the case of Cave Hill in Augusta County, where the biology of Grand Caverns, Fountain Cave, and Madisons Saltpetre Cave has been extensively studied. However, neither epikarstic amphipods nor trechine cave beetles, ubiquitous in the surrounding caves and karst, have been reported from Cave Hill, which hosts otherwise healthy subterranean communities. The second example comes from caves in the Wolf Creek and Walker Creek valleys, western tributaries to the New River, and the upstream portion of the North Fork Holston Valley. Here, despite extensive habitat and sampling, reports of cave adapted asellid isopods are limited to the immediate vicinity of the New River and a single unusual species from the headwaters of Wolf Creek, while cave adapted amphipod records are limited to the wide-spread morphospecies *Stygobromus mackini*. In a third example, the Cirolanid isopod *Antrolana lira* is widespread in the phreatic karst waters of the South Fork Shenandoah River basin and proximal, geologically contiguous areas, but conspicuously absent from all but the uppermost

portions of the North Fork Shenandoah River basin despite karst bedrock continuity and abundant suitable habitat. Identification and investigation of these and other interesting but esoteric biogeographical puzzles, using modern tools such as molecular genetics, could provide clues to the natural history of the karst and surrounding landscape.

Drossites: Novel Speleothems Associated with Magnesium Deposition from Cueva Cheve

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Speleothems vary widely in morphology, which is determined by a variety of factors, including elemental composition, mineral structure, and environmental conditions. The discovery of new morphologies can indicate previously unrecognized precipitation mechanisms and parageneses in caves. In Cueva Cheve we identified novel speleothems with a dark coating and fractal dendritic structure which we termed "drossites." Interior structures resembling biofilms were identified with scanning electron microscopy, while XRD and EDAX assays revealed that the drossites are rich in magnesium and partially composed of aragonite, with a nanocrystalline interior structure. More work is required to understand the formation of these speleothems. The

black color is presumed to be a magnesium oxide, and the fractal structure that forms in the direction of airflow is likely controlled by environmental conditions. Fully understanding the structural composition of the drossites could reveal the unique conditions within Cheve that lead to their formation.

Invertebrate Mark and Recapture, and Application for Learning About Endemic Species

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The majority of troglobitic invertebrates in the world are known from only a single scientific paper, the species description. Nevada's taxa are no different, with little known about the life histories or population sizes, making data-based management decisions difficult. Thus, we are conducting a mark and recapture study in Great Basin National Park for the Model Cave Harvestman, *Sclerobunus unguatus* Briggs, and Great Basin Cave Pseudoscorpion, *Microcreagris grandis* Muchmore at three caves. Using fluorescent paint, micro-rulers, and extensive underground monthly searches, this investigation estimates population sizes, potential reproduction rates and timing (via size class distribution), microhabitat use, and prey species availability. Low, if any, mortality has been observed as a result of the painting and handling methods for the arachnids, but the methods did not work for millipedes. Population sizes are robust for the harvestman (196 individuals as of a preliminary analysis) and smaller for pseudoscorpions (32 individuals) in Model Cave, the site with the most recaptures. Overall pseudoscorpion recaptures are low and we suspect they move more freely throughout cave systems seasonally. The two other sites, Little Muddy Cave, and Root Cave, have few or zero recaptures, making population estimates less valuable. Comparing the dataset for two different species and among three different caves gives an excellent picture of the utility of this method for understanding invertebrate troglobites globally.

Reproductive isolation and genetics of albinism in two populations of cave-dwelling snails in southwestern Illinois

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Snails of the genus *Physella* are a common part of the aquatic community in the largest caves of the Sinkhole Plain Karst in southwestern Illinois. Fogelpole Cave is home to a highly polymorphic population of *P. gyrina*. A majority of individuals lack pigmentation in the head, foot and mantle, while some snails express pigment more typical of surface-dwelling snails. Controlled crosses demonstrated that the lack of pigmentation is heritable and follows the pattern expected of a single recessive allele. However, albino snails do express melanin in the digestive gland. The snail population in Illinois Caverns is albino and individuals resemble one of the albino morphs seen in Fogelpole Cave. We tested reproductive isolation between pigmented Fogelpole Cave snails and Illinois Caverns snails by pairing immature individuals in no-choice mating experiments carried through to the F2 generation. The pairings produced fertile F1 offspring indicated no reproductive isolation between lab colonies of the two populations. Over 1000 F2 embryos were screened and a 3 pigmented to 1 albino ratio was observed. It is unclear whether the albinism in Illinois Caverns snails is due to the same recessive allele found in the Fogelpole Cave population. Significant differences were observed in the hatching success rate of control crosses and experimental crosses. Illinois Caverns snails had a high rate of embryo failure with many individuals exhibiting an unusual, lethal behavior of twisting to the point of separating their head and foot from the visceral mass inside the shell during hatching.

Biological Influences on Secondary Passage Enlargement in the Caves of Gunung Mulu National Park, Borneo

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The study of speleogenesis has a growing recognition of the role of biological influences on chemical erosion and deposition. We are increasingly aware that secondary speleogenesis, such as condensation corrosion, can lead to post-speleogenetic passage enlargement, although the role of biology in these secondary processes is poorly understood. The caves of Gunung Mulu National Park in Borneo are especially unique in their size and morphology, which could potentially be explained by the influence of the extensive guano found throughout the caves. The impact of microbial metabolism within cave swiftlet guano on the production of phosphoric and nitric acid may explain some of the more unusual 'fluting' and 'air scalloping' morphologies found in the caves, which is causing secondary passage enlargement. By collecting air condensate, along with XRD analysis of biogenic materials, we propose a previously unrecognized role for an integrated animal-microbial ecology in the morphology and large-scale dissolution of tropical karst environments.

Examining the Physicochemical Conditions and Microbiology Driving Aragonite Frostwork Formation

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Wind Cave, South Dakota, is host to a profusion of frostwork; CaCO_3 secondary mineral deposits recognized by large clusters of needle-like projections, offering a suitable site to investigate the environmental conditions that direct carbonate polymorphism and the development of aragonite speleothems. The aim of this project is to identify key factors driving aragonite frostwork formation, evaluating the potential role of microorganisms in influencing carbonate crystallization and growth. Preliminary microscopic observations of frostwork show signs of surficial biogenicity, opening up the possibility for a microbial component in the formation of morphologically distinct frostwork. X-ray diffraction (XRD) of specimens evidenced mineral paragenesis; distinct structures composed of calcite, aragonite and hydromagnesite. Long term airflow monitoring aims to characterize the climatic conditions of while geochemical analysis of the cave water and host rock will delineate the kinetic factors contributing to

frostwork formation. Understanding the link between inorganic factors and microbiological processes controlling CaCO_3 polymorphism is foundational to the development of microbially induced carbonate precipitation (MICP) dependent biotechnology, leveraged towards industrial carbonate production and CO_2 sequestration.

Filling in the Gaps for the Cavernicolous Species Records of Hawai'i

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Although diverse arthropod assemblages have been found from lava tubes and caves throughout the Hawaiian Islands over the past 50 years, determining the number of cavernicolous species within the State has been a challenge. Early workers suggested from 70 to 75 troglobionts, but counting discrepancies were apparent and many species have been undescribed. To fill the gaps, we searched the scientific literature for Hawaiian species records, including peer-reviewed publications, books, conference proceedings, dissertations, unpublished government and technical reports, databases, and museum records. We also reviewed caving group newsletters to confirm cave names, spellings, and locations because some caves have been referred to by multiple names, such as a Hawaiian name, a general name or number given by cave mappers, and then another name used by biologists or archeologists. Overall, we uncovered 1100 records from ~250 different caves or cave sections. Of 294 different species, 76 were obligate cave-adapted species. Hawai'i Island had the most records of any island and 50 distinct troglobionts. Regionally, the 'Ailā'au flows formed on Kilauea Volcano have the richest cavernicolous fauna and 22 troglobiont species. Kazumura Cave ('Ailā'au flow) had more species than any Hawaiian cave, at 50,

from which there were 17 different troglobiont species. Another regional hotspot on Hawai'i was Pu'uwa'wa'a (Delissea System) on Hualālai Volcano, with 20 troglobiont species. In total, 4% of biosurveyed caves on Hawai'i had 10 or more troglobiont species. These

results provide a benchmark for conservation and management decisions to protect the cave fauna of the Hawaiian Islands.

Cave Digging

(Wednesday morning)

Burroughs Cave, Essex County, NY

Ben Brown

Burroughs Cave is formed in the Grenville Marble, the base rock of the Adirondack Mountains in New York State. It has been known since the 1870's. The water resurging from the cave entrance comes from an resurgence 1500 feet uphill from the entrance that sumps quickly. The distance between the upstream and downstream sumps in the system is about 700 feet horizontally and 85 feet vertically.

The project made use of both in-cave and surface survey, LiDAR surface imaging, and traditional hiking in the snow to find promising dig locations. The project is in an area with a significant glacial history which presented a set of special search and digging challenges both on the surface and in the cave. The metamorphic bedrock is inconsistent in its structure which creates similarly inconsistent cave passages, especially when combined with glacial melt events. This presentation discusses the search for and ultimate discovery of significant missing passage in the cave system.

Cave Diving

(Monday morning and afternoon)

The Continued Exploration at Wookey Hole

Duncan Price

British sump diver Duncan Price will speak about the exploration of Wookey Hole, the site of some of the earliest cave diving on the planet. Now a show cave, Duncan and party helped the cave managers drive a tunnel from Chamber 9 to Chamber 20, which required accurate underwater surveying as well as radiolocation beyond sumps. The exploration continued from there through dry cave to more sumps, and from Chamber 24, digging underwater, the sump divers found even more dry passage bypassing the sumps, eventually allowing dry cavers to reach the exploration front.

circumstances. Miners who kept their mouths shut lived just long enough that after months of sorting the excavated ore, their skin started to come off their hands like paper. None of them knew they were mining uranium ore that would support Soviet atomic bomb development. Today, 65 years after shutting down its operation, the Kowary Uranium Mine's dark and gloomy corridors reaching to 1600 feet of depth offer a breathtaking diving experience. Cave diver Marcin Stempniewicz tells the story of diving the Kowary mine, the diving conditions, dangers and challenges, and historical context, illustrated with photos taken while diving the mine.

Kowary Uranium Mine

Marcin Stempniewicz

Miners working at the Kowary Uranium Mine after World War 2 were forced to sign a secret document obliging them to the utmost discretion. Those who talked too much disappeared under unclear

New Exploration at Proyecto Purificacion

Osama Gobara and Zeb Lilly

The exploration team will discuss their most recent push into the Infernillo entrance sump series, including the logistics and potential for more exploration.

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Pushing Canada to 450 feet: Hole in the Wall British Columbia

Jason Richards

The latest remote exploration push at Hole in the Wall, BC brought Canada's deepest underwater cave to 450 feet of depth. New equipment and new techniques were used including dual closed circuit rebreathers. Though the dive was successful, not all ended up as well as could be.

Systema Paloma, Ambergris Caye, Belize

Ben Popik and Arielle Ginsberg

The underwater cave systems of Northern Belize have been a focus of exploration and research since the 1970s. The discovery of Sistema Paloma on Ambergris Caye – now the longest-known underwater cave system in the country – brought to light the existence of an extensive underwater cave system, and underscores the importance of the region for understanding both Mayan history and local ecology. Since its discovery in 2019, a team of cave divers from around the world has been mapping its intricate network of more than 15km of chambers and passages, to explore and document the previously undiscovered labyrinth of passages existing just beneath Belize's most-popular tourism destination. This talk will provide the historical context of cave diving in the region, an overview of the ongoing exploration project, and a discussion of the unique challenges and considerations encountered by the team in this extreme and delicate environment. Ultimately this project seeks to enhance our understanding of the region's unique hydrogeology and its value in terms of conservation and preservation efforts.

KUR and the Exploration of the Florida Aquifer

Brett Hemphill

Karst Underwater Research is a collective of Cave Divers pushing some of the longest and deepest dives in Florida. They have refined the use of in water habitats, and pushed the limits of long and deep exploration cave diving. Brett Hemphill, one of the directors of KUR, will give an overview of specialty equipment the team developed to increase safety and the ability to keep divers in the water far beyond previous time ranges and the idea of less is more and the threats of

overcomplication. He will also give an overview of KUR projects over the last few years.

Applying diving concepts to caves with hazardous gas environments

Katie Graham

Mt. Meager is the home to several ice fumaroles formed by active volcanic action under the Job Glacier. Dead birds near the entrance led cavers to believe there might be a high level of hydrogen sulfide coming from the cave. Katie will talk about the use of a cave diving approach to exploring a different type of non-breathable atmosphere in caves.

Diving Hot Springs in Wyoming

Kevin Blackwood

As part of a geomorphology investigation to study the origins and evolution of the plumbing systems of geysers and hot springs, an inactive geyser near Yellowstone National Park was dove and mapped during the summer of 2018. Occurring at the edge of a canyon, a surface stream had incised into the geyser plumbing, diluting the thermal waters with cold surface waters originating from snow melt and thus reducing the temperature of the groundwater within the geyser to <35° C. Within the geyser, numerous morphological features were identified which are indicative of the geyser being formed via hypogene speleogenesis. Although the geyser was inactive, the exhaust bubbles from dive equipment followed the same path as bubbles generated during boiling episodes, offering a rare inside glimpse of pre-eruption steam generation. The dive was planned over the span of a year with five potential hazards identified and plans in place to avoid. During the dive, a sixth unexpected hazard was discovered accidentally when thermophilic microbial mats dislodged from the ceiling and were being drawn into a siphon tunnel. Noticing the powerful siphon, one of the divers was able to secure himself on a rock just as he was being drawn into the siphon current and avoided a potentially fatal incident.

Minnesota Sump Diving Update

Michael Raymond

Michael Raymond will give updates on sump diving projects in Minnesota. The principal diving project in the state is at Deep Lake Cave, in Forestville / Mystery Cave state park. The spring drains the third largest drainage

area in MN. Michael Raymond and Ian Flom have been making gradual progress on expanding exploration and mapping of the system. Michael will also discuss efforts to explore the flooded lower level of Holy Grail Cave, which sits on top of a 10+ mile underground river. He will also give a quick sump rescue training update.

Remembering Ron Simmons' Florida Explorations

Michael Poucher

Michael Poucher is a long time Florida Cave Diver where a significant portion of early exploration was touched by Ron Simmons and his group of friends. Following the death of another of this group, some of Ron's personal artifacts were unearthed, and Michael will bring them along for people to see in person as well as talk about the exploits of Ron and his fellow pioneers of cave diving.

Cave Photography

(Thursday morning)

Cave Photography with Cellphones 201: Newer Tech Makes for Better Results

Dave Bunnell

More and more cavers are using cellphones for cave photography, driven by the vast improvements in cellphone image capture in the past few years. Three factors have converged to make cellphones a viable alternative to larger cameras:

1. Sensor sizes and image resolution have been increasing, with less noisy and more usable images.
2. Multiple lenses are available on many cameras, especially wide angle, and macro.
3. Night capture modes are available on Google Pixel, Apple iPhone, and Samsung phones.

These use a burst of short exposures that are easier to handhold, which the phone's software combines to yield light capture similar to a long exposure that might have required a tripod for similar results. Some phones combine HDR to also dampen highlights and boost shadow detail.

Great results can be obtained by using the cellphone with multiple light sources. Headlamps and multi-LED light panels can be combined in one exposure. This technique has the advantage of being able to see the effects of the lighting more clearly than in typical multiple flash photography. The general rules are the same: move the lights away from the camera to increase shadows and texture, and balance them to achieve the effect you want. Most headlamps and panels have selectable output levels. A common problem is mixing

lights with different color temperatures in one image, a difficult fix in post. Phone apps such as Lightspectrum Pro allow quick assessment of color temperature of available light sources. Topaz AI is useful for sharpening images.

Get Creative by Combining AI Art with Your Cave Photography

Dave Bunnell

There are many image creation programs that use artificial intelligence to make images based on text prompts and of particular interest to photographers, some allow input of your own photographs to supplement the text prompt. These act as a guide only and are not reproduced verbatim.

I've been experimenting with Midjourney, one of the more popular programs. I tried others but found the images poor quality and too small to be useful.

While Midjourney is great at drawing nice images looking out of cave entrances, it really doesn't draw realistic looking cave formations. Surprising, as it draws on material it can find online, but input "cave draperies" and you'll see how poorly it does.

Using image prompts, I've been able to make much better-looking caves, so will focus on how to best mix image and text prompts to get good caves.

I've created a series of caver cats that I've been putting into cave scenes. The AI caver cats have stunning details, but the caves generated by text prompts are

Abstracts – Cave Photography

lacking detail and the cats are static. I've had better results by prompting with my own caver action images to get the cats in action. Another approach has been to composite my cats into existing cave photos with Photoshop. A further issue for development of characters is how to produce a consistent character for different scenarios. All these approaches will be covered in this presentation, as well as use of Topaz AI to enlarge and sharpen the images.

A 1983 Photo Shoot in Powderhouse Cave with Chip Clark

Chuck Hoffman

When I became a caver in the mid-1970s there was one outstanding cave photographer, Chip Clark. In March of 1983, I had the opportunity to go on a photo shoot with Chip Clark. We photographed a newly discovered cave in West Virginia's Germany Valley. To document this cave, we used the highest resolution color slide film of the day,

Kodachrome ASA25, with large Press Camera flash bulbs to provide the light needed for this very slow film. The talk will include digitized versions of my own photographs, in addition to photos which must be called Chip Clark's because they were taken using his lighting.

Digital Asset Management, or How To Find The Picture You Took 10 Years Ago.

Kenneth Ingham

Digital Asset Management (DAM) is the term for all of the things that occur after you take the photo. DAM covers how you store the photos on your computer, how you name the photos and the folders containing them. It covers metadata such as tags or keywords. Finally, it covers backups, about which I will not talk. The basic idea of DAM is that you want to be able to find your images ten years later. I have a bit below 400,000 image files on my computer. If I cannot find an image, I might as well have not taken the photo in the first place. I will describe the digital asset management work flow I use to raise the probability I can find something later.

Digital Camera Dynamic Range: Understanding How It Affects Your Cave Photography

Dan Legnini

I will review what DR is, and why it matters to cave photographers. The influence of camera settings used to capture the image data, and the concept of ISO invariance seen in some newer cameras will be presented. Tips for shooting and processing single images may also be discussed. Multi-image HDR is not the subject of this presentation but will be mentioned for completeness.

Alexander Caverns Then and Now, a Photo Essay

Ryan Maurer

The winter and spring of 2021/2022 I participated in the production of a history book about Alexander Caverns, a significant ex-show cave in central Pennsylvania. This photo essay included photographing locations in the modern era as they were photographed in a series of postcards from the 1940s. Many locations were shot on medium format black and white film. This expanded beyond to photograph previously undocumented locations in the cave, including a new extension opened in the 1980s. This essay was published as part of Alexander Caverns: Mifflin County's Once Spectacular Show Cave and spawned two NSS News covers and a Salon Best In Show award winning photograph.

Back To The Future with Analog (PHOTOGRAPHY)

Ryan Maurer

In the last two decades digital cameras have revolutionized the world of photography and have made the art accessible to almost anyone. Today, even cell phones have capable cameras. Also, in the last two decades a new generation of cave photographers are arriving without any exposure to analog techniques and mediums. This presentation explores the lessons that can be learned by incorporating traditional analog film photography into the modern cave photographer's workflow.

Cave Photography in Pits and Vertical Spaces

Jacob Lieber

The technical difficulties and logistical challenges of cave photography are amplified in vertical spaces, as is caving in general when transitioning from moving in horizontal passage to getting on rope. First and foremost is safety and the mitigation of hazards, from potentially falling

cameras to burning flashbulbs. Organizing your equipment so it can be deployed and used in the correct order, and communicating that use is much harder while doing rope work than it is when traversing a room. Lastly, shafts present unique opportunities for lighting techniques and effects. This session will focus on harnessing these skills to tell the story of verticality.

Communications and Electronics

(Monday afternoon)

Improvements to BuecherNet, a Low Power Data Network in Fort Stanton Cave, NM

John T. M. Lyles (jtml@losalamos.com)
Ted Lappin, and John Corcoran III

Fort Stanton Cave Study Project

The Fort Stanton Cave Study Project is installing a quasi-real time sensor network called BuecherNet, to measure water and air conditions at the Snowy River passage, about a mile into the cave. Unlicensed UHF radio modules called Digi SX were selected for the task. Near line-of-sight paths in the cave work with 10-20 milliwatts of transmitted power and 110 Kbps data rate. Ranging tests in 2021 determined that 50 nodes would be required to bring the data to the surface. In late 2022, it was determined that a more reliable network is a hybrid solution of wireless and wired communication. Twenty-six radio nodes are used from the entrance to a passage called Roaring Hill. Beyond this, the passage becomes crawling with many bends and obstacles to line-of-sight propagation at 915 MHz. The wired segment is in this part of the route using a new addition that we named Longwire, a hardwired data communication link using 1400 feet of two conductor shielded cable from Roaring Hill to the junction with Snowy River. Longwire uses the signal levels of RS485 in half duplex operation with a driver chip at each end and has been tested for months with 2000 feet of cable at 110 Kbps with no errors. It incorporates a microprocessor at each end to handle the data protocol, implement sleep mode to save power, and interface with the Digi SX node. This project is a collaborative effort between BLM and FSCSP, with materials funded via Assistance Agreement by BLM.

Radiolocation and Communications on Bill Stone's 2023 Expedition to Sistema Cheve in Oaxaca, Mexico

Brian Pease (w1ir@arrl.net)
<https://radiolocation.weebly.com>

This spring I arranged transportation for a 3 week trip to Cheve Base Camp in Oaxaca to conduct the first radiolocation in Sistema Cheve. In 2022 the cave reached 80.9km and 1530m depth making it the World's 12th deepest cave. Connecting the resurgence 1100m lower would make it the World's deepest. The goal was to check map accuracy at the limit of exploration, 11.7km from the Cheve entrance. I built a high power beacon for this project powered by the same 36V 9AH battery used for Hilti hammer drills.

At Cheve Base Camp (1km from the Cheve entrance) I was able to access the single wire phone and data system, which worked well despite a bad joint between camps 2 and 3, some poor phone grounds, DC resistance to ground, and the capacitance of 13km of wire to ground.

The main passage is ~600m below the village of San Miguel Santa Flor. The cave team had previously climbed a waterfall lead into a passage much closer to the surface and picked station SNG40 for the radiolocation, which we used GPS to locate the day before. Here I also measured rock conductivity to ~20m depth, which was very low (.00078 S/m). The radiolocation was successful, with minimal effects from the rock. The estimated depth was 250m (820 ft) making it my deepest radiolocation. Incredibly it was only 20m from the mapped GPS point!

CO₂ Mitigation Experiments at Edgewood Cavern, NM

John T. M. Lyles (jtml@losalamos.com)

Edgewood Cavern is a densely jointed cave in Santa Fe County, with a 128-foot vertical entrance shaft. A recent discovery is adding length to the 4.9 mile cave and reaches new depths in the western end. Trips to this region are hindered by variable CO₂ levels in air. A cable was installed from the surface to a location in the main trunk passage using an abandoned water well as a conduit, that intersected the passage. An accurate wide-range CO₂ sensor is prepared for installation in an environmental enclosure in the passage. At the surface building, a Campbell Scientific CR310 datalogger interfaces using ethernet with a Microhard BulletLTE-NA2 gateway with 4G/LTE for cellular data. In this way, the gas concentration is monitored using computers or cellphones anywhere. Precision barometric pressure sensors are included in this system. CO₂ levels have been measured as high as 29,000 ppm (2.9%) during major low pressure weather fronts. During high pressure periods, the level drops significantly. An electric powered blower has been set up on the surface with a small generator, to force fresh air down the old water well casing to the area where we wait to climb out of the cave. This countermeasure has been tested and improves the air quality in the horizontal passages near the base of the entrance pit, where fresh air is most important for the climb.

Digital High Frequency Communication Experiments in Fort Stanton Cave, NM

John T. M. Lyles, K5PRO (jtml@losalamos.com)
Fort Stanton Cave Study Project

A portable HF radio system was assembled and tested for the Fort Stanton Cave Study Project in 2021-22. It uses miniature PSK31-modulated radio transceivers connected to smart phones, with tuned antennas on 10.148 MHz, an amateur radio allocation. The first experiment gave positive results with slow text communication between a station at the surface campground and another station underground near the Bridal Chamber. Inductive-loaded tuned horizontal dipole antennas with nonmetallic tripods were used for the 2021 test. A tunable single-turn vertical loop was

then developed, which is more compact when disassembled. Other equipment improvements were made to address problems discovered in the first test, and in October of 2022 several tests were run, using the dipole antenna on the surface and the new tuned loop underground. Success was achieved at Bridal Chamber, but limestone overburden under the ridge east of the campground attenuated the transmitted signal and made communication impossible. The third location worked well, from near Devils Backbone in the cave to the canyon floor on the surface. It was determined that transmitter power needs to be increased, so a small amplifier stage is being developed for this, with plans to continue testing in late 2023. The ultimate goal is to determine what depth communications remain reliable, using extremely low bandwidth binary phase shift modulation and 10 MHz radios. A compact portable communication link like this, using inexpensive equipment, would be a useful tool for cave exploration, science, and rescue missions.

A Cheap & Solidly Performing Cave Radio Kit on the Horizon

Ken Smith VE6AGR & Ian Drummond VE6IXD
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Commercially available cave radio options are scarce, and kits are rare and limited in function. A small, lightweight, commercially available QRP SDR transceiver holds promise to be usable for wireless cave communications, albeit with several limitations.

Conservation and Management

(Tuesday morning and afternoon)

Updates on the NPS CKRIT Cave Database

Georgia Schneider

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Cave and Karst Resource Information and Tracking
(CKRIT)

Geologic Resource Division
National Park Service

Caves and the associated location data are protected by the Federal Cave Resource Protection Act of 1988. Cave locations are a crucial piece of information when it comes to effective cave management. For this reason, the NPS has decided to create a spatial cave and karst database using ArcGIS pro and the ESRI suite of applications. These tools will allow the park service to move cave and karst location data to a platform that is accessible for specialists, with express permission, at their respective parks. The Cave and Karst Resources Information Tracking database (CKRIT pronounced secret) development is an on-going project, but the conceptual and logical design are complete and the database is nearly ready to house data.

New Dye Trace Efforts in the Hidden River Cave System, Horse Cave, Kentucky

Mykah Carden, Pat Kambesis, and Lee Anne Bledsoe
Crawford Hydrology Laboratory
Western Kentucky University
Bowling Green, Kentucky

Hidden River Cave, located in the city of Horse Cave, Kentucky, has a long history of anthropogenic impacts. In the late 19th and early 20th centuries the cave was used as a water source, for hydroelectric power generation, and as a show cave. However, contaminants from unknown sources polluted the cave stream so severely that it was closed in 1943 as it essentially functioned as an open sewer. Due to the extensive dye tracing work of Jim Quinlan and associates in the seventies, the contaminant sources were identified and remediated, and a new water treatment plant installed. The cave made a major recovery in terms of groundwater quality and in 1992 the American Cave Conservation Association, who had acquired the cave, opened it to the public. However, since that time and despite the environmental success, cave species die-offs sporadically occur as well

as occasional odiferous episodes of unknown origin. The purpose of this study was to determine the source of these occasional groundwater and odiferous air episodes. Dye-trace studies were resumed and determined that city infrastructure directly impacts the cave stream during flood events. Flow-paths from discrete sites that occasionally contribute industrial pollutants to the cave stream have also been identified. The new tracer studies have also delineated smaller sub-basins within the main basin that recharge the southern and eastern sections of the cave. The more refined delineation of Hidden River's groundwater basin is an important resource for the continued environmental protection of the cave and its important subterranean ecosystems.

Management of a Long-term International Speleological Project

Bill Steele (NSS 8072) FE, LB, CM, AL

The caves in the vicinity of the remote mountain town Huautla de Jimenez, Oaxaca, Mexico were discovered by USA cavers/NSS members in 1966. Sistema Huautla is a complex integrated system of deep caves 100 km (62 miles) long, 1560m (5,118 ft.) deep, with 30 entrances: the deepest known cave in the Western Hemisphere.

Ten years ago, the speleological project was reorganized, renamed, and branded as Proyecto Espeleologico Sistema Huautla (PESH) by Tommy Shifflett (NSS 14207) FE, LB and Bill Steele. Goals were established to: 1) Conduct ten month-long expeditions in April, the driest month of the year (the caves flood during the rainy season), 2) Do all speleological studies possible: geology, biology, paleontology, archaeology, paleoclimatology, anthropology, and collect folklore stories about the caves handed down in oral tradition by the indigenous Mazatec people of the region, 3) Support Mexican cave scientists, 4) Extend the length of the cave system to 100 km and the depth to 1610m, a vertical mile (5,280 ft.).

Nearly 400 cavers from 12 countries have participated in expeditions. Over 200 articles and two books have been published. Besides the exploration and mapping and state of the art cartography, master's theses have been published in geology and archaeology, a Ph.D. dissertation in anthropology, as well as scientific papers

published by Mexican cave scientist collaborators in biology and paleontology. Currently a paleoclimatology study is being conducted, working with a U.S. professor who is at the top of this field, and folklore stories are being collected documenting the local indigenous people's oral tradition stories about the caves handed down through the ages.

PESH co-leader Bill Steele will present on how annual expeditions are organized, their timetable, funds raised, objectives set and addressed, and publications that follow.

Paleontological Inventory of Caves in White Pine County, Nevada

Peter Druschke, Gretchen Baker and Doug Powell

Abstract: As part of the grant-funded "Protecting Wild Caves in White Pine County" project, resource assessments have been progressing on 45 wild caves in Great Basin National Park and the Ely Ranger District of Humboldt-Toiyabe National Forest in eastern Nevada. For this project, a paleontologist together with a multi-disciplinarian science team from the Great Basin Institute have conducted field inventories to identify paleontological resources with significant future research potential. The inventory process began in June 2022, and will continue through October 2023. In the project area, bedrock fossils are typically sparse due to recrystallization or metamorphism of the Cambrian to Devonian host carbonate. However, a number of project caves are known to contain significant Pleistocene fossils in cave sediments. Inventory procedures for the two managing agencies have varied due to differing policies. In Great Basin National Park, a moratorium on fossil and fossil-bearing sediment collection has led to a focus on photo-documentation of in-situ surface fossils and associated sediments. In Humboldt-Toiyabe National Forest, project staff have participated with paleontologists from a number of academic institutions to conduct targeted surface collections and a small number of controlled excavations of cave deposits. The results of these studies and preliminary carbon dating of fossil remains have been leveraged to help with assessing the potential of Park Service caves to contain similar resources. Discoveries made during the project timeline have included a number of horse, camelid, carnivore, and a wealth of small mammal and bird remains, representing significant future research potential.

Evaluating Risk Pathways for Groundwater Contaminants on a Karstic Carbonate Landscape

Zach Normile

An understanding of risks to water quality on karst landscapes is necessary to mitigate threats to human and ecosystem health. Karst groundwater is a potential source of drinking water for as much as 17% of the world population, and many rural areas completely rely on well water for their water needs. Synoptic and real-time water-quality monitoring are used to evaluate risk pathways for groundwater contamination on a karst landscape within Tumbling Rock Cave, Alabama. The results show that cave stream and drip water varied in ways which demonstrate the connectivity of drips to the surface and the importance of managing the surface to prevent contaminant entry to karst groundwater. Precipitation events and seasonality during the summer and winter were shown to be important variables to consider for water quality in karst systems.

The data supports three key recommendations: (1) treat groundwater during summer-fall and immediately following rain events; (2) delineate probable capture zones for creation and implementation of Best Management Practices; and (3) focus research efforts on contaminant transport via conduit flow.

The Urgent Need for Extraterrestrial Subterranean Conservation 15-30

Ceth Parker

Jet Propulsion Laboratory
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The entrances to more than 2,500 extraterrestrial subterranean features (ESF) have been discovered via satellite identification of Subsurface Access Points (SAPs) across our solar system. They are assumed to be entrances to lava tubes, caves, subsidence 'sinkhole' like features, fissures, and yet to be described subsurface formations. These SAPs have thus far been identified on the Moon (221), Mars (1,036), Titan (1,297), Enceladus (100), Triton (3), Pluto (2), and Charon (1). On planetary bodies with minimal geologic activity and/or minimal ice-shell turnover, some ESF could be 1-4 billion years old. These features may contain evidence of climatic evolution and serve as records of environmental change over immense time periods. Additionally, it has been proposed that some ESF could contain remanent biosignatures of extinct life or even serve as habitats

harboring extant life today. Semi-autonomous robotic architectures are being designed and built to explore these subsurface features, with the first lunar SAPs to be explored robotically within this decade, Martian SAPs to be explored within the next, and Ocean-Worlds soon to follow. Unfortunately, there is minimal communication between cave scientists and the robotic engineers designing and building these near-future subterranean explorers. The risk of irreparable damage to billion-year-old subsurface features is high without improved communication between the disciplines. Here we aim to start the crucial dialogue between cave explorers, cave scientists, and roboticists about approaches, high sensitivity features, robotic architectures, and management plans for ethical subsurface exploration. As with all conservation efforts, extraterrestrial subterranean conservation must be a delicate balance between scientific discovery and the preservation of natural features. Indeed, ESF cloud contains some of the most ancient and fragile geologic features in our solar system, and potentially shelter evidence of non-terrestrial life. These features require ethical considerations and protection plans developed well in advance of their exploration.

A Video Essay of the Scientific Inventory of Caves in White Pine County, Nevada

Jean Krejca, Gretchen Baker and Doug Powell

As part of the multi-disciplinary cave inventory also reported during this session, the field crew (aka the Dream Team) gathered video footage of the project. Three videos are presented, the first takes place at a remote alpine cave, and explores the overall process to inventory caves according to three specialties (biology, archaeology, and paleontology). The second video follows geologic specialists into a well known, but large and complex cave, as they hypothesize on the genesis of unexplained features. This is designed to capture their detailed discussions and the processes they use to determine the chemical makeup and evolution of the unusual formations. The third video follows intrepid biologists into a long muddy crawlway as they capture, measure, and paint invertebrates. The videos are designed to be fun, in a one-day trip-report style that is not created by professionals, yet also deliver meaningful information to citizen-scientists who are interested in learning more about cave science or volunteering to crew on a team. This type of media is increasingly available and relevant to land management agencies (e.g.

USFS and NPS) as they vie for attention and appreciation of the underground regions they manage.

Coordinating the Dream Team to Inventory Caves in White Pine County, Nevada

By Gretchen Baker and Doug Powell

Abstract: In 2020, Great Basin National Park and the Humboldt-Toiyabe National Forest, Ely Ranger District, wrote a multimillion-dollar grant proposal to protect wild caves in White Pine County, Nevada. A major component of the project consisted of hiring a multidisciplinary team consisting of an archaeologist, geologist, paleontologist, two biologists and tribal member to visit up to 30 Park caves and up to 15 Forest caves, and prepare detailed reports on their discipline, as well as maps and photos of each cave. The project was approved, and the crew started in June 2022, with their second week spent at the NSS Convention to make connections and round out their cave knowledge. Over the past year the crew has visited over 40 caves, with 1 to 14 visits per cave. The multidisciplinary approach has allowed for the crew to become well-rounded in many aspects of cave science and management. Some notable results include discovery of new cave passage, quantification of cave biota in select caves, a better understanding of the speleogenesis of the area, identification of various Pleistocene bones to include horses and camelops, timelapse photography of developing cave ice formations, investigation of historic inscriptions, and more. Fieldwork will continue through October 2023, followed by data analysis and final report writing. We hope this model of a multidisciplinary team will be useful to others looking for a comprehensive understanding of caves on lands they manage.

Microplastics in Karst

Jeremy M. Weremeichik, PhD.

The current research seeks to examine the distribution, abundance, and kinds of microplastics (MPs) deposited with cave sediments and how they impact karst ecosystems. By definition, MPs are plastic particles smaller than five mm in diameter (Arthur et al., 2009). The current body of research on MPs suggests that it is possible to transport MPs via air or water and deposit them in fluvial, lacustrine, and marine sediments. Caves are extreme and fragile ecosystems with exceptional scientific value, rich in endemic and troglobitic fauna

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and speleothems, representing an extraordinary and unique Quaternary archive (Cigna and Forti, 2013). As Balestra et al. (2023) mentioned, MP-contaminated environments have increasingly been documented in detail over the past two decades. Still, much more research is needed to study the effect on cave and karst environments.

The observation of MP contamination within karst groundwater was first reported by Panno et al. (2019), who noted that MPs can be introduced to groundwater flow systems. MPs originate from various sources; most are generated from synthetic clothing, tires, and urban dust (Corami et al., 2020). As Moore (2008) mentions, plastics can accumulate on the seafloor, inhibit gas exchange between porewaters of the sediments, and disrupt or smother benthos' inhabitants. Balestra and Bellopede (2022) demonstrated the presence of MPs within sediments of karst ecosystems (e.g., caves) via similar transport mechanisms as surface sediments. As water and other materials are transported from the surface, MP-contaminants may make their way underground and affect mineral and speleological formations.

Sinkhole Cleanup in New Mexico – Initiation, Implementation & Communication

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Large amounts of discarded material, mostly composed of ranch trash, has been known to exist in many sinkholes in the gypsum plains north of Roswell, in Lincoln and Chaves Counties, New Mexico. In 2021 an initiative, coinciding with the International Year of Cave and Karst, was put forward by the Bureau of Land Management (BLM) and local cavers of the National Speleological Society (NSS) to clean up these sinkholes

and educate local ranchers about the benefits to the local ecosystem and groundwater protection. The BLM worked with local cavers to locate the sinkholes and partnered with the National Cave and Karst Research Institute (NCKRI) to create educational outreach materials.

Between 2022 and 2023 five sinkholes, in the San Andreas formation, were remediated and in total around 18,000 pounds of unwanted material was removed and sorted. Recycled material sent to recycling centers and non-recyclable material was properly discarded at disposal facilities. No cleaning process is complete without the engagement, involvement, and participation of local communities. Flyers were distributed to individual households showing how sinkholes are interconnected to the water table and can become contaminated. Alternative methods of disposing of ranch trash are being developed in conjunction with the local community. Sharing and learning about successes and failures that other cleanup projects have encountered is critical to success. In 2023 teams from Slovenia and Lebanon met with the New Mexico team; they discussed successes, failures, and unique logistics of each cleanup effort. These types of collaborations help refine cleanup strategies and invite new ideas and personnel, keeping the project's momentum towards positive outcomes.

What do You Know about Cave Protection Laws?

Patricia Seiser

It's been 35 years since the 1988 Federal Cave Resources Protection Law was passed. Many within the federal government and the caving community are unaware of the law or misunderstand it. There is also concern about how to implant it successfully in the age of digital knowledge. The presentation will cover these concerns as well as those associated with state laws.

Significant Caves Designation Call for National Forest System Lands

Limaris (Lima) Soto, Chad Harrold and Michael
Fracasso

The United States Department of Agriculture's Forest Service manages diverse cave and karst resources across its National Forests and Grasslands. The Forest Service has responsibility under the Federal Cave Resources

Protection Act of 1988 (FCRPA; 36 CFR 290) to designate significant caves and provide for their protection and preservation. The FCRPA requires periodic updating of the significant caves inventory and the last official Forest Service call for updates was in 2017.

Caves must be nominated and designated to be listed as significant. Caves can be nominated by the public, Forest Service partners, or staff by using the recently updated Significant Cave Nomination Form. To be designated, each cave needs to meet only one or more of seven criteria pertaining to biological, cultural, geological, hydrological, recreational, and/or educational/scientific values as described in the FCRPA. Additionally, if a specially designated management area is defined in part or in whole owing to its cave resources,

the caves within that area automatically qualify as significant.

The FCRPA specifically exempts the disclosure of significant cave location information from the Freedom of Information Act provisions (5 U.S.C. § 552). Sensitive cave resources, whether significant or not, may also be protected from disclosure under the National Historic Preservation Act of 1966, the Archaeological Resource Protection Act of 1979, and/or the Paleontological Resources Preservation Act of 2009.

To assist with the effective management of cave and karst resources and the Call for Significant Cave Nominations, the Forest Service is working on a Master Participating Agreement with the National Speleological Society.

Cultures of Caves, Cavers and Caving

(Wednesday afternoon)

We Are James

Catherine Bishop (cschbishop@gmail.com)

Over the past 50 years, members of the James Cave Project have spent countless weekends in the exploration and survey of James Cave in west-central Kentucky. Living together in a primitive camping area above the cave allowed the cavers to develop a culture like that of a large extended family or a small village. Standardized procedures evolved for conducting surveys, doing vertical work, and dealing with a half-million federally endangered bats during hibernation. Leadership followed a tiered structure that was tacitly understood and accepted. Property owner relations demanded a high degree of discretion, and the caving group was sometimes accused of being secretive and excluding anyone who was not a member of the “in” group. This perception was false, and new cavers were continuously being brought to the cave though they needed to be introduced by a current member who could vouch for the newcomer’s skills and ability to fit comfortably into the group. “Newbies” might be used in support roles until their fortitude proved itself. James Cave is located on private property but is only a few miles south of Mammoth Cave. Because of this location, any north-trending lead in James was worthy of a long, hard push by the strongest cavers who might require the assistance of “sherpas” to provision underground camps. Completing this rite of passage confirmed a new caver’s adoption into the James family.

Succession Planning: The Devil’s Canyon Caving Team (or Caving with High Schoolers)

Cordelia Ross (cross@sstx.org)

In 1950, several determined people in Austin decided that Texas students should have access to quality education like that offered on the East Coast. Impressively, St. Stephen’s Episcopal School (SSES) was not only the first Episcopal co-ed school in the US, but also was the first integrated boarding school in the South. Following the Episcopal belief that learning is threefold: mind, body, and heart. This dedication to the whole learning body meant since its founding “SSES has maintained a fierce attachment to the land,” which consists of 370 acres on a hill overlooking Austin. By the 1990s, faculty and students founded the Devil’s Canyon Wilderness Program, now called the Devil’s Canyon Adventure Program. One of the first teams established was the caving team, led by Troy Lanier soon joined by Becky Jones and Peter Sprouse. The students built its quarters, The Strawbale House, and we still operate out of it to this day. I join this inspiring line of wilderness folks, as St. Stephen’s newest caving coach. This presentation will consider what the team has meant to our students—ages 14-18—why it is one of the draws for them to attend, how many of them continue exploration caving post-graduation, and how some have

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made a career of caving. The NSS is currently facing a crisis: younger people are not joining and caving. SSES offers a model to get younger people caving safely while prioritizing conservation and, of course, joy in the outdoors, specifically underground.

Exploring the Intersection of Geological, Historical, and Economical Legacies at Grand Caverns, Virginia, using the Geoheritage Framework as a Theoretical Lens

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Austin Shank, Town of Grottoes, Virginia
Lindsay Caesar, Town of Grottoes, Virginia

Grand Caverns, first discovered in 1804, holds the title of the oldest show cave in continuous operation in the contiguous United States. Since 1806, it has been offering guided and interpretative tours to visitors, at least once a year. Throughout its two-century history, Grand Caverns has become a focal point of multidisciplinary research, especially in the fields of geology and history, shedding light on the Shenandoah Valley's karst and societal evolution in the state of Virginia. One of Grand Caverns' significant geological features such as overturned bed, playing an important role in the cave's speleogenesis, rare speleothem as the cave shield, among other features attracting researchers and tourists alike. Furthermore, in this talk we explore the intersection of various concurrent heritages at Grand Caverns, including geological, historical, and economical heritages, and their relevance for understanding local economic impact of show caves, cave development processes, identification of microbial communities, archaeological findings, and the development a formal educational program. We also highlight ongoing efforts towards the construction of a proposal to elevate Grand Caverns' status to be a part of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) World Heritage list. We hope to contribute to the broader understanding of the significance of Grand Caverns and its value to the world's geoheritage.

Preparing Future Cave Scientists: Lessons from the incorporation of undergraduate researchers to an expedition in the Tongass National Forest

Devra Heyer (dheyer@nckri.org)

The summer of 2022 two undergraduate researchers from New Mexico Tech (NMT) joined a cave science expedition to the Tongass National Forest. This opportunity was supported by the National Cave and Karst Research Institute (NCKRI) and the Cave and Karst Studies (CKS) Program at NMT, through the Undergraduate Research Opportunities in Caves and Karst (UROCK) program. The NMT UROCK program is designed to create undergraduate research opportunities in cave and karst science at New Mexico Tech. This special opportunity was different from previous UROCK awards; instead of students applying with a project of their design/interest and then matched to a mentor; this time the students were matched to the project. A major proponent of this opportunity was to prepare students for remote environments. This meant mentors and mentees made monetary, interpersonal and time investments. To minimize this burden on both parties required a focus on communication, and safety, both physical and psychological. One of the outcomes from incorporating these elements is that we were able to engage undergraduate students from diverse academic and experiential backgrounds into caves. The UROCK students walked away with not only an understanding of cave environments, sampling techniques, and conservation ethos but also a better understanding of life skills such as project management, communication strategies, self-advocacy, self-reliance and a deeper connection to the natural world.

Situationism in the Sewers? Urban Caving versus Urban Exploration

Greg Brick (bric0004@umn.edu)

I began exploring natural and artificial caves in the Minneapolis-St. Paul metropolitan area of Minnesota in 1988, culminating in my 2009 book, *Subterranean Twin Cities*. I was first to use the phrase “urban caving” to describe this activity, in a 1992 article in the *NSS News*. I took it as a point of pride never to go underground without investigating some geological or hydrological enigma. With the advent of urbex (urban exploration) websites in the late 1990s, however, the local caves and tunnels were suddenly flooded with a new generation of urban explorers. Because of the ample subterranean resources in these cities, much of the local urbex focused on infrastructural exploration, rather than the usual aboveground industrial “ruins.”

Latter-day urbex has been explained by some researchers in terms of postmodernist theory. The very term “exploration,” however, is fraught with colonial baggage. It’s even questionable whether urbex fits the trendy “transgressive” label. Urbex is a highly gendered practice, most participants being young white males, whose online self-promotion and pursuit of “spectacle” (now with YouTube monetization!) were readily assimilated by consumer capitalism. Situationism, on the other hand, a French movement often cited as a forerunner of urbex, could prove fatal to someone underground. Guy Debord himself would soon be lost in the Paris catacombs or sewers if he had “drifted” randomly through the confusing labyrinths. I argue that much scholarship on urbex by cultural geographers applies more readily to aboveground urbex. We need to make this distinction when assessing the academic literature.

Herb and Jan Conn’s Geopoetics

Kai Bosworth (bosworthk@vcu.edu)

There are certain aspects of the experience of caving which cannot easily be conveyed in maps, measurements, photos, or video – they are more like images of daydreams. Cavers express these images in literary and artistic forms: the names given to cave rooms, cave poems and songs, photography and painting. Geographers (like me) find in such creative work inspiration for understanding how people relate to the physical environments around them. This talk describes “geopoetics” as a practice of thinking with the world and its intimate spaces and materials. Here, I examine Herb and Jan Conn’s 1977 book *The Jewel Cave Adventure*. This engrossing text describes the wonder of caving in all its misery and humor, through witty poems and descriptions of their early explorations of the South Dakota cave. Undoubtedly, many cavers likely know this book; those who attended the 2022 NSS convention will be further aware of the Conn’s playful style from the “Oh, Manganese!” Daily Newsletter. The Conns describe the range of positive and negative emotions one experiences while caving—often emerging in contradictory fashion: “Excitement may lead to

triumph, or to disappointment and frustration. Worry and fear alternate with comedy and fun”; a little bravery comes hand in hand with being “a little dumb.” So, to those of you who have already read the book—or knew Herb and Jan—what I seek to offer is a reflection on how their writing exemplified generosity and intimacy of an anti-heroic attitude toward caving.

Karst Protection Guidelines: How Do We Go from Words to Action?

Katarina Kosič Ficco (katarinakosic84@gmail.com)

María A. Pérez (maria.perez@mail.wvu.edu)

Karst science has been advancing for over 400 years. However, advances in the protection and management of karst terrains remain sluggish. The slow progress may come as a surprise, considering how many guidelines and recommendations have been and continue to be developed on national and international levels, globally. Despite these efforts, states and countries worldwide still do not adequately address karst protection and management. The question that arises is, why? Are the legislators and environmentalists intentionally ignoring the protection of these essential and valuable resources? Are the guidelines difficult to understand or implement? Is it possible that the reason lies elsewhere? Most guidelines are exceptionally comprehensive from a karst protection perspective, and following them could advance extensive protection of karst terrains. However, they often do not adequately account for economic, political, and social aspects, making them hard, if not unrealistic, to implement. Interestingly, approaches including these essential elements have been developed by scientists worldwide but are rarely considered during the development of guidelines. We argue that a persistent false belief in science as outside of society perpetuates this oversight to the detriment of both karst research and protection. In this talk, we present ways of correcting this oversight and considering more realistic and holistically informed approaches with better chances of translating words into action. We also call for more interdisciplinary research and cooperation among scientists and other stakeholders focusing on human-karst relations across time and place.

Geology and Geography

(Friday morning and afternoon)

Hydrogeological Characterization of a High-Discharge Coastal Freshwater Spring System: Ayuyu Cave, Northwest, Guam

Maria Jhonnie Villareal, John Jenson, Romina King and Edgardo Aban

Studies of the distribution, modes, and geologic associations of coastal freshwater discharge provide clues to the internal characteristics or “natural plumbing” of island karst aquifers. This study employed remote sensing techniques, field survey and cave mapping to characterize - *Ayuyu* Cave (65-m-long x 3486 -m³-volume) – a coastal cave discharging the singularly highest-volume concentrated spring flow on the northwest coast of Guam and its relationship to prominent geologic (e.g., *Pugua* Fault) and geomorphic features of the interior area containing its catchment. Presented here are new geological and structural insights to the characteristics of the *Pugua* Fault Zone. Originally interpreted as a classic normal fault, LiDAR data interpretation indicate features diagnostic of a strike-slip fault. This finding has significant implications to the surface hydrology of the study area and the occurrence of the high-discharge coastal freshwater spring system in *Ayuyu* cave. Brecciated zones observed in the cave are found to be consistent with the regional structural deformation that is characteristic of strike-slip displacement. The complex morphology of *Ayuyu* Cave is a testament to its complex history which reflects the many cycles of Pleistocene eustatic sea-level fluctuation, contemporaneous with episodes of tectonic uplift and subsidence of unknown timing and magnitude. Features characteristic of vadose, phreatic, breakdown, and flank margin caves are overprinted such that the sequence and timing of events cannot be discerned.

Recent Hydrologic Trends in Tumbling Rock Cave, Alabama: Water Chemistry and Fluvial Geomorphology of an Underground Stream System

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Hydrologic characterization of the subsurface is key to sustainable management of water resources in karst landscapes. Robust understanding of physical processes in karstic vadose zones, however, is complicated by complex flow paths and rapid transport, high surface water-groundwater connectivity, and distinctive rock-water interactions. Caves like *Tumbling Rock Cave* (TRC) in northeastern Alabama offer a uniquely direct

view of these processes. TRC, managed by the Southeastern Cave Conservancy, allows significant access to an underground stream system along its ten kilometers of surveyed passageway in the Mississippian-aged *Monteagle Limestone Formation*. A conceptual model of the stream system was developed through a stream survey, pebble counts, and inflow and outflow inventory. Baseline conditions for water quality were established with measurements including temperature, electrical conductivity, pH, and dissolved oxygen, both by synoptic testing of stream water within the cave and continuous monitoring at the spring where the stream resurges. Rock-water interactions were also studied through X-ray diffraction analysis of limestone samples, ionic analysis of water from cave drips and stream samples, and chemical calculations of saturation indices for target minerals in PHREEQC. Water chemistry measurements and calculations showed that the stream appears to be healthy but is sensitive to changes in surface conditions, all sampled cave waters are calcium-bicarbonate type waters, and the minerals calcite and dolomite are likely to precipitate, whereas any gypsum in contact with water is likely to be dissolved. These analyses provided an understanding of TRC's hydrologic regime, stream morphology, geologic setting, and interactions among the three.

New Dye Trace Efforts in the Hidden River Cave System, Horse Cave, Kentucky

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Hidden River Cave, located in the city of *Horse Cave*, Kentucky, has a long history of anthropogenic impacts. In the late 19th and early 20th centuries the cave served as a water source, for hydroelectric power generation, and as a show cave. However, contaminants from unknown sources polluted the cave stream so severely that it functioned as an open sewer and the cave was closed to the public in 1943. Due to the extensive dye tracing work of Jim Quinlan and associates in the seventies, the contaminant sources were identified and remediated, and a new water treatment plant installed. The cave made a major recovery in terms of groundwater quality and in 1992 the American Cave Conservation Association, who had acquired the cave, opened it to the public. However, since that time and despite the environmental success,

cave species die-offs sporadically occur as well as occasional odiferous episodes of unknown origin. The purpose of this study was to determine the source of these occasional groundwater and odiferous air episodes. Dye-trace studies resumed and determined that city infrastructure directly impacts the cave stream during flood events. Flow-paths from discrete sites that occasionally contribute industrial pollutants to the cave stream were identified. The new tracer studies have also delineated smaller sub-basins within the main basin that recharge the southern and eastern sections of the cave. The more refined delineation of Hidden River's groundwater basin is an important resource for the continued environmental protection of the cave and its important subterranean ecosystems.

Cave and Karst Development in the Republic of Haiti

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The Republic of Haiti occupies the western third of the island of Hispaniola with the remaining landmass in the Dominican Republic. Mountains that make up the backbone of the country are predominantly limestone interspersed with some volcanics and small coastal plains. The coastal areas consist of uplifted reef terraces that also occur on small islands off the coast. This diversity of geology influences the distribution of karst and type of cave development. Mountainous areas are dominated by fluvial karst consisting of spectacular cone karst, deep sinkholes, sinking streams, caves, and resurgence springs that emerge along river beds and the fringing coastal plains. Uplifted reef terraces reflect changes in sea level during the Pleistocene and have been karstified by coastal mixing zones resulting in flank margin caves. Wave action on the coasts and islands resulted in littoral cave development as well as overprinting of littoral process on flank margin caves. Pseudokarst has been documented in the form of tafoni and talus caves. Early documentation of karst was provided in colonial era narratives and later biological and archeological reports. The first documented modern cave and karst documentations were undertaken in the early nineteen eighties and the late nineteen nineties respectively. More systematic and detailed studies on the caves and karst of Haiti were initiated in 2007. The results so far show that a complex interplay of geology and speleogenetic processes have shaped the

physical expressions of cave and karst development on Haiti.

Carbon Dioxide in Caves Revisited – Texas and Virginia

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The most reported atmospheric hazard in North American caves is a combination of increased carbon dioxide and decreased oxygen. Caves in certain areas are more prone to bad air. Caves in central Texas are notorious for high carbon dioxide levels, which are also observed in other states, e.g. Virginia. In 2020 we collected air samples at 19 locations in nine caves, taking measurements with handheld meters in six of them. We also documented behavior of a butane lighter flame and colorimetric changes of EasyCap respiration monitoring devices throughout the caves and at sampled locations. Many cavers use butane lighters to check for “bad air”. The NSS medical section cites Smith (1997) stating a butane lighter flame fails when oxygen levels dip to 14.5%. However, our studies were more consistent with those of Fralia (1989) who reported flame failure at ~17% oxygen. EasyCap readings were consistent with field meter and laboratory values. The NIOSH immediate danger to life and health (IDLH) for CO₂ is 4%, and significant cognitive impairment is reported at much lower levels. Values in our study ranged from 0.04 to 4.17 % with cavers present, and to 9% (inferred) by remote sampling tube. At most sites, CO₂ + O₂ = ~20.9% (replacement or “type 2” air) but exceeded 23% in the highest CO₂ caves (additional CO₂ exsolved from water?), with butane flame persisting but IDLH (CO₂) exceeded. Awareness and understanding of this atmospheric hazard is low in the caving community, and existing guidance is both inaccurate and inadequate.

On the Definition of a Cave in Solar System Exploration

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Caves are subsurface voids, defined by issues of scale in time and space. Duration of cave existence is controversial. Is a void in seasonal snow a cave? Is a bubble in water as opposed to lava a cave? A void in limestone is a cave whether it is full or drained of water; is a lava tube, full of molten rock, a cave? If so, is the molten outer core of Earth a cave?

Is a cave required to be enterable by humans? What size human? Vesicular basalts and porous limestones both have subhuman-sized voids. So, what is the transition size to become a cave? Does connectivity matter? Rane Curl called a cave in which humans can fit a 'proper cave', a subset of all caves. Therefore voids smaller than humans are caves.

Mechanism is another issue. Many people view karst caves formed by dissolution as the standard, and everything else as pseudokarst, which makes dissolution the "default" mechanism by which all caves are compared, a biased view.

A cave is formed when a void is enclosed, a *constructional cave*, or when a void is excavated within an existing material, a *destructional cave*. To locate, enter, and characterize caves on planets, moons, asteroids, and comets requires starting with first principles. Earth is a geologically complex planet and contains most of the cave types identified thus far on other solar system bodies. Caves on other bodies have only been identified by remote sensing, and are considered subsurface access points or SAPs.

Breakdown in the Friars Hole Cave System

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The Friars Hole Cave System (West Virginia, USA) is developed in gently-dipping units ($<5^\circ$) of the Greenbrier Group, a heterogeneous package primarily composed of relatively pure and argillaceous units of limestone. Breakdown fragments and associated features vary significantly with lithology. Argillaceous units contain illite, kaolinite, and montmorillonite clays and

occasional pyrite. They are susceptible to chemical weathering and gypsum crystal-wedging and are weaker than purer units. Spheroidal weathering locally leads to chip breakdown of curved fragments. Canyons in argillaceous units often exhibit exfoliation with curved sheets and slabs convex out into the passage, with convexity developed both vertically and horizontally along the length of the passage. Locally, passage cross sections may be hyperbolic in shape. Canyons in purer units develop (among other features) trench blocks and fault wedges. Highly fractured walls in purer units near the Snedegar Cave Saltpetre entrance contain in-situ wedge- and arrowhead-shaped fragments that could reflect near-surface influence of cold temperatures and ice wedging during past periglacial episodes. However, similar fractured purer rock occurs far from entrances. Areas of highly fractured rock in argillaceous units are associated with nearby thrust faults (e.g., at the Quartz Room near Snedegar Dome) where slip is parallel with the contact between the lower argillaceous units and overlying purer units.

A Maze Puzzle: Hypogene Cave Formation in Carbonate Rocks By Cooling Hydrothermal Fluids

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Cumulating evidence shows that a large portion of the known karst systems was formed by groundwaters ascending from depth ("*hypogenic karst*") rather than by CO₂-loaded meteoric water that infiltrated from the surface ("*epigenic karst*"). The hypogenic karstic cave systems often make up many-kilometer complex mazes of caves and have significant hydrogeological implications. Despite the importance of the hypogene karstic systems, the mechanisms of their formation have remained elusive and ill-constrained. To address this

issue, we provide herein geological, geochemical, and theoretical evidence that many hypogene karst systems were most likely formed by the interaction of carbonate country rocks with CO₂-rich geothermal groundwater that rapidly ascended from depth. As the water cools, carbonate solubility increases (due to its retrograde solubility), inducing rock dissolution and cave formation on relatively short geological timescales. The suggested mechanism explains the location of caves observed in a presented field case study from Israel and captures the characteristics of cave morphology, particularly the formation of the typical maze-like pattern of the caves. The ingredients of this mechanism are very common in Earth's crust, suggesting that the scenario proposed herein for the formation of extensive hypogene karstic caves may be ubiquitous worldwide.

Speleological Evolution of Phreatic Paleokarst of Ghar Kriz Cave, Jbel Chetlou (Tellian Tunisia)

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The geomorphological study conducted in the Ghar Kriz cave, which is located in Jbel Chetlou, illustrates a model of the speleogenic evolution of the endokarst system especially, in the Tell region of Tunisia. The Ghar Kriz cave represents a “phreatic paleokarst” known particularly in the Tell region of Tunisia. This geomorphological study of Ghar kriz cave is based on the speleological exploration of the cave. The visual observations and the collection of samples are crucial to analyse the karstic environment and conceptualize the scenario of cave's speleogenic formation. The carried out samples, mainly carbonate deposits (stalagmite concretion) and fine deposits (silty-clay) have made it possible to specify two main speleogenic phases.

The first phase represents, the phreatic phase of the cave probably belonging to the pre-middle Pleistocene, as inferred from the evidence observed in the walls and ceilings of the cave. This phase is characterized by the presence of the ceiling pockets, the irregular shape of the walls as well as the insoluble parietal edges. Those patterns indicate the phreatic origin of the cave.

The second phase is the dewatering phase of the cave that started from the middle Pleistocene ($478823 \pm 21,457$ years BP) and up to the present day. This phase produces two generations of stalagmite concretions. The first generation (C1) is prior of the middle Pleistocene ($478823 \pm 21,457$ years BP) and the second generation (C2) that lasted from $478823 \pm 21,457$ years BP to 181 ± 11 years BP.

Is This Desiccated Moonmilk? And Why is it Common in the Snake Range Caves of Eastern Nevada?

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Recent work in the Snake Range of eastern Nevada has revealed a speleo-oddy in many caves. Unstructured piles of extremely porous, generally very poorly consolidated, nearly pure calcite sediments cover slopes and floors in the hypogenic caves. Thin carapaces of calcite or dolomite with a “cauliflower-like” surface texture typically coat the deposits. The calcite sediments are poorly sorted silt- and sand-size particles. They cluster together in irregular-shaped nodules, typically a few centimeters to two decimeters in diameter. Flowstone is on top of these deposits in a few places. Many deposits are below or within downward sloping, smaller passages. Close examination shows that some nodules contain small vugs and fissures lined with calcite crusts with tiny needle crystal penetrating the voids.

We suggest that these deposits are desiccated, subaerial moonmilk that predates the dominant (Plio-Pleistocene) period of drip- and flowstone deposition. However, this interpretation raises many questions: 1. Why are these deposits common in the Snake Range but not

recognized elsewhere? 2. What was the nature of the original “moonmilk”? Pure calcite? Hydromagnesite? Gypsum? 3. Do these deposits inform us about speleogenesis?

Lehman Caves has lithified, structureless, white, nearly pure calcite secondary deposits under flowstone in several places. Was this originally the same material that is now cemented?

A 12.5 Ma Mammillary Deposit: What Will Mammillaries Reveal in Eastern Nevada?

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Numerous caves in eastern Nevada display cave mammillary deposits. Mammillaries typically form just below the piezometric surface and represent extended periods of regional groundwater saturation. These deposits potentially hold valuable information on incision rates of nearby canyons, paleoclimate (O^{18}/O^{16}), paleo-groundwater chemistry and, in this case, basin deposition/fault rates in the Snake Valley basin.

A mammillary crust from Indian Burial (aka Snake Creek Burial) Cave, one of the lowest (~1730m asl) and likely youngest hypogenic caves in area, recently provided a uranium-lead date of 12.5 ± 0.74 Ma. This likely represents a time when the regional piezometric surface was immediately above the already-formed cave passage. Nearby Lehman Caves, also hypogenic, lies at 2080 m asl and has the potential to be older than 12 Ma.

Several caves in the Northern Snake Range have mammillary coatings and currently are nearly 300 m above the bottom of adjacent drainages. Near the eastern edge of the range, they are also very close to the Snake Valley, which has a regional base level about 500 m lower. We are currently sampling mammillaries from these caves and expect to find older results. Developing a suite of dates should help better define the age and rate of basin and range tectonism in this region.

Microfacies Analysis of an Early Silurian Carbonate

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Carbonates can act as a record of environmental conditions during deposition, as well as provide a means of producing low resolution cross-sections of a formation. In the Mifflintown Formation of central Pennsylvania 3 proximally located limestone caves allow for facies analysis. Within these caves, passage development occurs at an angle greater than the dip of bedding - resulting in passages that transition rapidly from younger rocks to older rocks in the formation. To use these karst features as a means of determining environmental conditions, a detailed thin-section analysis of the cave was conducted. Samples were gathered at varying depths from the ceiling and walls of the caves. In both thin sections and hand samples, areas of the rock are extensively fossiliferous with bryozoans, calcareous algae, gastropods, and other benthic organisms dominating. In addition, boundstones and small patch reefs were found in the caves. To spatially organize thin section data, the caves were mapped using Compass and reef features were recorded as a database. Interpretation of the results indicates that this patch reef has a heterogenous nature and limited extent. Similar patch reefs are interpreted as a response to the generally unstable climate and tectonics of the early Silurian, as seen in the contemporary Great Lakes reef complex. The finite extent of this patch reef and variable nature may indicate localized environmental responses to the changing conditions of the early Silurian, as well as a glimpse into reef evolution over time.

Photogrammetry in the Dark: Methods and Applications for Small-Scale Structure from Motion in Cave Environments

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Structure from Motion (SfM) is a photogrammetric technique that uses multiple overlapping photos of an object to construct a detailed model of its 3D physical structure. While such a process can be quite difficult to execute in underground environments, SfM in caves is certainly feasible and has a myriad of potential applications, such as modelling speleothems, speleogens, fossils, or archaeological features. To explore these

possibilities, SfM was used to model fossils and speleothems at Tumbling Rock Cave, a popular wild cave in northeastern Alabama managed by the Southeastern Cave Conservancy. The most successful workflow used a 360-degree lighting setup, Canon EOS 700D DSLR, and Agisoft Metashape Pro photogrammetry software to create a detailed model of a large stalagmite. As an extension of this virtual 3D reconstruction, these results can be further processed for 3D printing or use in augmented reality applications. Results were also compared to LiDAR point clouds from a LiDAR mapping project to put into perspective two related geospatial technologies and their usefulness for 3D reconstruction in caves. This research shows that SfM is a relatively cheap and effective tool for focused 3D modelling of cave features. In addition to allowing for hands-off analysis of delicate formations, it shows great promise as an educational tool for cave-focused students and researchers in disciplines such as geology and archaeology. The success of this relatively simple SfM project also opens the door for further experimentation with more complex cave subjects requiring more advanced planning and sophisticated lighting setups.

Poster Abstracts

Automated Sinkhole Mapping in Mifflin County, Pennsylvania: A Test Case for an Updated, Statewide Karst Feature-density Map

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Sinkhole mapping is vital for geohazard mitigation, groundwater protection, project planning and siting, and emergency management. Increased rainfall and storm intensity due to climate change, combined with development of communities in areas vulnerable to karst hazards, may result in more sinkhole incidents. Sinkholes pose a risk to human lives and infrastructure and are a conduit for groundwater contamination. Karst feature maps are used by developers, planners, citizens, consultants, karst scientists, hydrologists, and the caving community. The current datasets and maps for Pennsylvania are based on visual examination of historical aerial photographs before 2000.

Mifflin County was selected as a test case area for automated sinkhole mapping. It is largely rural, reducing difficulties posed by urban areas, and is unglaciated, reducing challenges in identifying closed depressions in mantled karst. The county is underlain by Ordovician, Silurian, and Devonian carbonates.

Lidar digital elevation models (DEM) with one-meter cells were modified according to steps outlined by Doctor and Wall (2018, 15th Sinkhole Conference, NCKRI, 54 p). Artificial dams created by roads were removed from the DEM. The modified DEM was used to identify closed depressions greater than 9m². The resulting 13,340 polygons were screened to remove false sinks including road crossings, alluvial features, quarries and mine collapses, and anthropogenic features. Field inspection checked questionable depressions such as solifluction lobes, vernal pools, and urban artifacts. The resulting 3,406 sinkholes were used to create a map of karst-feature density map. Continuing county assessments will build a better statewide map.

Deciphering the Karst Hydrogeology of Castlewood, VA: A Work in Progress

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Earth and environmental science students from University of Virginia's College at Wise (UVAW) conducted field and remote sensing reconnaissance in the Castlewood/St. Paul area of western Russell County and eastern Wise County, Virginia. Water quality parameters, fecal indicator bacteria (FIB), and background fluorescence are being monitored at swallets, streams, and springs in preparation for dye tracer testing to delineate karst groundwater flow paths and travel times to the new Clinch River State Park. This structurally-complex area is highly fractured and faulted, with both residential and agricultural land uses and no centralized sewerage. The study will identify nonpoint sources (NPS) of pollution to the river, support stormwater management and emergency/spill response planning, improve source water and drinking water supply quality, and advance broader efforts to protect the aquatic habitats of threatened and endangered

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species, including freshwater mussels and non-game native fish.

Improving Digital Geologic Data Access for the State of West Virginia

J. Wayne Perkins Jr.

West Virginia Geological and Economic Survey

Until recently, the West Virginia Geological and Economic Survey (WVGES) has relied on classical methods of geologic data disbursement that revolved around sales of GIS Data and paper/digital map products. Recently, the agency has been transitioning to a modern model of disbursement that began with an interactive map application that allows users to view geologic map data at a variety of scales and is evolving to on-demand, free digital data download requests ranging from the generalized statewide map (1:250,000) to more detailed 1:24,000 quadrangles. While the data viewer and download capabilities are live, the resources remain separately accessible on the WVGES website (<https://www.wvgs.wvnet.edu/>). WVGES is continuing the effort to simultaneously provide geologic maps for viewing and download. Looking forward, installing capacities to extract customized downloads are planned. The vehicle to provide these options is being built through a customized Enterprise Dataset. Furthermore, the geologic mapping of West Virginia is evolving as the Agency is working to sort out historical inaccuracies, such as quadrangle boundary mismatches, and also to reconcile the ever-changing nature of stratigraphic nomenclature. To achieve these goals, geologic mapping, along with technological improvements in data accessibility, remains paramount. WVGES plans to build upon the past and present mapping to provide improved geological information for the state of West Virginia.

Caves as Geoheritage Sites in Pennsylvania

Katie Schmid

Senior Geoscientist, Pennsylvania Geological Survey

Pennsylvania has a Pennsylvania natural diversity index (PNDI) list which provides some level of protection for the site – if an activity may disturb a site the developer must look for viable alternative. Geologic features are included on this list thanks to the Pennsylvania Geological Survey's Outstanding Scenic Geological Features of Pennsylvania publications by Geyer and Bolles, 1979 and 1987.

The PNDI list was designed to protect biota. To fit geoheritage sites into the PNDI list, geologists at the Pennsylvania Geological Survey needed to come up with a classification scheme that could fit into a list designed for biota. We divided our geoheritage sites into six broad categories: Hydrodynamic, Geomorphic, Compositional, Tectonic, Earth History, and Cultural and Historical. Primarily, caves on the geoheritage list are classified as Erosional Geomorphic features and are subdivided into Solutional carbonate-rock weathering features and Non-solutional weathering features. But, several caves on the PNI list also have secondary classifications. With including caves on the PNDI list, there are some concerns that we are still working out. For example, caves are not a single point and all the data on the list is shown as point data. Revealing the location of caves can be a safety issue not only for the preservation of the cave and its biology but also for the safety of inexperienced people who may visit the cave. These issues may be addressed by establishing a buffer zone around points designated as caves on the PNDI list.

International Exploration

(Wednesday morning and afternoon)

Rolland and Pete Caving Expeditions Exploration of Sotano Mina De Arena #1, Mexico

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Rolland and Pete Caving Expeditions began leading cave exploration expeditions in the Sierra Mazateca of Oaxaca, Mexico in 2019. In the spring of 2021 we began

sponsoring vertical training classes to introduce the local Mazatec people to caving. March and April of 2023 was our first time to offer an expedition in the spring. The first week of April we offered another vertical training class in San Andres Hidalgo, Huautla. It was poorly attended and with just Rolland Moore and Peter Zabrok, we completed a team with Joel Perez Salazar, an alumni of our first course. Given various cavers were active in the area we preceded. We continued exploration in Sotano Mina De Arena #2 from the previous November

looking for a connection to a neighboring cave, Sotano de los Cuarenta Chivos.

On an off day we went to a cave no one had explored before, Mina De Arena #1. To our surprise it went down well and kept going. The rest of our effort was focused on this cave. It would not have been possible for us to cave safely had it not been for our Mazatec friend. We realize we need to talk more about our projects and recruit more cavers. By the end of activities we have surveyed Mina De Arena #1 to 780 meters long and -330 meters deep. The cave continues and we look forward to going back.

Panti Pit, Belize: Good Air Brings Big Breakthroughs

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After several years of frustration, the cave gods finally smiled on the Boundary Fault Exploration Team when we returned to Panti Pit, Belize in February, 2023. In 2022, bad air in the form of high CO₂ had prevented cavers from accessing the most promising leads, particularly the main borehole heading south towards Slate Creek. This year the air was the best that it has been in the six years since the project was started. As a result cavers extended the cave significantly to the south beyond the big room (Leisure World) and the main borehole that the team had pushed back in 2020 just before COVID halted exploration. Good air also allowed for the exploration of the main water passage down a series of huge, ancient rimstone dams to a point where a rope was needed to continue, leaving a great lead for the next trip. In addition, a dye trace was conducted and several other leads in the area were investigated. The team added more survey length this year than in any other expedition except the first one, making Panti Pit 9.2 kilometers long and 133 meters deep.

The State of Cave Exploration in Haiti

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Cave exploration in Haiti has always been logistically challenging due to remoteness of karst areas, lack of infrastructure, politics, and recurring natural disasters

(not necessarily in that order). The earliest records of caves are found in colonial era narratives and later in archeological and biological reports. Though modern exploration of Haitian caves started in the early 1980s, it wasn't until 2007 that systematic documentation and detailed studies in Haitian caves began in earnest. Caves abound in Haiti's rugged mountains and along its terraced coastal zones, though only a small percentage have been documented. Since 2007, a total of 10 expeditions were fielded to most all of the limestone areas of the country. Because Haiti has less than 2000 km of developed roads, mostly in the heavily populated areas, reconnaissance to some of the more remote areas was conducted via Polaris ATV. This allowed for unprecedented access to some of the most inaccessible places in the northern mountain ranges and coastlines. During the course of these expeditions, the longest cave in Haiti, Grotte Marie Jeanne, was explored and mapped. Local connections and dumb luck allowed us access to caves that served as sites of Voodoo rituals. Significant archeological caves were documented all across the country. The remote mountain ranges of Haiti's southern peninsula have great depth potential which has barely been touched. However, cave exploration efforts anywhere in Haiti are currently stymied because of recent natural disasters and of the current, very unstable political situation.

Proyecto Espeleologico Sistema Huautla (PESH) 2023 Expedition, Mexico

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In 2013 Tommy Shifflett and Bill Steele organized Proyecto Espeleologico Sistema Huautla (PESH) with a goal to conduct annual expeditions for a decade (2014-2023, now extended to 2025 due to the COVID pandemic and skipping 2020 and 2021) to continue exploring and studying Sistema Huautla, Huautla de Jimenez, Oaxaca, Mexico, and other non-integrated caves in the Sistema Huautla drainage basin. Another goal is to explore and map the cave to over 100 km length and 1.6 km depth (a vertical mile). The 2023 expedition was the eighth of these. PESH's goals include conducting all speleological studies: cartography, geology, hydrology, biology, paleontology, paleoclimatology, archaeology, folklore (studying the local Mazatec Indians' beliefs in cave spirits) and also

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gear development and testing. PESH has an ongoing public relations program to educate local people about the caves beneath their homeland. Mexican cave scientists are invited to participate and are supported. Huautla cavers have a 50 year-plus record of published findings. PESH is an official project of the NSS. Expeditions carry the flag of The Explorers Club. The presentation will include the results of the 2023 expedition with focus on exploration and findings in the northernmost drainage area of the system. Prior to this year's expedition, Sistema Huautla stood as the deepest cave in the Americas, and 10th deepest cave in the world at 1560m (5,118 feet), and 100 km long (62.1 miles). Sistema Huautla is often referred to by speleologists who have visited it as one of the world's most magnificent caves.

Exploration of Cueva del Arroyo Durmiente in Múzquiz, Coahuila, Mexico

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Cueva del Arroyo Durmiente is a 286 m deep cave consisting of a series of vertical shafts that lead to a sump known to contain the Mexican Blindcat (*Prietella phreatophila*), an internationally endangered species. The cave was discovered in 2019, and Múzquiz expedition objectives have since prioritized exploration of this cave, including aid climbs and cave diving. In 2020 and 2021, solo dives were completed by Jean Krejca, who laid 150 m of line. With no apparent end of underwater passage, it was decided that two divers were needed to safely explore further. A new rigging route was selected to facilitate transport of gear required to support two divers. The route set in November 2022 follows the 100 m drop called Mama Bear using seven rebelay. There are now a total of 25 rope obstacles over 265 m of vertical passage; all but 50 m of the uppermost drop were left for future expeditions. The dive lead was pushed by Jean Krejca and Aubri Jenson, who brought three 40 cubic foot tanks each with the expectation of a long dive. However, the sump ended only 10 m beyond the line set in 2021. The sump opened into walking passage consisting of muddy crevices that appeared to drain below. A pace and compass survey added 126 m of passage length; the survey ended due to time constraints. A return trip is planned in 2023 to continue survey

beyond the sump, and to complete survey in other areas of the cave.

Expedition Cheve, 2023, Mexico

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The Cheve 2023 expedition was aimed at finding a back entrance, which would save 6 to 10 days per person trip. Efforts in the bottom of Cheve to explore up a narrow, wet, upwards trending shaft series quickly yielded a maze of large fossil tunnels. The passages discovered in this area appear to be almost exclusively phreatic in origin, with ample evidence of a complex paleo hydrology. Over 6 km of such passage were surveyed. A great deal of aid climbing was accomplished, with one dome complex reaching within 50 m of the surface. Signs are good for an entrance in this area. Additionally, a radio location was performed through 220 plus meters of rock, correcting survey error accumulated along a greater than 10 km traverse. The error was ~20 m.

A team was also placed on the surface in the village of San Miguel Santa Flor, directly above the bottom of the cave. Two significant caves (longer than a kilometer) were discovered early in the expedition. Both of these caves come very close to known portions of Cheve, the closest approach being a vector of about 70 m.

A significant discovery was made several kilometers north of the current bottom of Cueva Cheve. This cave was left going, and is entered via a staggering 221m deep shaft.

After much digging, Agua Pajarito, a small but deep cave situated northeast of Cheve's farthest extent, was explored to a depth of greater than 700 m. It was left continuing at the end of the expedition.

Descent into Fire and Ice: The Mount Meager Volcano Project, British Columbia, Canada

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The Mount Meager Volcanic Complex (MMVC) in British Columbia is Canada's only known active volcano. The discovery in 2016 of glaciovolcanic caves at MMVC, and associated volcanic activity, have been of great interest and concern. As Mount Meager (Qw̓elq̓w̓elústen) is one of the most geologically active mountains in Canada, active volcanism and related hazards have significant potential impact to the area residents and infrastructure. Toxic levels of hydrogen sulfide and other volcanic gasses have prevented exploration and analysis of the volcano.

An expedition involving a diverse team of engineers, scientists, and technical specialists was completed in September 2022. Christian Stenner and Kathleen Graham entered the cave system while wearing a specialized hybrid self-contained breathing apparatus. Underneath the glacier, they encountered a vapor cloud of dangerous levels of volcanic gasses but succeeded in exploring the cave system, capturing the first direct measurements taken from a Canadian volcano.

Studies of the MMVC cave system support the development and ground-truthing of robotic missions for detection of life on Ocean Worlds. The sensor head of the Exobiology Extant Life Surveyor (EELS) mission concept robot was successfully tested at the cave, while samples of ice, snow, and sediment from the cave are revealing unique microbial life. EELS is a NASA/Jet Propulsion Laboratory project that focuses on the development and testing of a robotic snake that will be capable of exploring and delivering scientific payloads to englacial conduits on Earth and subsurface features on Ocean Worlds such as Saturn's moon, Enceladus.

First Objective Achieved – Update on DEEP23 (Dara Expedition for Exploration and Protection 2023), Lebanon

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Sponsored by the National Speleological Society (NSS) and the International Union of Speleology (IUS), the DEEP23 (Dara Expedition for Exploration and Protection 2023) is planned for late August of 2023. It targets Dara Sinkhole, the deepest cave in Lebanon (depth estimated at 622 m). The cave was discovered in 1955 by shepherds and then explored by Spéléo Club du Liban cavers. It is cold (6-7°C), wet, and is known to be linked hydrologically to springs along the coast (Fouar, Jeita and Dychounie springs) that supply drinking water to the capital, Beirut. The DEEP23 has two main objectives. The first objective is to financially support the local caving community. The Lebanese currency in the last two years has lost 99% of its value and it has affected caving activities drastically. All the group equipment required for this expedition has been donated and is on its way to Lebanon for local cavers to use after the end of the expedition. The second objective is to protect the cave, which is under threat from fast-encroaching human developments. Old and new footage and photographs collected by local cavers will be presented outlining the importance of this expedition. In addition to a traditional refinement of the survey, we intend to document the cave more broadly. This will include photography, filming, photogrammetry, inventory of the cave's biology, and collecting three speleothems. The international and local cavers assembled for this expedition will also travel across the small country to enjoy its karst and to support and engage with local cavers. Footage and photographs of these features will also be presented highlighting the importance of karst for Lebanon.

Loser Plateau, Austria

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The Cambridge University Caving Club (CUCC) has explored caves on the Loser Plateau, about 80 km east of Salzburg, Austria, since 1976. The main system is Schwarzmöskogel Höhlensystem (SMK system) at 137 km long and 1125 m deep. Much of the effort in 2022 was put into either connecting new entrances into this or pushing it further.

Two main goals were pushing Balkonhöhle and Fischgesicht, both of which have much potential in both depth and length. Over five weeks the 2022 expedition discovered and surveyed more than 3.8 km of passage by

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a team of 37 cavers. Balkonhöhle (part of SMK) gained 1.5 km of passage expanding SMK northwards and now requires camp trips at more than 500 m deep.

Fischgesicht is not yet connected to SMK, but is now only 150 m away. Its depth went from 250 m to 412 m, and it was connected to Glücklich Schmetterlinghöhle on a 9 person connection trip. Connecting Fischgesicht to SMK will likely happen in the next few years and is one of the main goals for next year. Much of the 2022 exploration was made possible by very dry conditions, allowing us to explore previously ice or snow plugged areas which can take a long time to melt as the cave temperatures are around 2°C.

The evolving relationship between the NSS, Hanoi Caving Club, and Vietnam's Ministry of Natural Resources and Environment

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Pham Van Manh
Hanoi Caving Club

The karst rich country of Vietnam has historically been difficult for US cavers to explore. Caving permits were obtained by British, Belgian, German, and Japanese with Americans participating through their projects. Vietnam has asked the NSS to become involved in new exploration, scientific studies, surveying, cave rescue training, and anything else cave-related through a new MOU between our organizations.

Since 2018 Steven Frye has been working with cave tour operators, Phong Nha Ke Bang National Park, Quang Tri and Thai Nguyen Province Tourism Departments, Hanoi Caving Club, Vietnamese Institute of Geosciences and Mineral Resources, and the Hanoi and Hai Phong Province Search and Rescue. A new relationship has developed in which Vietnam is seeking the NSS' help in improving their ability to protect cave resources. They share the same karst range that the Thai kids were rescued from and are well aware that they need to be more knowledgeable and better prepared for any cave-related situation.

Recently the Hanoi Caving Club has been working with several NSS members on proper exploration techniques and SRT, survey and safety training. The Vietnam Speleological Society is currently being developed with the help of the Hanoi Caving Club and NSS.

This session introduces Pham Van Manh, an officer of the Hanoi Caving Club. He will explain their new role working with the NSS, along with opportunities for NSS members to come to Vietnam to not only explore world-class caves, but also help educate the new breed of Vietnamese caving community in safe and proper caving techniques.

Highlights of caving in Vietnam

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With abundant limestone, tectonic upheaval, and a wet tropical climate, Vietnam is a paradise destination for cavers. The central province of Quang Binh attracted attention because of Phong Nha Cave and its 20 km underground river. British exploration in the 90's led to the development of Phong Nha Ke Bang National Park, the opening of another spectacular show cave, and the rise of underground adventure tourism. Son Doong is the most famous, but nearby Hang Ruc Mon is equally impressive and not yet surveyed.

While central Vietnam has the most famous caves, impressive karst areas are scattered all over the north. Kevin Ditamore has visited Vietnam on seven occasions including two month-long trips in 2022, and has focused recent efforts on establishing relationships with Hanoi cavers. In June 2022 they explored Na Cave, located just 4 km from the China border. In November they began a survey of Hang Sa Khao in Thai Nguyen Province, the closest major cave to Hanoi which is two hours northeast of the capitol. The first kilometer was surveyed initially, with a visiting NSS team adding another half kilometer in April.

Exploration in nearby Vu Le Cave led to the discovery of a previously unknown connection to Suoi Mo Ga, a commercial cave with an entrance on the other side of the mountain range. A passage leading upward from the stream level was blowing hard and remains unexplored. The Suoi Mo Ga / Vu Le system is an excellent candidate for a future survey project.

Anahulu Cave, Island of Tongatapu, Kingdom of Tonga

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The Kingdom of Tonga, a South Pacific Ocean archipelago, consists of 150 islands tectono-stratigraphically divided into three distinct island chains. The southern-most, which is the Tongatapu Group contains Tongatapu Island, the largest in the kingdom at 257 km². A thin layer of andesitic-rich volcanic ash mantles uplifted Plio-Pleistocene coral reef carbonates that reach a maximum thickness of 247 meters on the southeast coast; the lower 100 meters are below sea level. Tongatapu is archaeologically significant, serving as a base for human migration to East Polynesia. Dutch explorers first visited the island in 1642 and it was the site of where Captain Cook's ship first anchored in 1772. Pursuant to a cave assessment request by the owners of Anahulu Cave (translation: Cave of Dry Leaves or Torch Cave), a small contingent of cavers affiliated with Cave Research Foundation spent a week exploring and mapping the cave. Anahulu Cave, of flank-margin origin, is located at mean sea level on the west coast of Tongatapu and is known for a 20-meter-deep freshwater lake which sees a steady flow of Trip Advisor-inspired tourists looking to swim in its depths. The cave, one of the eight that have been documented so far, was previously explored for 300 meters to breakdown. Our push of that obstacle revealed a series of freshwater lakes and sumps. The cave served as a water source for pre-contact Tongans, is highly decorated, contains rare stygo fauna and echo-locating cave swallows, and houses sediments that suggest major tsunami events of culturally impactful significance.

A decade of partnership yields great caves in Sultan Kudarat Province, Mindanao, Philippines

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Since 2014, NSS cavers have partnered with the Sarangani Bay Area Outdoor Club (SBAOC) from General Santos City to explore, map and document caves in the Sultan Kudarat Province of Mindanao in the southern Philippines. On our 6 previous trips we identified a 40 km by 10km area of karst that has been the focus of our project. In 2023 a group of 9 cavers returned to the area to continue work. Due to the ongoing security problems in the area, few tourists or cavers have ventured there and our work was made

possible due to support from the provincial government, including the Philippine National Police, Marines, and Army. This area of the Philippines has little development with scattered small villages or “barangays” and the trails are steep and muddy. We worked out of Keytodak which welcomed our groups and made spaces at their school for us to set up camp. This year was unusually wet, making some of the river caves sporting and others inaccessible. The project has documented 83 caves totaling over 29 kilometers. We also gave presentations again to various communities and government groups, and were gratified that they are now talking about the importance of protecting their caves and watersheds.

Exploring the Karst and Caves of Phou Hin Poun Protected Area, Laos

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Phou Hin Poun is a karst protected area on the western end of the Central Indochina Limestone belt, which stretches across central Laos and into Vietnam. The karst of Phou Hin Poun is developed in Carboniferous-Permian limestones of the Khammouan Formation, 500-1100 m thick, and comprised of massively bedded crystalline limestones and dolomitic limestones. Compact, massive and pure carbonates of this kind provide the perfect host rock for karst development. Geomorphic and geologic features of the Phou Hin Poun landscape were surveyed and documented as ‘geosites’ for a prospective UNESCO Global Geopark. Together, the geosites tell the story of the Phou Hin Poun landscape, with each geosite providing a chapter of the story. The identified geosites comprise 14 types of karst or related geologic features. Karst features assessed as being of international significance include: large poljes bordered by high fringing cliffs, fengcong karst massifs, pinnacle karst, and giant river caves. Other features of regional significance include: paleokarst, the sandstone-limestone association, karst springs, and a karst canyon. Recent exploration of caves in the Phou Hin Poun karst has led to new discoveries of large and extensive upper-level relict passages, and a new cave with endemic cave-adapted crabs and unusual cave formations such as showerheads and giant cave pearls.

The Mulu Caves 2022 Expedition

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A large, multi-national expedition returned to Gunung Mulu National Park for an expedition from late October to early December in 2022. Working in numerous teams, over 6.5 km of new cave was discovered. Of note was a 15 m sump dive that made a connection from the 10 km Racer-Easter Cave to Clearwater Cave. This connection increased the length of Clearwater Cave to 256 km (155 miles), passing Lechuguilla Cave to become the 8th longest cave in the world. The US-Canadian team established a new camp in Easter Cave and spent several days trying to find a connection to the 12 km Lagangs Cave. This connection would increase the length of Clearwater Cave to over 165 miles, making it the 6th longest cave in the world. Despite extensive effort and over 1 km of survey, none of the passages connected to Lagangs. The team then returned to the Scientific Method area in Clearwater, using a new travel route that bypassed the Dune Series ropes. A bolt traverse was made into a high-level continuing passage, which unfortunately connected to known passages which connected into Leopard Cave. As the exploration of the cave has entered a later phase, major discoveries are

becoming more difficult to find. Returning expeditions will therefore require much more advanced work to identify potential breakthroughs, with pre-planned teams, extensive lead lists, and longer, scheduled camps.

Adventures at the International Congress of Speleology, France

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The 18th International Congress of Speleology took place in Savoie, France in July 2022, with around 1500 cavers from all around the world in attendance. In addition to the many official sessions and other activities, there were plenty of opportunities for excursions before, during, and after the Congress.

This personal account covers canyoneering in the Vercors, caving at Grotte de l'Asperge (one of the "blue" caves) and Grotte de Clamouse in Hérault, and via ferrata at Roc de Cornillon near the Dent du Chat in Savoie.

Spelean History

(Thursday morning)

Russell Trall Neville – “The Cave Man”

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Russell Trall Neville (1878-1950) was an attorney who lived in Kewanee, Illinois. During the 1920s, 30s, and 40s, Neville was the foremost celebrity of American speleology. Advertising himself as “The Cave Man,” Neville took thousands of photos in American caves, and even took the earliest motion pictures in wild caves. Using these images, he presented a lecture called “In the Cellars of the World” across the country to groups of all ages.

What Really Happened - Theories on the Mystery Surrounding Pete Hauer

Roland Vinyard (roland@bardrocks.com)

In 1975, caver-historian and homesteader Peter Hauer killed an innocent young man, then himself, in remorse. That's what the police said, giving only a vague motive. Cavers and friends could not believe it and tried to make sense of it all. There were many theories about what really happened, only none fit well. These will be explored in varying degrees of depth and yet another theory advanced, one which fits the facts better - but opens up new questions.

NO, Part of Mammoth Cave Was NOT Named after Part of the Female Anatomy

Bert Ashbrook (caving.ashbrook@comcast.net)

A shallow pool of limpid water lies along Gratz Avenue in the historic section of Mammoth Cave. It was first described by Nahum Ward in 1816, who named it the “*pool of Clitorius* [spelled with a ‘u’] after the ‘Fono Clitorius’ of the classicks [sic.], which was so pure and delightful to the taste, that after drinking of it, a person had no longer a taste for wine.” Ward's name came from

classics authors Ovid, Pliny the Elder, and Eudoxus, who each told the distaste-for-wine myth about a pool near the ancient Greek city of Kleitor on the Peloponnese. Unfortunately, when civil engineer Edmund Lee surveyed the cave and published his map in 1835, he misspelled the pool's name, "clitoris." Slave guide Stephen Bishop, perhaps thinking purer thoughts than Lee, coined the name "Lake Purity" on his 1842 map, and that name has stuck. In 1897, Richard Ellsworth Call called Lee's name "inappropriate" but blamed Lee's misspelling on Ward. Ward's original name for the pool has never been used, since. And what about the water's fabled ability to produce a distaste for wine? Alas, when the Pool of Clitorius lost its name, it seems to have lost its mythical power, too: I myself have slaked my thirst from the water of Lake Purity, and I still enjoy a nice glass of wine.

From Russia with Love: Charles Cramer and His Improbable 1837 Book about American Caves

Bert Ashbrook (caving.ashbrook@comcast.net)

The first book ever devoted exclusively to American caves was published in 1837, but it remains virtually unknown because, improbably, it was written in German and published in St. Petersburg, Russia. The author,

amateur mineralogist Charles Cramer, was a native of St. Petersburg but traveled throughout America from 1824–1828 while working for his family's international trade and shipping firm. He visited several caves, including Mammoth Cave and Weyer's Cave. Cramer returned to New York from 1834 to 1836 to serve as a trade consul for Czar Nicholas I's government. Cramer collected published accounts of American caves and began sending reports about them back to the Russian Imperial Mineralogical Society. After he returned to St. Petersburg, he compiled these reports into a book that the Mineralogical Society published under the title, *Etwas über die Natur Wunder in Nord America* (Something of the Natural Wonders in North America). It described 57 caves in 17 present-day states and 11 others elsewhere in the hemisphere. A second volume, published in 1840, principally described springs and waterfalls but included descriptions of a further 30 caves in 13 U.S. states and three foreign caves. More than 80 years would pass before so many American cave descriptions would be compiled in one place. Cramer was also the first to publish maps of two different American caves: Mammoth and Weyer's. The author is preparing a translation of Cramer's book.

Survey and Cartography

(Friday afternoon)

Electromagnetic Locating: An Accuracy Evaluation

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Horizontal positions on the surface and depths to underground points can be obtained using electromagnetic locating equipment. Accuracy of those results has been mostly speculative. Work was conducted in the 1970s to obtain quantitative values for the errors associated with positions and depths obtained using this equipment. Twenty determinations were made at Blue Springs Cave, Indiana, and thirty-seven at Mammoth Cave, Kentucky, determining both horizontal position and depth. These results were then compared with results obtained from precise surveys. Surveys were to a precision exceeding 1:5000 but less than 1:10,000 for horizontal position. Elevation differences were based on leveling that exceeded third order accuracy requirements.

The accuracy of horizontal positions obtained was directly related to depth. At depths of less than 100 feet, errors in horizontal position of less than 0.5 foot resulted. At depths of 200 feet, the error in horizontal position averaged 6.9 feet. Depth determinations were consistently less than the actual value. At a depth of 74 feet, the determined depth was 97.6% of the actual value, and at 197 feet, 94.9% of the actual value was obtained. Results of this project indicated that there were limitations to the capabilities of this type of equipment. The values for the errors were directly related to depth and the associated factors of signal strength, null width, and atmospheric noise. With the limiting factors known, it would be possible to better plan the use of electromagnetic locating equipment to obtain the most accurate results for controlling and checking cave surveys.

Simplicity is a Fantasy

Ryan Maurer and Hope Brooks
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Starting in the summer of 2022, Ryan Maurer and Hope Brooks have undertaken an effort to survey Fantasy Cave, an exceptionally complicated three-dimensional maze cave in south-central Pennsylvania. Previous efforts were stymied by the complexity of the cave and bad landowner relations. The cave is formed on 7 to 10 vertical levels stacked directly on top of each other, presenting a significant cartographic challenge. For us it has also been a lesson in co-managing a very complicated project. This presentation demonstrates the complexity and difficulties and seeks input and advice in portraying this 3D labyrinth in a 2D form.

Remapping Friars Hole

Ryan Maurer (underarockphoto@gmail.com)

The second-longest cave in West Virginia is getting a new map. This presentation shows the evolution of maps drawn of the system from the 1970s through to the modern-day and shows how the different survey and sketching standards are being consolidated into a single cohesive form and demonstrates the shifting in positions, elevations, and spatial relationships between parts of the cave as resurvey is conducted.

Data management for expeditions and large projects- What works, what doesn't work

Mike Futrell, NSS 25010 FE-LB
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A successful cave expedition implies there will be useful documentation produced in a reasonable time frame. Most project cavers have some understanding of this. However, the mechanics of getting from the depths of a cave to a publishable report are variably ingrained or structured. Distributed responsibilities and adhering to a plan helps avoid one person having to pull it all together, often with insufficient information.

Planning for documentation and data management begins with preparation before the expedition such as assigning roles like Data Wrangler, Description Writer, and Daily Journal Keeper. Existing maps, reports, and GIS files are gathered.

During the trip following a rigid routine of daily (if at all possible) and periodic tasks is strongly advised. Individual teams need to enter and compile survey data, draw a rigging diagram, and write cave descriptions. The group should account for everyone, every day, and backup everything.

At the end of the expedition when everyone is still in a group, divide the follow ups. Assign every map to a cartographer. Who's writing which reports? Who's giving a presentation at the NSS Convention, or writing for the NSS News? Does everyone have a full copy of the expedition files?

Logistics get you to the cave. Data management is the second most important consideration, and presumably that's why you're there. It's more fun and more people can participate when responsibilities are spread around.

Update on exploration and survey of caves in or near the Tiger Cave System, Phong Nha- Kẻ Bàng National Park, Vietnam

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Exploration of the karst and cave resources in Phong Nha-Kẻ Bàng National Park, Vietnam, is a decades-long multinational effort, yielding truly extraordinary cave discoveries. To date we have initiated survey and karst inventory of the Kong Doline, including discovery of a new significant cave, named Python Cave. We also identified previously unexplored areas in a lower level of Hang Over Cave, adding over half a kilometer of additional length and connecting it to another cave in the Tiger Cave System. There remain significant discovery opportunities, and our long-term goal is to update and extend the mapped areas of these caves. Following a COVID-19 induced hiatus, we returned to the region in 2023, and this presentation will include additional exploration updates to the Tiger Cave System. In summary, the area encompassing the Tiger Cave System watershed, and Phong Nha-Kẻ Bàng National Park as a whole, possesses extraordinary potential for continued significant cave discovery in the future.

Survey in the Tiger Cave System involves the need for a diverse set of techniques, not only to access certain cave passages but also to effectively survey. For instance, Pygmy cave presents a unique survey challenge in that the distances from wall to wall are immense, but also partially bathed in surface light, rendering most laser-measuring devices ineffective—at best marginally

effective due to distance and atmospheric conditions at night. Moreover, significant stretches of passage are wall-to-wall water and/or require a combination of vertical caving techniques and portaging. We will discuss these challenges and others.

Static to Searchable – Making cave maps more useful

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The final product of most cave survey projects is a cave map rendered using a drawing program. Cave maps are oftentimes aesthetically artful and can provide a lot of information about the cave in general and specifically. However, no matter how artful or detail-packed, the limitation of such a map is its lack of searchability in terms of its features and other information. We demonstrate the workflow for making a searchable map from a detailed manuscript map and its line plot. A cave resource inventory is done using the final (or manuscript) map and the “field” process of inventory to compile a detailed inventory of all of the features shown on the map. Survey notes are used to augment the manuscript map since sketching scale and drafting scale often differ resulting in the omission of some sketch detail. The inventory data are entered into an Excel spreadsheet and georeferenced to a shapefile of the cave’s line plot using GIS. The manuscript map is converted to an image file and georeferenced as a base layer in the GIS. The final product is a map that can be searched on its features. Data can be added to the existing GIS attribute table. This format also allows for other analyses to be conducted on the data associated with the cave map.

Mobile LiDAR as a Tool for Planetary Exploration and Terrestrial Cave Survey and Study

W. E. King, M. R. Zanetti, E. G. Hayward, K. A. Miller

The Kinematic Navigation and Cartography Knapsack (KNaCK) team at NASA’s Marshall Space Flight Center in Huntsville, Alabama is developing tools that enable ultra-high resolution terrain mapping and navigation using mobile LiDAR (Light Detection and Ranging) and SLAM (Simultaneous Localization and Mapping) algorithms in fully GPS-denied and unilluminated environments. The backpack mounted LiDAR instrument under development by our team demonstrates the potential of mobile SLAM LiDAR for use in challenging lunar and planetary surface environments as well as for lunar, planetary, and terrestrial cave exploration, study, and utilization.

The KNaCK instrument has been used to map two terrestrial caves: Three Caves, a quarry in Huntsville, Alabama, and Lava River Cave, a lava tube in the San Francisco Volcanic Field of northern Arizona. Data used to generate a map of Three Caves was collected in just 6.5min, capturing a substantial portion of the maze-like complex with only a short, 370m traverse. The data used to produce a map of Lava River Cave was collected in 44min over 1100m and records the morphology of the cave at cm-scale. These maps contain 18.4M and 44.8M points, respectively, after post-processing. The accuracy of the Lava River Cave map was compared to an existing survey produced by the Central Arizona Grotto in the 1980s. The LiDAR map is shown to be very accurate at the local scale but shows considerable drift from the traditional survey at the global scale. Potential techniques for increasing the global accuracy of mobile LiDAR maps at the global scale are discussed.

U.S. Exploration

(Tuesday morning and afternoon)

Cave Exploration on Prince of Wales Island (Alaska)

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The 2022 Prince of Wales Island expedition discovered and surveyed several caves, the deepest being 300’ deep and dropping fast. The expedition was supported by the

Tongass USFS and based out of the El Cap Guide Cabin, just below El Capitan Peak. The expedition resulted in the discovery of several deep pits nearby El Capitan Pit (the deepest limestone pit in the US) and the connection of two caves in a large, lowland hydrologic system. In addition, a cave with significance as a fresh water source to Alexander Archipelago wolves was discovered and mapped. This presentation will showcase

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the highlights of the expedition, including some of the challenges and successes encountered, the discoveries made, and their implications for future exploration efforts in the region.

Revenge takes time: Continuing exploration in Wind Cave (South Dakota)

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The western extension to Wind Cave, Revenge Fantasy was found in 2019. Through a series of breakthroughs, over two miles of cave was found by early 2020, although the 4+ hours of travel time was limiting what could be accomplished on day trips. A camp was established when COVID restrictions eased in early 2022, and since then there have been several three-day camp trips to the area. These camp trips had added over a mile of additional passage, although the leads are small, and survey is unpleasant. Nonetheless, a number of additional passageways have been found and strong airflow continues to be felt. Progress also continues toward Persistence Cave, which would provide a much easier route to the area. The near proximity of this additional entrance is supported by the discovery of animal tracks in some of the highest known passages in the cave. While exploration continues through tortuous leads, these recent explorations have helped propel Wind Cave to 164 miles, bypassing the length of Optymistychna and making Wind Cave the 6th longest known cave in the world.

Exploration under the South Cirque of Silvertip (Montana)

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In June 2022 a team of ten cavers spent two weeks in the Bob Marshall Wilderness of Montana exploring underground and overground karst features, looking for new cave entrances and new passages in known caves. The trip started a little bit earlier in the season than usual, and the team encountered lots of snow which delayed the exploration for a few days. During this time, the team cleared out the trail from fallen trees, hiked through snow and dug open cave entrances. The rest of the time was spent resurveying known caves in effort to create a better map of the South Cirque system, and surveying new passages, as well as caves discovered the

previous year. A total of 6,465 feet of survey was completed, about 1000 feet of which is resurvey. Over a mile of cave passage was added to the south cirque of Silvertip, with annual return trips planned.

Tears of the Turtle - Deepest Limestone Cave in the US (Montana)

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An expedition to the Bob Marshall Wilderness of northern Montana in the summer of 2022 has resulted in extending the length and depth of what was already the deepest limestone cave in the US. Exploration in what may well be the world's most miserable cave continues by a group of cavers who obviously suffer from cognitive impairment.

The Kamapua'a Cave System, Big Island (Hawaii)

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The 1880/81 lava flow on the Big Island of Hawaii has been documented to contain two major cave systems. The Emesine Cave System (23 km) and Kaumana Cave (2km) which are separated by almost 30 km of highly vegetated lava flow. Because of the Big Island's penchant toward long and deep cave systems, it is speculated that there must be more cave in the 1880/81 lava flow that has the potential to connect the two systems. However, there was no known cave at the midpoint gap between the two systems and no known leads. Undeterred and inspired by some very fuzzy and suspicious looking dark spots on Google Earth, we opted for some volcano-style ridge-walking through miserable stands of Ohia and other entrance-obscuring vegetation with an occasional pig trail for respite. Blind ambition and the blessing of Pele allowed us to score a couple of entrances which eventually connected into the beginnings of a cave system that went mauka toward Emesine and makai toward Kaumana. So far, an integrated 6.1 km of cave has been explored and mapped with open leads on both ends. The gap to Emesine has narrowed to 2 km and that to Kaumana to "only" 22 km. We named the system Kamapua'a after Pele's ex-lover who occasionally took the form of a pig (as ex-lovers are prone to do). Kamapua'a has the potential to be a 50+ kilometer cave system with a vertical extent of over 1000 meters.

Exploration in Carlsbad Caverns (New Mexico)

Derek Bristol (derekbristol@gmail.com)

One of the best known and most visited caves in the world has been thought by many to be fully explored and mapped. Recent efforts to fix bad loops, improve sketch quality, and update the cartography has resulted in a number of new discoveries throughout the cavern. Airflow patterns hint at the potential for many more discoveries yet to be made. This talk will review the resurvey efforts and new discoveries in areas such as the Guadalupe Room, Chocolate High, and even Spirit World, which is located 225 feet above the tourist trail in the ceiling of the Big Room. Technical climbs in Spirit World, the Bell Cord Room, and Liberty Dome have helped to push Carlsbad Cavern close to 40 miles in length.

Continuing the Exploration of Loaded Dice Cave (Wyoming)

Pete Johnson (peterfjohnson@gmail.com)

Work continued in 2022 by the Bridger Teton Caving Project in Western Wyoming, including pushing Loaded Dice, the 6th deepest cave in the United States, which contains Jackpot Drop, a 547' pit within Loaded Dice. With over a hundred square miles of karst terrain, the Bridger Teton National Forest has significant cave potential, but limitations in technology, the remote nature of the area, and the sheer size of the potential karst present significant obstacles to discovering and exploring caves and karst features. In 2017 the USFS and the Northern Rocky Mountain Grotto partnered to form the Bridger-Teton Caving Project. By combining a new approach to ridge-walking, modern technology, and the public-private partnership, the BTCP has inventoried dozens of caves. Progress in this exciting karst area will be discussed.

Cave Exploration in the House Range (Utah)

Matt Paulson (matt.paulson1@gmail.com)

Located in the Great Basin of western Utah lies the House Range, a string of mountains that encompass 300 square miles. Due to its richness in limestone, the area has great potential for caves. In September 2020, the Timpanogos Grotto began a project to document and

survey these features. Efforts have relocated previously recorded caves and discovered new ones. Over 50 working days have been put into the project, and as of April 2023, 46 caves, 11 pits, and 89 shelters have been documented. Access to these caves is often difficult, involving long approaches and aid climbing up cliff faces to entrances. Significant paleontology, cave life, and unique speleothems have been found in the process. These findings indicate that the House Range is an important gateway to cave discoveries, and through continued documentation, this project will benefit both cavers and researchers into the future.

Standing on the shoulders of giants – Fern Cave Survey (Alabama)

Rand Heazlitt, Marion Ziemons
randheazlitt@gmail.com

This presentation will focus on the rejuvenation of the Fern Cave Survey and Exploration Project. Highlights will include how in November 2021 a group of Indiana Cavers became involved in the survey and exploration of one of TAG's premier cave systems and the birthplace of SRT in the US. Building off the work of over 150 cavers from the previous effort, the presentation will cover:

How the group managed to interpret decades of survey data to resume a project started in 1992 but halted in 2008 due to WNS

- Identified new leads for exploration and survey
- Developed a project management plan
- Recruited talent for the project
- Worked in sensitive hibernaculum areas
- Negotiated new Special Use Permits (SUPs) with Fish and Wildlife Services and The SCCi
- Developed quads for both plan and vertical profile map views
- Drafted first set of quads
- Surveyed the low-water connection between Surprise Pit and the Bottom Cave
- Found significant unknown cave passage, including several new pits
- Surveyed over 2.5 miles of new and known cave, some of the most difficult routes
- Conducted 36 trips in 18 months with 19 participants
- Professionally videoed significant areas of Fern Cave
- Provided regular reports to permitting entities
- Project continuation

Abstracts – U.S. Exploration

Co-coordinators Marion Ziemons and Rand Heazlitt have spearheaded this ongoing project, with long-time Fern Cave liaison Steve Pitts. Marion is the project cartographer and Rand Heazlitt will give the presentation.

Exploring the caves of Tazewell County (Virginia)

Mike Futrell, Andrea Futrell
karstmap@hotmail.com

In the past decade a lot of effort has been expended in southwest Tazewell County, Virginia. The study area encompasses 65 caves with a current sum length of approximately 25 miles of passage. Major portions of the area have been closed to caving for 50 years. Over the last decade a switch to “research only” access has fostered a new era of exploration and study. Hydrology divides the project into two parts. On the flanks of Short Mountain lies a classic textbook cave system formed in the middle Ordovician limestone. The major cave here, Fallen Rock, is currently over 8 miles long. On the flank of Morris Knob, Stompbottom Cave is over 12 miles long and formed in lower Ordovician and upper Cambrian dolomite. Such length in dolomite is very unusual for Virginia. Numerous associated and surrounding caves also continue to yield new passage and insights to the hydrogeologic setting. Significant biological resources augment the cave systems.

Sarah Furnace Cave: Perhaps the Maziest Maze Cave in the World? (Pennsylvania)

Bert Ashbrook (caving.ashbrook@comcast.net)

Sarah Furnace Cave in Clarion County, Pennsylvania, may be the densest 2-dimensional maze cave in the world, as measured by Alexander Klimchouk’s metric, “passage network density” (length of survey divided by surface area underlain). Nearly 9 miles of passages have been surveyed lying beneath a surface area of about 6 acres. Passages form along several sets of parallel joints in the flat-lying Vanport Limestone. Intersections are spaced every 6–12 feet. Typical passages are 2–3 feet wide and 1–3 feet high. A vein of iron ore forms the passage ceilings. The ore was mined from the ceilings of some passages ca. 1860–1867 for the Sarah iron furnace. Stoop-walking is possible in some of the mined passages. Surveying is difficult because of low ceiling heights, the dense maze, and seasonal flooding in parts of the cave. The first attempt to map the cave was in

1956, but that and subsequent attempts all failed. The current survey, begun in 2019 by “Team Sarah” of the Mid-Atlantic Karst Conservancy, has discovered the outer limits of the maze (where passages get too low or are blocked by breakdown) to the west, south, and northeast. However, nearly 100 leads remain unexplored heading east and north. No lead is more than 600 feet (straight line distance) or 25 minutes’ crawling from the cave’s only entrance. The extent of the limestone means there is a huge potential for more cave.

Cave mapping and inventory in the Daniel Boone National Forest (Kentucky)

Ben Tobin, Chelsea Parada, Maaz Fareedi
bwtobin80@gmail.com

The Daniel Boone National Forest has long been known by cavers to contain hundreds, if not over a thousand caves. Recent efforts have begun reconciling historic cave data with entrances and caves in the forest. With the establishment of a new agreement in 2022, this has resulted in mapping of 15 caves, including 4 that exceed 0.5 miles of passage. In addition to mapping, resource inventory data has been collected throughout the cave along with ridge-walking to find additional caves. Currently, this has resulted in the documentation of over 150 entrances, 50 of which had not been identified in historic data and in need further documentation.

New Explorations in and Around the Whippistle Cave System (Kentucky)

Pat Kambesis (pat.kambesis@wku.edu)

After a hiatus of a few years, explorations in the Whippistle Cave System in Kentucky have resumed full force. New activity has added over a mile and a half of new survey from all three major sections of the cave system including the Martin Ridge, Jackpot, and Historic Whippistle, bringing the new length of the system to 37 miles (60 km) and a vertical extent of 315 feet (96m). Satellite caves are also being revisited to extend the southern reach of the Whippistle System. Part of the recent exploration/survey successes are due to the now excellent access to all of the entrances to the system and satellite caves by local cavers, some of whom live above the cave system. Updated maps also contribute to the successful exploration efforts; 80 quad maps have been completed so far and additional cartographers have been added to the effort. Connections of the submerged type to the seemingly endless cave system to the northeast are

being pursued from both sides – success would add another 420+ miles (687 km) of cave to the Whigpistle Cave System.

Exploration in the Fisher Ridge Cave System (Kentucky)

Sean Lewis (sealewis@gmail.com)

Fisher Ridge exploration continues over the past few years, with several notable results. As of this writing,

Vinegar Ridge Cave is suspected to be a mere 10 ft below Fisher Ridge passages, with a sound connection and leads remaining nearby. In early 2023, a borehole was discovered and many associated leads heading east away from known cave. Other survey work continues in various parts of the cave. An update will also be given on the Crump Spring Cave connection, following a trip in June. Fisher Ridge Cave System is approximately 133 miles long as of April 2023.

West Virginia Exploration

(Monday morning and afternoon)

An Updated Geologic Map of Monroe County, West Virginia: Improved Mapping of the Greenbrier Group and its Geologic Structure as a Guide for Future Cave Exploration

Daniel Doctor, David Weary, Mark Kozar

Monroe County contains the type localities of the limestone units within the Greenbrier Group; however, the individual formations were not broken out on the 1926 county geologic map. New geologic mapping was conducted by the U.S. Geological Survey to provide a geologic framework for a water resource study of the county. With the aid of lidar-derived elevation data, the Greenbrier Group units were mapped, and their structural complexity was revealed. In addition, a dataset of lidar-derived and field-observed sinkholes was produced, and potential sink points for surface drainage identified. A cave density raster was also produced using information in West Virginia Speleological Survey Bulletin 22.

A cross-county dye trace from a stream sink at the Hillsdale-Maccrady contact southeast of the hamlet of Gates to Dickson Spring confirmed earlier work by Bill Jones and suggests a well-developed conduit system wraps around the Hillsdale anticline. Numerous caves have entrances near the contacts between the Denmark Formation, Taggard Formation, and Pickaway Limestone adjacent to a fault zone on the western limb of the Hillsdale anticline, including Union Cave which appears to have formed within a shallow syncline in the uppermost Denmark Formation (the informal Patton limestone member). Three north-south trending faults have been mapped between Willow Bend and Hillsdale;

the entrance to Drool Cave and a previously undocumented cave were observed along one of these faults. Caves also exist in the Glenray Limestone Member of the overlying Bluefield Formation and in the Ordovician limestones in the far southeastern part of the county.

de Tour de West Virginia 2020

George Dasher

This talk will discuss the four karst- and cave-forming limestones within West Virginia, as well as the different types of karst. The talk will also describe the karst and hydrology within the various counties and river basins, starting in southern West Virginia and working north, and it will provide a limited description of some of the caves within the state.

Memorial Day Cave: A 2023 Update on Exploration and Survey

Rick Royer

The Memorial Day Cave (MDC) entrance was discovered in 1999 by the Germany Valley Karst Survey (GVKS). Over the last 2+ decades, MDC has grown to over a 29.4 mile-long system including the connection to Ruddell Cave. Much of the initial exploration was focused on horizontal leads though some bolt climbs that led to extensive new areas of MDC.

In more recent years, with the horizontal leads completed, more bolting has led to new areas of survey: Crumbly Chasm Canyon (CCC) above the Southern Borehole; the upper levels above the Titanic Room Window (Hawking Hall, Dead Disto Dome, the Graham

Abstracts – West Virginia Exploration

Finale drop at top of Pulpit Room, and dome complex above Edgard's Climb), the EZ dome complex extensions off the Southern Borehole; and leads above the Broken Heart Room in the Big Easy. Digs including downstream Dragon Canyon have yielded more cave and greater depth. Other new caves including Warner Noisy Blower have come close to MDC but massive collapses hinder connections. There is still an intriguing amount of air to follow in MDC.

Recent Advances in Shoveleater Cave

Mark Minton

Since the presentation on Shoveleater Cave in 2012, the length has grown from 5.3 to 6 miles and leads remain in several areas. While no major breakouts have occurred, the potential still exists for significant new discoveries.

The Organic Dig at the bottom of Papusha Pit followed a very tight upstream infeasible until it broke out into nice passage, including a 60-foot dome pit, before ending in collapse after 1100 feet. Downstream, widening in Rolling Thunder Canyon led to 400 feet of passage with a couple of pits, good air and a resounding echo. A waterfall can be heard past a constriction at the current end. Nearby bolt climbs and digs yielded another 481 feet of passage. The Nothing Pit connected to Papusha, closing a large loop from a different branch of the cave.

The Sisyphus Dig was an old lead off of the Bottom Borehole. It has airflow and leads to a narrow descending canyon, which is still open. Another dig in an old lead was Rushin' Rift/ Hammer Canyon. This descending complex has yielded 813 feet of passage with air and water flow. The current lead is down 19 pitches, probably a record for the cave.

The most recent areas of work are in Acrobat Pit near the entrance, where a downstream dig could lead to a major shortcut to the main level of the cave. Finally, bolt climbs in the Pinnacle Room Dome have led to upper level crawls with air.

Hellhole's TARDIS - It's Bigger on the Inside

Reilly Blackwell and Nikki Fox

Germany Valley in Pendleton County, West Virginia boasts 51 pits/domes of 100 feet or more in length; 30 of them are in the Hellhole Cave System (including Shoveleater Cave). The Valley also contains six vertical shafts more than 300 feet deep. This is the same number

as the entire TAG region, which is famous for deep pits, but the significance of the Valley's vertical caving is not as widely known outside of the Virginias. All six of these pit-dome shafts in Memorial Day Cave and the Hellhole Cave System were explored or greatly extended by multi-pitch aid climbs.

Two large pit-domes have recently been added to the list in Hellhole: Dark Cathedral and Waterfall Dome. Both aid climbs are part of a dome series accessed by another tall aid climb, the TARDIS, which was dug open in 2013, surveyed in 2015, and aid climbed in 2016. Exploration of the upper level took off in December 2016. This presentation by Nikki Fox and Reilly Blackwell will cover the history of aid climbs and survey of the TARDIS area from 2016 to present, including some of the techniques Germany Valley cavers have used to climb safely and efficiently in remote areas with very poor quality rock.

The Exploration of Kimble Pit, Germany Valley, WV

Corey Hackley

Kimble Pit is a ~10 mile long cave in Germany Valley, West Virginia. The vast majority of the known cave was explored following the acquisition of the entrance by cavers in 2013, making Kimble Pit the newest major cave in the valley.

Entry to Kimble pit is gained via a shaft approximately 170' deep, beyond which is about 1000' feet of cave that was known historically. Kimble was notorious for its strong airflow, and a digging effort in 2013 was successful in following the air into virgin cave.

The first mile of passage to be explored was extremely muddy, consisting of a network of multilevel canyons, pits, and some short borehole segments. However, in fall of 2014, an unlikely route was established down into a system of deeper, desiccated trunks. A camp was immediately established and the length of the cave exploded.

Climbing upwards through a dense 3D maze in the Northern end of the cave gained access to yet another nexus of large tunnels, and a second camp was established. Most exploration between 2015 and 2017 was centered in this area, featuring large, uninterrupted trunks. The cave continued to grow to over 8 miles in length.

Although the pace of exploration has slowed since 2017, two large discoveries have been made since: an upper

level passage complex South of Camp 1, and a lovey gypsum sand filled trunk between camps one and two. Plenty of work remains to be done.

The Survey of Cave Hollow Arbogast, Tucker County, West Virginia

Dave West and David Socky

The Cave Hollow - Arbogast Cave system is a roughly 5-mile cave in Tucker County, West Virginia. The system was known to locals for many years and was visited frequently by organized cavers starting in the 1960s. A rather slow-moving survey project was gaining momentum in the late 1970s and early 1980s when access to the cave was halted by the U.S. Forest Service. Since 2007 Dave West has been working with the Forest Service to get approval for the Cave Research Foundation (CRF) to produce an accurate and detailed map of the cave. Finally, in 2017, approval was obtained, and the new survey of Cave Hollow Arbogast began.

Since 2017 there have been about 7 to 8 trips a year. The goal has been for monthly trips, but ice, snow, and flooding have cancelled a number of trips. So far, the project has resurveyed a little over half of the cave and stands now at 3.4 miles. When the project started, the cave trips were pretty easy, surveying nice large trunk passages and breakdown rooms. However, most of the easy cave has been done, and we are now focusing on some of the more challenging sections. There are a number of water crawls that need to be done, and there are sections of the cave where “small persons” are required. But it’s not all hard. There is still some nice passage that needs to be done, but it’s just not within 10 minutes of the entrance. There is still a couple of years’ worth of work left to do.

The last survey was in February of 2020 when the Forest Service shut down access to the cave because of the COVID pandemic. The cave has not been open since. Hopefully, with some work between the CRF, Cave Conservancies, cavers, and the Forest Service the cave will be opened again and the cave can be finished.

Surveying and Exploration in the Cheat River Canyon, West Virginia

Greg Springer (presenter), Aaron Bird, Brian Masney,
Dave Riggs

The Cheat River Canyon in north-central West Virginia is a comparatively little-visited caving locale. The Cheat

Canyon and vicinity is home to roughly 100 caves and most of these caves were found between 1985 and 2011. They have a total combined length of nearly 10 miles. The longest cave in the canyon, Cornwell Cave at over 3 miles in length, is a maze cave with a long history of exploration and sport caving. Cornwell is currently being resurveyed and is expected to substantially exceed its previous known length.

There are many shorter but interesting caves that a small group of persistent cavers from West Virginia University and the WVU Student Grotto have dug open, explored, and surveyed. Druid is the longest of these “other” caves at ~2.4 miles and is notorious for its crumbling sandy limestone. Looking for the Druid stream source, the 3,000-foot-long New Year’s Day Cave (NYDC) was discovered above Druid. NYDC still goes but unpleasanties make trips rare. Discoveries made since 2000 include caves dug open after fist-sized blow holes were found: Jimmy Fish-pot Cave and Windy Slope Cave. Jimmy Fish-pot is the most impressive, with a 4,000-foot long stream trunk that is easily the nicest passage in the canyon.

There is no doubt more cave passage can be found in the Cheat Canyon and as the Cornwell resurvey is the current priority, new discoveries may occur in this, the longest-known cave in the canyon.

Scooped, Lost, and Found: Progress along the Randolph Pocahontas County Line, West Virginia

Hunter Campbell

Since 2019, sport cavers have been evolving into project cavers by scouring up and down the hillsides of Northern Pocahontas and Southern Randolph County in search of new cave. The county line bisects The Elk and Tygart River Valleys. Both valleys have outcrops of the Greenbrier Limestone, through which water is pirated from the Tygart River to the Elk River in one or possibly more instances.

The caves in this area started being documented as early as the late 1800s, then heavily worked from 1950s to the 90s. Since then, there’s been other groups working in the area as well, but not a great deal has been published. To not much surprise at all, our search yielded a lot of scooped cave, some caves that got lost in time or translation, and a few new caves as well. Some of these scooped, lost, and found again caves could be considered significant in their own regards.

Howli Mowli Breakthrough in Friars Hole Cave System

Keely Owens

Downstream exploration at the southern end of the Friars Hole Cave System, a location with significant hydrologic and meteorologic potential, was stymied between 1964-2020. The multilevel cave passages all terminated at an east-west trending, linear feature characterized by extensive breakdown. In 2020, this so-called “Kill Line” was breached by a successful breakdown dig at the terminus of a mid-level historic passage known as the Howli Mowli. Beyond that breakdown constriction, a sizable infeeding stream was found approaching from the south. Where that stream meets the Kill Line, the water plunges rapidly, ultimately becoming unsafe to follow due to complexity and instability in the breakdown column. However, the water is easily followed upstream, clearing the breakdown and forking into two significant infeeders.

These passages were surveyed between 2020-2023 and collectively added 1.2 miles of canyon and stream trunk to the cave. The larger infeeder, Fireball Canyon, terminates in a majestic dome complex just below the most southwesterly stream-fed sink along the Friars Hole Valley. This sink holds promise for a new entrance. There is also at least one intriguing lead off of Fireball Canyon that suggests a divergence between the paleo-drainage route and the current drainage route. If an old phreatic conduit can be followed back into the core of Parker Mountain, there is hope that the lost waters of the entire system could be accessed on the far side of the Kill Line.

Exploration of the Historic Section of Maxwellton Sink Cave

Greg Springer

Maxwelton Sink Cave was dug open in a stream sink in 1970 and closed off in 1972 by a hurricane, but 10 miles were surveyed while it was accessible. The cave became accessible again in 2004 when Monroe County Cavers, WVACS, and friends dug into a known side passage on a hillside safe from flooding.

Much of the previously known cave was surveyed in the next 3 years, but a working map was not made, and the survey notes were not readily accessible. This dampened interest in the cave, but the survey reached ~10 miles by 2012. A new wave of surveying began in 2011-12 when a

working map was begun, and the notes were scanned and made available in a cloud drive. Over the next five years, a working map of everything but the new entrance passage was created, which guided lead killing.

The cave reached 12 miles in 2016 and the survey was assumed to be nearing an end. However, discovery of the extensive Sweetwater River section in 2017 turned attention away from “historic” Maxwellton. Nonetheless, lead killing in the historic section continues to yield surprises. As of 2023, the historic section is 15.5 miles long and Maxwellton Sink Cave is 27.99 miles long. Maxwellton was connected to McClung Cave to form the Great Savannah Cave System in 2019 and the total system length is 52.70 miles as of early 2023. Historic Maxwellton is the seed from which the larger system grew.

McClung Cave, West Virginia – 23 Miles in 4 years

Dave Socky

In February of 2019 we knew the connection between Maxwellton Sink Cave and McClung Cave in Greenbrier County, WV was imminent via a sump dive (The combination of the two caves is called the Great Savannah Cave System). It was decided that to have an accurate and up to date length for McClung Cave a resurvey was necessary. This was important because the combination of the two caves could very well result in the longest cave in West Virginia. So, in February of 2019, the resurvey of McClung Cave was started. Fast forward to May 2023, only 4+ years later – the resurvey is now at 23 miles and the known length of McClung is 24.74 miles.

This program will highlight some of the best photos from recent survey trips, document some of the new passages that have been found, and show some of the very nice borehole passage of McClungs. The cave is not really known for nice formations, but plenty of pretties have been found during the resurvey. Some comparisons between the old map and new map will be shown plus statistics on trips, surveys, and participants will be presented, giving some idea on how to survey a large multi mile system in just 4 to 5 years.

Update on Great Savannah Cave System's Sweetwater River

Nikki Fox

Lying under the scenic karst topography of rolling hills and sinkholes in Greenbrier County, West Virginia is the largest cave in the state where a caver dove a sump in September of 2019 and connected two +20-mile caves named Maxwelton Sink Cave and McClung Cave. Thus, the Great Savannah Cave System (GSCS) was born. The discovery of Sweetwater River in 2017 and the subsequent mapping in historic Maxwelton was key in the creation of the 52.73-mile cave system (as of May 6, 2023).

The old days of surveying the large, meandering Sweetwater borehole are long over and the leads left are hard-earned footage added to GSCG. Most of the work has either been mop of areas ranging from Echo River, one of the most remote places underground in the state and the furthest point in the system from any entrance, to upstream Sweetwater where upper levels were discovered, or bolt climbs to new passages.

The main areas discussed here will be exploration and discoveries since the last Sweetwater update, which was given at the 2019 Convention.

Dry Cave, West Virginia: Anything but Dry

Greg Springer

Dry Cave is by any measure unique with spectacular formations, unusual geology, and strike-oriented stream passages extending over 2.5 miles from the entrance. The cave is developed in the steeply-dipping, but otherwise cave-poor Tonoloway Limestone. The West Virginia Association for Cave Studies (WVACS) took interest in Dry in 2011 and the Dry survey continues during its open seasons. WVACS has discovered extensive upper levels and new sections to compliment the many stalactites, stalagmites, and columns found throughout the cave. The upper levels have spectacular displays of aragonite, triangular calcite crystals, massive popcorn speleothems, and the only known square soda straws in the world.

A breakout, The Better End, took place in 2019 and has proven to be a major upstream continuation of the cave that abounds with potential. The most intriguing lead is nearly 3 miles upstream of the cave entrance in Bobcat Creek, where a waterfall can be heard in the grim lead. Unfortunately, the mainstream was found in 2021 to end in an upstream sump, but overpasses are being sought. The sources of the cave's water are unknown with no known sinking streams or potential upstream entrances.

Nonetheless, the cave sits at 8.95 miles and WVACS has its sights on 10 miles.

The Geology of Burntwood Cave

Corey Hackley

Like many caves in Northern Greenbrier County, Burntwood Cave begins high in the Union limestone, near its contact with the overlying Alderson formation. After traversing the Worm Way, a tight tube in an occluded floodwater maze, the cave begins dropping precipitously through the pure sections of the Union formation, with vertical shafts interrupted by several prominent thin silicious beds.

The cave assumes a more horizontal character once reaching the top of the Pickaway formation, owing to the unit's lower solubility and the near-horizontal dip. From here, a system of tubes, some long-abandoned, trends generally westward, accumulating some infeeders, and finally consolidating into a streamway. The streamway terminates in windy breakdown.

A single push into this breakdown in 2013 resulted in the discovery of a much larger underground watercourse, stained with tannins typical of WV surface water in the fall. The water course is largely obstructed by breakdown, which corresponds to a surface sink, but continues in the downstream direction. The source of the water is not yet understood.

In the vicinity of Burntwood, several enormous sinkholes penetrate hundreds of feet of clastic rock to express on the surface. These sinks can be interpreted as stopping features from the underlying soluble rock, but this demands a mechanism to continuously digest stopping breakdown. Such a mechanism may be an enormous source of chemically aggressive water-underground Spring Creek. The sinks may thus provide insight into the location of the lost river.

Discovery and Exploration of Burntwood Cave

Bruce Fries

Burntwood Cave is located in Greenbrier County, West Virginia, three miles southwest of the southern most entrance to the Friars Hole system. The entrance is at the end of a 2-mile long blind valley with a catchment area of 2 square miles.

Abstracts – West Virginia Exploration

The current extent of exploration is 1 mile from the entrance, where the Burntwood stream feeds into a collapsed trunk passage approximately 80 feet wide, with a stream flowing through the breakdown that has 5 to 10 times volume of the Burntwood stream. This intersection is directly under a 300 foot diameter sinkhole that has punched its way through the 150 foot thick sandstone cap.

The first map was produced in the early 1970s by a team that included Ron Simmons and Doug Melville. They mapped 100 feet and were stopped at the beginning of what's now known as the Worm Way. In the late 1990s a group of local WVACS cavers that included Carroll Bassett, John Pearson, and Dave Cowan, enlarged the Worm Way, eventually breaking into to the 80-foot tall MayaCon Canyon on the second day of the 2012 NSS Convention in Lewisburg.

The current priority is digging a new entrance in a nearby sinkhole that is within 40 feet horizontally and 40 vertically of the top of a known dome pit. This will bypass the Worm Way and reduce the travel time to Camp 1 by one hour. Conservation work is also underway to improve the access road and erosion.

The West Virginia Speleological Survey

George Dasher

This talk will describe the West Virginia Speleological Survey, what the organization goals are, its history, what it has accomplished to date, and its plans for the future. The talk will also outline the weakness in the system, it will describe how cave length and depth is determined, and it will provide lists of the long and deep caves within the state.

2023 NSS Convention
Elkins, West Virginia

Non-caving Activities



by George Dasher

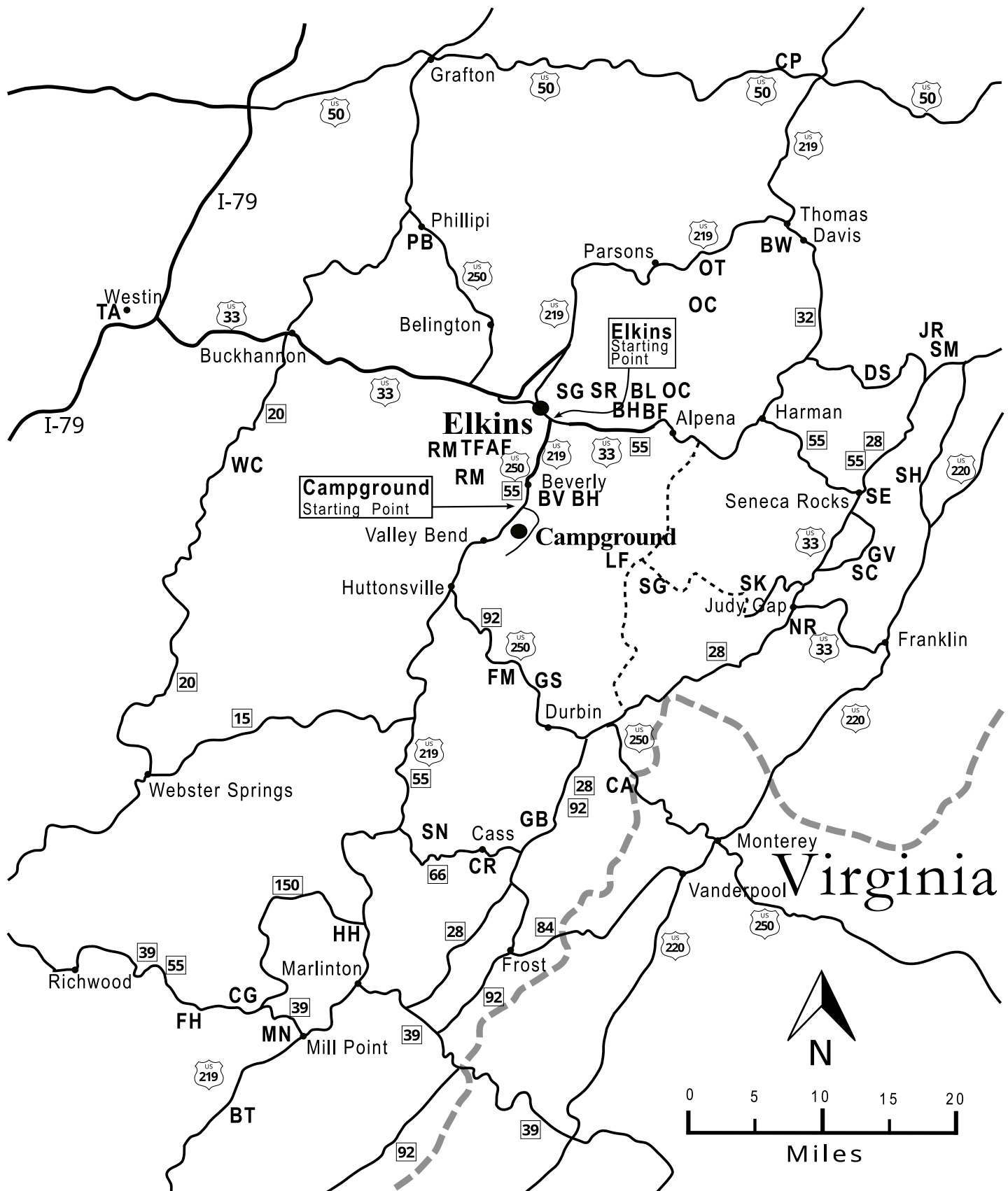
DON'T FEEL LIKE SITTING IN SESSIONS OR CAVING?

If you want a break from sessions and caving during the Convention, there are many other interesting activities within easy driving time from the convention site. This section provides descriptions and driving directions for many places that can provide a non-caving break.

Non-caving Activities

Locations of Non-caving Activity Sites

Approximate locations of the sites are shown with two-letter codes. The codes are shown in the Table of Contents on the next page.



Non-caving Activities

Contents

There are two starting locations for the directions to the non-caving activity locations described in this paper:

Campground: The intersection of Back Road 38 and US Routes 219/250/33 near the campground. This is the starting point for trips to the south of Elkins. This starting point is about 8.5 miles south of the Elkins starting point.

GPS: 38.8094, -79.8817

Elkins: The intersection of US routes 219/250/33 on the east side of Elkins (at the McDonald's). This is the starting point for trips to the east, north, and west of Elkins. This starting point is about 8.5 miles north of the campground starting point.

GPS: 38.9177, -79.8426

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Section cover photo: Upper Falls of Hills Creek. See description on page 120. Photo by Ryan Maurer.

Non-caving Activities

— ELKINS AND BEVERLY —

APPALACHIAN FOREST DISCOVERY CENTER

The Appalachian Forest Discovery Center is located on the first floor of the Darden Mill, a National Historic Landmark, in downtown Elkins. The Darden Mill, built in 1902, was a historic grist mill known as the Elkins Milling Company. The West Virginia Railroad Museum occupies the second floor of the Darden Mill. Visitors will learn about the Appalachian region's rich cultural and forest heritage, how the people of this region interacted with this dynamic forest resource and how it, in turn, molded and influenced them. The Center is open Thursday through Sunday, 9:30 AM to 5 PM and admission is free.

Directions: From the Elkins starting point take 11th Street past McDonald's. After several blocks, turn right at the traffic light onto S. Davis Ave. Turn left at a light onto 1st Street then right onto Railroad Ave. The museum is on the left immediately after the turn.

GPS: 38.9235, -79.8511 (Discovery Center entrance)

BEVERLY

Beverly is not only the historical county seat of Randolph County, but is also the oldest West Virginia town west of the Allegheny Mountains. Its main street was at one time the Parkersburg-Staunton Turnpike, a 19th century stagecoach road that was the major highway through central Virginia. In the winter of 1865, one of the last large successful Confederate raids of the American Civil War was to Beverly, when two veteran Union Cavalry regiments were captured virtually intact. These soldiers were marched, some in their underwear and barefoot, to prisoner-of-war camps in eastern Virginia. Beverly was also the home to Stonewall Jackson's sister, who was a staunch supporter of the Union. The Randolph County Historical Museum is located in downtown Beverly at the corner of US-219 and Main Street.

Directions: Beverly is on the road between the campground and the college.

GPS: 38.8409, -79.8753 (Downtown Beverly)

BEVERLY HERITAGE CENTER

The Beverly Heritage Center combines four historic buildings in the center of Beverly to tell the story of the

Battle of Rich Mountain and the First Campaign of the American Civil War, the pivotal role of the Staunton-Parkersburg Turnpike, and daily life in a small rural county seat through the 19th century.

Directions: The Center is in the center of town at the Court Street intersection.

GPS: 38.8406, -79.8753 (Museum)

NEW TYGART FLYER [train]

This is a diesel-powered train that departs from Elkins. The train travels east and under Cheat Mountain in an S-shaped tunnel, and then turns north and goes up the Shavers Fork to the High Falls of the Cheat River. The 46-mile round trip takes about 4 hours. There are many chances to see wildlife, including bald eagles and black bears. Trips leave at 11 AM Thursday through Sunday. Reservations are highly recommended. Call 304-636-9477 or visit mountainrailwv.com for more information. FEE

Directions: From the Elkins starting point take 11th Street past McDonald's. After several blocks, turn right at the traffic light onto S. Davis Ave. Turn left at a light onto 1st Street then right onto Railroad Ave. The train station is on the left after a couple blocks.

GPS: 38.9251, -79.8508 (Train station)

RICH MOUNTAIN BATTLEFIELD

The Rich Mountain Battlefield is located just a few miles west of Beverly on the crest of Rich Mountain. The site is astride the old Parkersburg-Staunton Turnpike (which is a dirt road), on which the Confederates fought delaying actions early in the American Civil War—after losing battles at Grafton and Parsons. Principally, they burned bridges and instigated small holding actions as they retreated east, but they also constructed breastworks at the top and western bottom of Rich Mountain, where they hoped to stop the Federal advance. The Union did not attack the fortifications, but instead employed a local guide to lead them in a long flanking movement that caught the Confederates by surprise at the top of the mountain. Most of the Confederates were captured (and later exchanged), and this part of western Virginia was secured for the North.

Directions: from the Campground starting point go to Beverly and turn left (west) on Rich Mountain Road and follow it 5 miles to the site. It's about 20 minutes from the campground.

GPS: 38.8663, -79.9345 (Battlefield)

THE STIRRUP GALLERY

Where can you learn about the Roman Empire, marvel over a collection of brilliantly colored butterflies from Peru, and get an up-close look at tools used by Native Americans? The Stirrup Gallery, located in the Myles Center for the Arts on the D&E campus, contains an eclectic collection of artifacts gathered from many sources. It's worth a visit between convention sessions.

GPS: 38.9336, -79.8439 (main entrance)

STUART RECREATION AREA

This area is a short drive from downtown Elkins and features hiking trails, picnic shelters and tables, and a swimming area. There is a \$5 fee per vehicle.

Directions: From the Elkins starting point take US-33 east for 3.5 miles and turn left on Old Route 33. Turn left after 2 miles onto Shavers Fork Road, then turn left after 4/10 mile onto the Forest Road 91, the recreation area's entrance road.

GPS: 38.9157, -79.7698 (start of entrance road)

WEST VIRGINIA RAILROAD MUSEUM

The West Virginia Railroad Museum is a relatively new museum located near the former rail yard in downtown Elkins. It has a number of exhibits and displays about railroad history in Elkins and the surrounding area. The museum is open from 9-5 on Thursday through Sunday. FEE

Directions: From the Elkins starting point take 11th Street past McDonald's. After several blocks, turn right

at the traffic light onto S. Davis Ave. Turn left at a light onto 1st Street then right onto Railroad Ave. The museum is on the left immediately after the turn.

GPS: 38.9235, -79.8511 (Museum entrance)

— WEST —

TRANS-ALLEGHENY LUNATIC ASYLUM

The Trans-Allegheny Lunatic Asylum is located in Weston, which is about 40 miles west of Elkins on US-33. This is an old psychiatric hospital that was constructed using prison labor, and which was operated by the State from 1864 until 1994. It was originally designed to hold 250 people, but it had about 10 times that number by the 1950s. The hospital's main building is one of the largest hand-cut stone masonry buildings in the United States and was designated a National Historic Landmark in 1990. The current owners offer historic tours and daytime paranormal tours 6 days a week, and several televised paranormal investigations have taken place at the facility. Visit www.trans-alleghenylunaticasylum.com for information or call 304-269-5070.

Directions: From the Elkins starting point take US-219 through Elkins and get on US-33 West toward Buckhannon. After about 35 miles, you will go under I-79. Stay on US-33 and cross the West Fork River in Weston after about 3 miles. Turn left onto Asylum Avenue and the asylum buildings will be on the left.

GPS: 39.0385, -80.4717 (Asylum)



The Trans-Allegheny Lunatic Asylum. Photo by George Dasher

Non-caving Activities

WEST VIRGINIA STATE WILDLIFE CENTER

The West Virginia State Wildlife Center is a small outdoor zoo located approximately 12 miles south of Buckhannon on State Route 20 (Buckhannon is about 30 miles west of Elkins on US-33). It takes a little over an hour to drive to the Center, which contains a menagerie of 30 or so animals that were indigenous to the area when white men first entered the region. These include bear, elk, buffalo, mountain lions, white-tail deer, wolves, otters, foxes, bald eagles, and owls. There is also a gift shop and a picnic area. For more information, call 304-924-6211 or visit www.wvdnr.gov/wildlife/wildlifecenter.shtm. FEE

Directions: From the Elkins starting point take US-219 through Elkins and get on US-48/US-33 West. After about 24 miles, get off at the Buckhannon exit and turn left onto Route 20. Follow Route 20 for about 12.5 miles to the Center.

GPS: 38.8581, -80.3108 (Wildlife Center)

— NORTH —

BLACKWATER FALLS STATE PARK

Blackwater Falls State Park has a large resort lodge and restaurant, camping and cabins, and West Virginia's highest aboveground waterfall, Blackwater Falls, which is 65 feet high. There is hiking, mountain biking, fishing, golf, and horseback riding. There are approximately 20 miles of trails, including an 8-mile-long trail to Canaan Valley. The park also contains Pendleton Falls, a tributary falls that is one of the highest waterfalls in the state. The area is located about 25 miles north-northeast



Blackwater Falls in Blackwater Falls State Park. Photo by George Dasher

of Elkins.

Directions: From the Elkins starting point take US-33 right (east) at the eastern US-33/US-219 intersection (near McDonald's) in Elkins. Stay on US-33 for about 22 miles until Harman. Turn left on Route 32 and follow it for 19 miles to Davis. Turn left onto Blackwater Falls Road shortly after leaving Davis.

GPS: 39.1287, -79.4732 (Park entrance on Rt. 32)
39.1129, -79.4842 (Blackwater Falls parking area)

CATHEDRAL STATE PARK

This park is located in Preston County about 90 minutes north of Elkins. It is 133 acres in size, and contains the last virgin forest of eastern hemlocks in the Appalachians. The trees are up to 90 in height, with circumferences of 21 feet. There are six miles of hiking trails, and the combination of hemlocks, rhododendrons, ferns, mountain stream, and wildlife offers excellent hiking and photography opportunities. The park is a Natural Historical Landmark, as "an area that possesses exceptional value in illustrating the natural history of the United States."

Directions: From the Elkins starting point go through Elkins on US-219 and stay on US-219 for about 45 miles, passing through Parsons and Thomas until you get to Silver Lake. There you bear left on Route 24 and stay on it until you reach US-50 in about 5.5 miles. Turn left on US-50 and the park entrance is on the right in about 1/2 mile (US-50 goes through the park).

GPS: 39.3263, -79.5339 (Park entrance)

OLSON OBSERVATION TOWER

Olson Tower was one of many towers used to watch for forest fires until airplanes took over the task. The current tower is 136 feet high and was constructed in 1963.

The tower sits on the top of Backbone Mountain. Climb the 133 steps for breathtaking views. Although the cabin at the top is closed to the public, you are welcome to climb to just below the cabin structure. Breathtaking views of the town of Parsons, Blackwater Canyon, Otter Creek Wilderness, Canaan Mountain, and the Cheat River watershed can all be seen from the tower heights.

Directions: From the Elkins starting point take US-219 through Elkins and Parsons. About 7 miles after Parsons, turn right on Forest Road 18. Travel 0.4 miles and stay to the right at the Y intersection

onto FR 717. Continue on FR 717 1.6 miles to the parking lot below the tower.

GPS: 39.1721, -79.5847 (turn off US-219 onto FR 18)

PHILIPPI COVERED BRIDGE

The Philippi covered bridge is the oldest, longest covered bridge in West Virginia. It is one of the few covered bridges still in operation along a major highway, possibly the only one.

Directions: From the Elkins starting point take US-219/250/33 north through Elkins. After about a mile turn right to stay on US-219/250/33. After 1.9 miles turn left to get on US-48/250 toward Buckhannon. After 6.7 miles turn right to stay on US-250. Stay on US-250 for 18 miles to reach the covered bridge.

GPS: 39.1529, -80.04416 (west end of the bridge)

— SOUTHEAST—

CAMP ALLEGHENY

Camp Allegheny is the site of a minor and inclusive Civil War battle in 1861. The Confederate camp is located on the Parkersburg-Staunton Turnpike, one of the few routes through the mountains in the 1800s. The old turnpike ascends Allegheny Mountain south of US-250's present-day route. Camp Allegheny is located astride the old turnpike near the Virginia-West Virginia state line. This is in the gap south of where US-250 crosses into Virginia. This fort is on private land, and consists of an extensive series of breastworks (in an open field) more than 5 acres in size.

Camp Allegheny is located at an elevation of 4,400 feet, and was one of the highest fortifications constructed during the Civil War. It was attacked on December 13, 1861, but the Federals were repulsed and retired to Fort Milroy several miles to the west. Because of its exposed position, winter at Camp Allegheny was extremely harsh. Disease carried away hundreds of Confederate soldiers, and the losses of men and the logistical nightmare of keeping the camp supplied forced its abandonment in April 1862. Fort Milroy was also abandoned for the same reasons in the same month by the Union army. Everyone decided to go fight the war somewhere warmer.

Directions: From the campground starting point take US-219/US-250 for about 40 miles

south and east through the towns of Mill Creek and Huttonsville. Stay on US-250 as it goes over Cheat Mountain and through Durbin and bear left to follow it after Bartow. After climbing Allegheny Mountain, turn right onto Old Pike Road just before you reach the Virginia-West Virginia border. You will come to the parking area in about 1.9 miles. The site is just past the parking area.

GPS: 38.4746, -79.7279 (Camp Allegheny)

CASS SCENIC RAILROAD STATE PARK

Cass is an old timber boom town that at one time had one of the largest lumber mills in the state. Several of the old logging steam locomotives are now used to pull visitors up Back Allegheny Mountain, which is west of the town. Almost all of these locomotives are Shays, which are slow steam engines that have gear-driven power to all wheels, including those under the tender. This allows Shays to climb grades as steep as 12%, swing around hairpin turns, and negotiate frail temporary track. In 1911, 3,000 miles of logging railroads existed within West Virginia, and today many of the state's hiking trails are old Shay railroad grades.

There are three train trips at Cass: A 2-hour trip to Whittaker Station leaves at 11 AM and 2 PM on Tuesday and Friday-Sunday, A 4.5 hour trip to Bald Knob leaves at noon on Tuesday-Sunday, and a 5-hour trip along the Greenbrier River to Durbin that leaves at 10 AM on Wednesday through Sunday. FEE

There is a lot of history and scenery, as well as a historical exhibit at Whittaker Station. There are also gift shops, museums, the remains of the old logging mill, an



Cass Scenic Railroad State Park. Photo by George Dasher

Non-caving Activities

engine shop, and a model train display in the town of Cass. For more information, call 304-636-9477 or visit www.mountainrailwv.com.

Directions: From the campground starting point take US-219/US-250 for about 30 miles south through the towns of Mill Creek and Huttonsville. Stay on US-250 as it goes over Cheat Mountain and through Durbin. Bear right on Route 92 in Bartow. After about 11 miles, turn right on Route 66 and follow it for 4 miles to the Park. (If your GPS tells you to take Back Mountain Road, don't do it. It's a very windy and slow road).

GPS: 38.3973, -79.9147 (Train station)

FORT MILROY

Fort Milroy is perhaps best known as the site of the highest Union camp during the American Civil War. Fort Milroy, also known as Cheat Summit Fort, offered an excellent view of the surrounding area including the Staunton-Parkersburg Turnpike, which crossed about 100 feet below the fort. In guarding the Turnpike, Fort Milroy helped to guard entrance to the Tygart Valley River valley to the west.

Construction on Fort Milroy (named for Union Brigadier General Robert H. Milroy) began on July 16, 1861. Due to its high elevation, the Union Army faced a number of winter-related miseries. Snow was first reported for the year on August 13. Horses froze to death in mid-September. These issues, along with some success in driving Confederate forces from the area led to the abandonment of the fort in April 1862. One Indiana soldier is quoted as having said this of their

departure: "With what a light step all started. Soon on the road turning at the brow of the hill, the fourteenth took what I fondly hope is their last look at Cheat Mountain."

Directions: From the campground starting point take US-219/US-250 for about 21 miles south, passing through the towns of Mill Creek and Huttonsville. Stay on US-250 as it goes up Cheat Mountain. Turn right on White Top Road (if you reach the river, you went too far). Stay on White Top Road for 6/10 mile then turn right onto Forest Road 245. The fort site is in 1/2 mile.

GPS: 38.6217, -79.8808 (site of Fort Milroy)

GAUDINEER SCENIC AREA

Gaudineer Scenic Area is located about 25 miles south of the campground. It is about 1 mile north of the highway on a dirt road very near the top of Back Allegheny Mountain. The area boasts a stand of virgin red spruce, some of which are over 300 years old. It is about 10 acres in size, and was left uncut because a surveyor did not correct for magnetic declination. The 250-mile-long Allegheny Trail passes nearby.

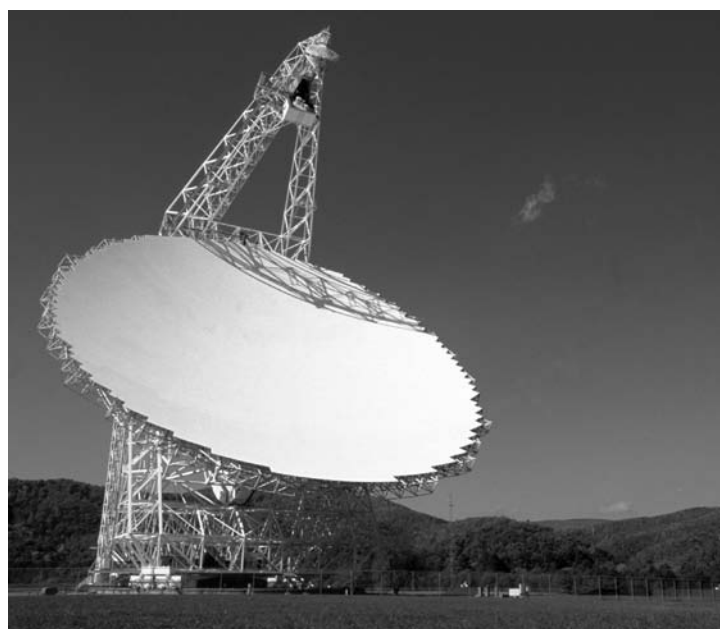
Directions: From the campground starting point take US-219/US-250 for about 21 miles south, passing through the towns of Mill Creek and Huttonsville. Stay on US-250 as it goes up Cheat Mountain. About 1.6 miles after crossing the Cheat River and the railroad track, turn left onto Forest Road 27. After 2.2 miles you arrive at the parking area for the loop trail.

GPS: 38.6000, -79.8512 (Turnoff from US-250)

GREEN BANK NATIONAL RADIO OBSERVATORY

The Green Bank National Radio Astronomy Observatory is one of three radio observatories operated under contract with the National Science Foundation. The Observatory has eight radio-disk receivers, the largest of which features an innovative clear aperture, a collecting area of 2.3 acres, and a computer-controlled reflecting surface of 328 by 360 feet, making it larger than two football fields. Tours are provided. Guided tours of the grounds have a FEE and walking tours are free. For more information, see greenbankobservatory.org or call 304-456-2510. (There is no cell phone service within several miles of the Observatory).

Directions: From the campground starting point take US-219/US-250 for about 30 miles south



Green Bank National Radio Observatory. Photo courtesy of NRAO/AUI

through the towns of Mill Creek and Huttonsville. Stay on US-250 as it goes over Cheat Mountain and through Durbin. Bear right on Route 92 in Bartow. After about 8 miles, the Observatory Visitor Center will be on your right.

GPS: 38.39729, -79.91426 (Visitor Center)

LAUREL FORK WILDERNESSES

The North and South Laurel Fork Wildernesses are located on opposite sides of dirt Forest Road 14 in the area of Laurel Fork Campground. These two areas are 12,200 acres in size, offer plenty of opportunities for hiking and fishing, and have elevations that vary from 2,900 to 3,700 feet. The areas are bordered on the east by Rich Mountain and on the west by Middle Mountain, and are remote and a fine place to go if you enjoy solitude. Night temperatures can drop as low as 30° F in summer.

Directions: From the Elkins starting point take US-33 east. After about 16 miles, turn right onto Forest Road 14, Middle Mountain Road. Go about 11 miles and bear left onto Forest Road 423. The campground is about 1.5 miles down this road. Several trails leave from this area and the Sinks of Gandy is about 4.4 miles past the campground.

GPS: 38.7405, -79.6925 (Laurel Fork Campground)

SINKS OF GANDY

Although on private land, the Sinks of Gandy is visited so often that it appears on State and Forest Service maps. The entrances are usually nice, cool places to visit, even for the non-caver.

Directions: From the Elkins starting point take US-33 east. After about 16 miles, turn right onto Forest Road 14, Middle Mountain Road. Go about 11 miles and bear left onto Forest Road 423. The Laurel Fork Campground is about 1.5 miles down this road. Leave the campground on Forest Road 40 and the Sinks of Gandy parking area is about 4.4 miles past the campground.

The upstream entrance is across the road about 1,000 feet WSW from the parking area. The two downstream entrances are located about 1/3 mile NNE of the parking area. All three entrances are out of sight of the road.

GPS: 38.7155, -79.6377 (Parking area)



Old print of the upstream entrance to the Sinks of Gandy. Drawing by Porte Crayon and supplied by George Dasher

— SOUTH —

BEARTOWN STATE PARK

Beartown State Park is a 110-acre natural area located on the eastern summit of Droop Mountain in northern Greenbrier County and a small portion of Pocahontas County. Recreation in the park consists of hiking along improved trails and boardwalks. Markers explain the natural processes at work in the area. The name “Beartown” was chosen because local residents claimed that many cave-like openings in the rocks made ideal winter dens for the native black bears, the state animal of West Virginia. Also, because the many deep, narrow crevasses were formed in a regular crisscross pattern, which appear from above like the streets of a small town. Beartown is noted for its unusual rock formations, which consist of Droop Sandstone formed during the Pennsylvanian age. Massive boulders, overhanging cliffs, and deep crevasses make up the beauty of the park. On the face of the cliffs are hundreds of eroded pits. These pits range from the size of a marble to others large enough to hold two adults. It is not unusual to see ice and snow remaining in the deeper crevasses until midsummer.

Directions: From the campground starting point take US-219 south for about 72 miles, passing through the towns of Mill Creek and Huttonsville (stay on 219 when it turns right in Huttonsville). About 7 miles after

Non-caving Activities

Hillsboro, turn left on Beartown Road and go 1.2 miles to the parking area.

GPS: 38.0519, -80.2757 (parking area)

CRANBERRY GLADES

Together, the Cranberry Glades Wilderness and the Cranberry Glades Backcountry total about 52,000 acres. The two areas are located on the headwaters of the Cranberry River, about 90 minutes south of the campground.

The Cranberry is one of the major backpacking and day-hiking areas within West Virginia, and one of the largest wildernesses east of the Mississippi. It includes the entire drainage of the Middle Fork of the Williams River and the North Fork of the Cranberry River, with elevations that vary between 2,400 and 4,600 feet.

The 750-acre Cranberry Glades are located about 1 mile west of the Center. This contains a half-mile-long boardwalk and several large high-altitude bogs that are more typical of Canada than of West Virginia.

The Cranberry Mountain Visitor Center is located at the junction of State Route 39 and the Highland Scenic Highway (Route 150), and is open from 9 AM to 5 PM between Memorial Day and Labor Day.

Directions: From the campground starting point take US-219/US-250 for about 48 miles south, passing through the towns of Mill Creek and Huttonsville (stay on 219 when it turns right in Huttonsville). Turn right on Route 150, the Highlands Scenic Highway. Stay on 150 until it intersects Route 39 after 22 miles. The Visitor Center is at this intersection. To get to Cranberry Glades, turn right on 39 and then right again after 6/10 mile. The parking area is 1.5 miles down this road.



Cranberry Glades Boardwalk. Image from www.forestwatcher.com

GPS: 38.1839, -80.2535 (USFS Visitor Center)
38.1978, -80.2752 (Cranberry Glades parking lot)



Lower Falls of Hills Creek. (The photo at the beginning of this section is the upper falls). Photo by George Dasher

FALLS OF HILLS CREEK

The three Falls of Hills Creek are located about 90 minutes south of the campground. The first waterfall drops 20 feet, the second 45 feet, and the third 63 feet, making the lower waterfall one of the highest in the state. There is a walkway to the first fall that is paved and accessible, and there is a path (three-quarters of a mile long) and stairs leading to the third falls. This area—because of the falls and the surrounding gorge—is one of the most scenic and photographed in West Virginia. Hills Creek, below the three waterfalls, sinks on Droop Mountain north of the Friars Hole Cave System, and then reappears at both Locust Spring in Pocahontas County and the Spring Creek Cenotes in Greenbrier County.

Take US-219/US-250 south from the campground for about 48 miles, passing through the towns of Mill Creek and Huttonsville (stay on 219 when it turns right in Huttonsville). Turn right on Route 150, the Highlands Scenic Highway. Stay on 150 until it intersects Route 39 after 22 miles. Turn right on 39 and then left after 5.4 miles onto Hills Creek Falls Road and the parking area.

GPS: 38.1786, -80.3390 (Parking area)

HIGHLAND SCENIC HIGHWAY

The 22-mile Highland Scenic Highway is located about 1 hour south of the campground. The highway leads southwest and its southern terminus is at the Cranberry Mountain Visitor Center on State Route 39. It is 23 miles long and provides fine views and access to Stony Creek, Tea Creek, Laurel Creek, Williams River, Cranberry River, and Swago Creek.

Directions: From the campground starting point take US-219/US-250 for about 48 miles south, passing through the towns of Mill Creek and Huttonsville (stay on 219 when it turns right in Huttonsville). Turn right on Route 150, the Highlands Scenic Highway.

GPS: 38.3067, -80.0944 (Northern terminus)
38.1839, -80.2536 (Southern terminus)

SNOWSHOE SKI RESORT

Snowshoe is located about 1 hour south of Dailey on US-219. The resort itself is on the top of Cheat Mountain, and the turn-off is well marked. In winter, Snowshoe has 251 acres of skiable terrain with 1,500 feet of vertical and 57 trails. In summer Snowshoe has ATV and Segway tours, horseback riding, hiking, lift rides, fly fishing, “shooting clays,” and a zip line (in the heart of Snowshoe Village). There is also the Split Rock Pool, the Gary Player Signature Raven Golf Course, and 40 mountain bike trails. Many restaurants and shops within the village are open year round.

Directions: From the campground starting point take US-219/US-250 south for about 34 miles, passing through the towns of Mill Creek and Huttonsville (stay on 219 when it turns right in Huttonsville). Turn left on Route 66. After 7/10 mile, turn left on Snowshoe Drive and go about 5 miles to the top of the mountain and the resort.

GPS: 38.4147, -80.0329 (Snowshoe Visitor Center)

MCNEEL MILL

This is a water-powered mill that ground corn, flour, and buckwheat from 1868 until 1947. The three-story wood-frame mill operated with a 21-foot-diameter metal mill wheel using water from the nearby Stamping Creek. The mill sat abandoned for many years, but is now being restored to operate. The building contains the original machinery.

Directions: Take US-219/US-250 south from the campground for about 61 miles, passing through the towns of Mill Creek and Huttonsville (stay on 219 when it turns right in Huttonsville). The mill is on the right just after you pass the intersection with Route 39 about 8.5 miles past the traffic light in the town of Marlinton.

GPS: 38.1574, -80.1818 (Mill parking area)



McNeel Mill. Photo by Walt Hamm

— EAST —

BEAR HEAVEN RECREATION AREA

Bear Heaven is a small area of interesting rocks along the unpaved Stuart Memorial Drive. It probably isn't worth a visit on its own, but worth a stop if you are driving on Stuart Memorial Drive.

If you visit Bickle Knob (see next site) Bear Heaven is about 3.5 miles down the road and on the right after you return to Stuart Memorial Drive.

GPS: 38.9323, -79.6805 (Parking area)

Non-caving Activities

BICKLE KNOB FIRE TOWER LOOP ROAD

There was at one time a Forest Service fire tower located on top of Bickle Knob. There is a picnic area here now, with an excellent view to the north. The area is located on Forest Service Road 91, which departs old US-33 in the area of Stuart Run Recreational Area. There is a junction: go up the mountain, not down the river (which is a very scenic drive in its own right). The road leads north to the old fire tower location, eastward to Bear Heaven, and finally south and back to Route 33 at the top of Shavers Mountain. Following Route 33 west and down the mountain will lead to Old Route 33, Bowden Cave (currently closed), and the Bowden Fish Hatchery. All told, the loop is about 16 miles long and makes an excellent scenic drive or mountain bike tour.

Directions: From the Elkins starting point take US-33 east for about 3.5 miles and turn left onto Old Route 33. After about 1.75 miles, cross the Cheat River and then turn left on Shavers Fork Road. After 4/10 mile, turn right on Forest Road 91. The left turn to the observation tower site is after about 3.8 miles and the Bear Haven Recreation area is on the right after 7.4 miles. The left turn to go to the parking area for the Otter Creek Wilderness is after 8.9 miles.

When you get back to the paved Route 33 after about 10 miles, turn right (west) and head down the mountain. The right turn onto Old Route 33 is after about 2.25 miles and just before you cross the Shavers Fork River.

GPS: 38.9117, -79.7655 (start of Shavers Fork Rd)
38.9345, -79.7314 (observation tower)

BOWDEN FISH HATCHERY

The Bowden Fish Hatchery is located on the Shavers Fork of the Cheat River about 8 miles east of Elkins. It is on old US-33, and is a great place to take the kids and let them look at the trout.

Directions: From the Elkins starting point take US-33 east for about 3.5 miles and turn left onto Old Route 33. The hatchery is on the right after about 5 miles.

GPS: 38.91092, -79.71534 (Hatchery)

DOLLY SODS

Dolly Sods, Flat Rock Plains, Roaring Plains, and Red Rock Plains are found in an area above 4,500 feet in elevation located at the junction of Pendleton, Tucker, Grant, and Randolph Counties. The extensive Red Spruce forests that were once located here were logged

very early in the 20th century. Lightning-caused fires broke out and the slash and high-altitude soils burned for several decades. This timbering, the fires, the high altitude, and the underlying sandstones of the Pottsville Group have produced a large subalpine plateau with a more-northern plant life than is typical of West Virginia. Freezing temperatures can occur any time during the year and snow can be expected any time between October and April.

Dolly is thought to be a corruption of the German surname “Dahle” and “sods” is an old German word meaning plains or open spaces. There are lots of great views within the high plains and there are grass plateaus, hiking trails, one campground, two “official” overlooks, and a dirt road that makes most of Dolly Sods easily accessible by car. This road was once a Shay railroad grade and it is not plowed in winter. The area was used by the U.S. Army for training during World War II and artillery shells are still sometimes found (report these to the Forest Service if you find one). The troops who trained here were later formed into the 10th Mountain Division and went on to fight in northern Italy in 1945.

The actual Dolly Sods Wilderness is located not on Dolly Sods, but rather on Red Creek, a tributary of the Dry Fork of the Cheat River. The Wilderness is 10,215 acres in size and is one of the most popular backpacking destinations in West Virginia. There are many miles of trails, one Forest Service campground, and a myriad of campsites located up and down the creek. There are no bridges across Red Creek—wading is thus required.

Directions: From the Elkins starting point take US-33 east for about 22 miles until Harman. Turn left on Route 32 and follow it for 5 miles to Red Creek Road. Follow this road east (taking a second right turn) to the small community of Laneville. The Dolly Sods Wilderness is located north of Laneville and the Sods (as well as Flat Rock, Roaring, and Red Rock Plains) are located up the mountain to the east. The USGS 7.5-minute topographic maps required when hiking in the area are Laneville, Hopeville, Blackbird Knob, and Blackwater Falls.

GPS: 38.9731, -79.3994 (Start of Red Creek Trail)

GERMANY VALLEY

Germany Valley is located about 1 hour east of Elkins on US-33. It is south of Seneca Rocks and is between North Fork Mountain and the North Fork of the South Branch of the Potomac River. The valley is best viewed either by driving the dirt road that traverses its long axis

or from the US-33 overlook on the west side of North Fork Mountain.

Germany Valley is the structural center of the Wills Mountain Anticline. This is a large, asymmetrical anticline that dominates the geology of western Pendleton County. The anticline is 185 miles in length and extends from southern Pennsylvania south through Maryland and West Virginia and into Virginia. The resistant Tuscarora Sandstone is exposed along the sides of the anticline, and has been eroded completely through in the Germany Valley area. This has allowed the less resistant Middle Ordovician limestones and shales to be exposed on the surface; the result is a large karst valley with virtually no surface drainage.

The elongated outcrop “ring” of Tuscarora Sandstone (that surrounds Germany Valley) extends for 60 miles from Smoke Hole Caverns south into Highland County, Virginia. East of the valley, the eastern limb of the anticline is displayed by the eastward-dipping sandstone that forms the long line of cliffs along the crest of North Fork Mountain. The western limb of the anticline is displayed by the River Knobs (such as Nelson Rocks, Seneca Rocks, and Champe Rocks) that are vertically bedded and located west of the valley.

Germany Valley was the site of Hinkle Fort, the only French and Indian War fort in Pendleton County to survive that conflict. Germany Valley is also home to Hellhole and Schoolhouse Caves, two caves where the proto-NSS first learned its vertical techniques. Hellhole’s entrance drop is about 155 feet deep and provides access to one of the largest and most spectacular rooms in West Virginia. The cave is over 40 miles long and is the third longest cave in West Virginia. Schoolhouse is a short cave that contains many vertical pitches and several airy traverses and pendulums. It was at one time considered the most dangerous cave in the United States. Both caves are now closed and gated year-round, predominantly because of endangered bats.

Directions: From the Elkins starting point take US-33 east for about 35 miles until Seneca Rocks. About 2 miles past Seneca Rocks, turn left on Harmon Hills Road (Route 9). Follow the road for about 9 miles through the valley. You will emerge on US-33 at the end.

To return to Elkins, turn right. To reach a very good overlook above the valley, turn left and follow US-33 for about 7.6 miles. The overlook is on the left as you climb the mountain.

GPS: 38.7090, -79.4082 (US-33 overlook (approx.))

38.8114, -79.3936 (Turn on US-33 to northern end of valley)

JORDAN RUN WATERFALL

Jordan Run is the stream that flows into the North Fork River at Smoke Hole Caverns. Ask the landowner of the commercial cave if you can hike up the stream; the waterfall is about a half mile upstream. This is one of the most spectacular waterfalls within West Virginia and is relatively unknown. The hike is arduous, as you have to wade in the creek following the axis of a small, unnamed syncline, with the resistant Oriskany Sandstone on both sides of the narrow valley.

Directions: From the Elkins starting point take US-33 east for about 35 miles until Seneca Rocks, then turn left onto Route 55. The Smoke Hole Caverns office is on the left after 13.5 miles.

GPS: 38.98590, -79.26589 (Caverns parking lot)

NELSON ROCKS

Nelson Rocks is located about 90 minutes east of Elkins, and are about 10 miles southwest of Seneca Rocks on State Route 28. They are accessed via the dirt Nelson Gap Road, which intersects Route 28 about 1 mile southwest of Judy Gap.

Both Seneca Rocks and Nelson Rocks are formed of the basal Silurian Tuscarora Sandstone, which is a part of the vertical-dipping western limb of the Wills Mountain Anticline. Both sets of rocks have also been broken in two by a reverse fault, which has resulted in one sandstone bed moving laterally and into a position parallel to the first. While this fault is not that obvious at Seneca Rocks, it is very noticeable at Nelson Rocks because the two sandstone beds are about 100 feet apart.

Nelson Rocks is privately owned and there is both a Via Ferrata and a canopy tour. The Via Ferrata is a mile-long trail of fixed anchors, cables, and a swinging bridge. Heights of up to 200 feet are reached, offering a unique physical challenge. It is open year round, weather permitting. Children under 13 years in age are not allowed. The canopy tour includes 12 zip lines, 3 sky bridges, and a 40-foot rappel. The zip lines together are almost a mile long, vary between 150 and 680 feet in length, and are up to 80 feet above the floor. Both the Via Ferrata and the canopy tour require about 3 hours to do and waivers are required. Call 877-435-4842 or visit www.nelsonrocks.org for more information.

Non-caving Activities

Directions: From the Elkins starting point take US-33 east for about 35 miles until Seneca Rocks. Turn right at Seneca Rocks and stay on US-33 for 11 miles. Turn right on Route 92 then left on Nelson Gap Road after 6/10 mile.

GPS: 38.7005, -79.4722 (Nelson Rocks office)

OTTER CREEK WILDERNESS

The Otter Creek Wilderness is a very popular, 20,000-acre area located along the wooded valley of Otter Creek that offers opportunities for day hiking, backpacking, fishing, and swimming. A good trail follows the creek (wading the creek is required), and there are also side trails that provide good loop hiking and camping. Because the area is designated a wilderness, its trail signs have been removed and its trails and shelters are not maintained. There are some caves in the wilderness, but they are currently closed by the Forest Service.

Directions: from the Elkins starting point: To reach the downstream (northern) part of the Wilderness, drive through Elkins and take US-219 north to Parsons, then east on State Route 72 to Hambleton and Hendricks. Stay on Route 72 and about 2.9 miles after “downtown” Hendricks, turn right on a road that leads to the parking area. There is a swinging bridge that leads to the start of the trail.

To reach the upstream (southern) part of the Wilderness, drive east on US 33 for about 12 miles and turn left onto a Forest Road 91 at the top of Shavers Mountain. Bear right at a fork after about 1.4 miles and park where the road ends in about 7/10 mile. The area



Otter Creek Wilderness. Photo by Bob Hokee

is located on the Harman, Mozark Mountain, Bowden, and Parsons USGS 7.5-minute topographic maps.

GPS: 39.0457, -79.6068 (Turn to northern parking area)
38.9413, -79.6687 (Southern parking area)

SENECA CAVERNS

Seneca Caverns is located about 1 hour east of Elkins on US-33. The cave is within Germany Valley and although its tour is designed for the non-caver, it does contain some nice formations, including two very impressive flowstone mounds. The cave is 1,875 feet long, and the tour exits through a second entrance. There is also picnicking and “mineral panning” at the caverns. For more information, call 304-567-2691 or visit www.senecacaverns.com. FEE

Directions: From the Elkins starting point take US-33 east for about 35 miles until Seneca Rocks then turn right to stay on US-33. After 7.6 miles turn left in Riverton onto Germany Valley Road, Route 9. Follow Route 9 for 3.3 miles to the Caverns.

GPS: 38.7633, -79.3886 (Caverns parking lot)

SENECA ROCKS

Seneca Rocks is located about 1 hour east of Elkins on US-33. It is one of the most-popular rock climbing areas east of the Mississippi River and is a traditional climbing area with over 440 documented routes, ranging from 5.0 to 5.13 difficulty. The Rocks is a vertical, 900-foot high, double exposure of the Tuscarora Sandstone and is a part of the western limb of the Wills Mountain Anticline. It is faulted, with one rock unit pushed up and into a position parallel to the other. The cliffs along the top of North Fork Mountain are also the Tuscarora Sandstone and are the eastern limb of the anticline.

There is a Forest Service Visitor Center nearby, a climbing shop and two guiding companies in the small community of Seneca Rocks, and a swinging bridge that leads to the Rocks themselves. In addition, a 1.3-mile-long switchback trail provides access to the Northern Peak; a far less formal trail allows hikers to descend the backside of the rocks.

Seneca Rocks is as vertical on its back as on its front, and the Southern Peak can be reached only by rock climbing. No one is sure who first reached the top of this peak, but when three men reached the summit in 1938, they found the inscription, “D. B., September 16, 1908.” This may have been D. Bittenger, a civil engineer who surveyed in the

area for the U.S. Forest Service. Seneca Rocks was used by the U.S. Army to train during World War II and many of the older routes still contain the pitons left by the Army. The troops who trained here were later formed into the 10th Mountain Division and were deployed to northern Italy in 1945.

There is a popular swimming hole in the river below the rocks. To get there, turn into the Seneca Rocks visitor parking lot (not the USFS Visitor Center lot), and bear to your left. Pass through a series of parking lots and park in the last lot. A path of gray crushed rock leads about 50 yards down to the swimming hole.

Directions: From the Elkins starting point take US-33 east for about 35 miles to reach the rocks. Turn right at the stop sign and then left after 2/10 mile to go to the visitor center.

GPS: 38.8326, -79.3755 (Visitor Center parking lot)



Seneca Rocks viewed from US-33. Photo George Dasher

SMOKE HOLE CAVERNS

Smoke Hole Caverns is located about 90 minutes east of the campground. It is not within the Smoke Hole Gorge, but is rather in the North Fork Mountain Gap, which is about 5 miles west of Petersburg. The caverns are relatively short, but are profusely decorated. The entrance area was reportedly used by Native Americans to smoke meat and as a hiding place for whiskey stills during the Prohibition.

Smoke Hole Caverns is formed in the Tonoloway Limestone, the uppermost Silurian rock unit in West Virginia, within the western limb of the Wills Mountain Anticline. In fact, the entrance passage emulates this anticline and has east-dipping bedding on its east side and vertical bedding on its west side—and the largest formation room is then located more to the west within an area of vertical bedding. For more information, call 800-828-8478 or visit www.smokehole.com. FEE

Directions: From the Elkins starting point take US-33 east for about 35 miles until Seneca Rocks, then turn left onto Route 55. The Smoke Hole Caverns office is on the left after 13.5 miles.

GPS: 38.9859, -79.2658 (Caverns parking lot)

SMOKE HOLE GORGE

The Smoke Hole Gorge is located south of Petersburg on US-220, about 2 hours east of Elkins. Here, the South Branch of the Potomac River has cut through the Cave Mountain Anticline and there are repeated exposures of the Oriskany Sandstone and the Helderberg Limestone.

The Smoke Hole Gorge is about 16 miles in length and it can be as deep as 2,000 feet. The upper third, southern part of the gorge contains a narrow state highway. As you enter the Smoke Hole by this road, you first drive past the eroded face of Cave Mountain on the right, with Cave Mountain Cave near its top, followed by the impressive Eagle Rocks. Downstream are more cliffs and spectacular scenery, and then a fork in the road is reached. A left turn, followed by a right turn, leads to the North Fork Mountain Gap and Smoke Hole Caverns; straight and downstream leads to a Forest Service Campground, Big Bend, and an outcrop of Tuscarora Sandstone. The river below the campground is accessible only by foot, canoe, and kayak, and the trip through the gorge is very popular and scenic. The Forest Service maintains 30 miles of trails within the Smoke Hole and these are marked with blue blazes. The required USGS 7.5-minute topographic

Non-caving Activities

maps for the Smoke Hole are Upper Tract, Hopeville, and Petersburg West.

Directions: From the Elkins starting point take US-33 east for about 60 miles to Franklin. As you reach Franklin, turn left onto US-220. Stay on 220 for 12.5 miles to pass through Upper Tract. Just before crossing the Potomac River, turn left onto Smoke Hole Road, Route 2, to enter the gorge. After 5.4 miles turn left at Shreve's Store to stay on Smoke Hole Road, then after 1/2 mile, turn right to continue on Smoke Hole Road. After 12 miles you will come to Route 28. Turn right to return to Seneca Rocks and turn right there to go to Elkins.

GPS: 38.9852, -79.2339 (Western end on Route 28)
38.8053, -79.2768 (Eastern end on US-220)

SPRUCE KNOB

At 4,832 feet above sea level, Spruce Knob is the highest point in West Virginia. East of the mountaintop it is possible to see the North Fork River Valley, Germany Valley, North Fork Mountain, and the long wall of Shenandoah Mountain. To the west, the Seneca Creek Valley and the Appalachian Plateau are visible. To the northeast are Roaring Plains and Dolly Sods, and to the southwest is the upper North Fork Valley.

Spruce Knob is located entirely within the drainage of the North Fork of the South Branch of the Potomac River. However, the first ridge to the west, less than 2 miles away, is the Eastern Continental Divide, where the water flows to the Monongahela and Ohio rivers via Gandy Creek and the Dry Fork of the Cheat River. Six miles to the southwest, the East Fork of the Greenbrier River carries that water southward to the New,

Kanawha, and Ohio Rivers. Spruce Knob is located about 1.5 hours east-southeast of Elkins.

There is a Forest Service campground and lake located just a few miles south of the mountaintop. In addition, the Forest Service maintains nearly 70 miles of trails in the Seneca Creek Backcountry, which is located northeast of this campground. These trails are open to hunters, hikers, fishermen, and mountain bikers, and provide access to Spruce Knob, Allegheny Mountain, Seneca Creek, Glady Creek, and Whites Run. The required USGS 7.5-minute topographic maps are Spruce Knob, Onego, Whitmer, Circleville, and Snowy Mountain.

Directions: From the Elkins starting point take US-33 east for about 16 miles then turn right onto Forest Road 14, Middle Mountain Road. Go about 11 miles and bear left onto Forest Road 423. The Laurel Fork Campground is about 1.5 miles down this road. Leave the campground on Forest Road 40. The Sinks of Gandy parking area is about 4.4 miles past the campground on the left.

Continue on FR 40 until you reach FR 29/1 in about 1.2 miles. After 1/2 mile on 29/1, make a very sharp right turn onto FR 1 and continue for 3.1 miles. Turn left on FR 112 and go 6 miles to FR 104. Turn left and go 1.75 miles to the Spruce Knob parking area.

To continue the loop, return to FR 112 and turn left. Go about 7.4 miles and turn right on Briery Gap Road, Route 33/4. After 2.4 miles you will come to US-33. Turn left and go 10 miles to Seneca Rocks. Turn left there to stay on US-33 and go 35 miles back to Elkins.

GPS: 38.5452, -79.8233 (Observation platform)

Notes

Notes

Daily Convention Schedule

Ongoing Events (location):

Registration (McDonnell)	Cartographic Salon (McDonnell Balcony)	Vertical Museum Display (Mon-Thurs) (McDonnell Balcony)
Vendors & Caver Co-op (McDonnell Vendor Area)	CaveSim (Outside McDonnell)	Old Cavin' Haven Display (Myles Atrium)
Fine Arts Salons (Myles Atrium)	Amateur Radio Special Event Sta. (Campground)	Junior Speleological Society (JSS) (Campground)
Cave Ballad Salon (Myles Atrium)	Self-service Videos (Mon-Thurs) (Myles Atrium)	Geology & Geography Posters (Tues-Thurs) (room 405)

	Monday	Tuesday	Wednesday	Thursday	Friday
Morning	Opening Ceremony (8:15) Myles Plaza West Virginia Exploration Session Aud BOG Open Meeting Paull Speleology for Cavers Class 413 Cave Diving Session 319 Vertical Setup & Contests Mem NPS Cave Management Mtg (closed) 318	U.S. Exploration Aud Conservation & Management Session 400 Exec. Director Presentation (10:00) 100 Vertical Climbing Contests Mem Vertical Reblay Course (10:00) Mem Geol/Geog Poster Discussion (11:00) 405 Painting with Cheryl - Kids (11:00) 404 SpeleoArt Workshop (10:00) Draw	International Exploration Session Aud Vertical Techniques Workshop Mem Cave Digging Session 400 Cave Formation Repair Workshop 103 Cave Conservancy Roundtable 318 NSF Closed Meeting 300	Spelean History Session 400 Cave Photography Session 100 Biospeleology Session 413 Vertical Section Business Mtg. (10:30) 319 Climbing Contest Awards (11:30) 319 Cartography Class 318 NSS Awards Committee Meeting 103 Cave Writer's Workshop (10:00) 300	Geology & Geography Session Aud Lightning Talks 400 Video Viewing Session 100 BOG Open Meeting Paull Cartographic Salon Critique McD Fine Arts Salon Critique (10:00) Myl Print Salon Critique (10:00) Myl Photo Salon Critique (11:00) 413 Cave Ballad Salon Critique Myl
Lunch	Fine Arts Opening Reception Myl BOG Lunch (closed) Paull Communications & Electronics Lunch 100 Vertical Climbing Contests (cont.) Mem Cave Diving Section Lunch 319 Speleology Class Lunch (closed) 413	Luminary Series - Dasher (12:30) Aud Vertical Climbing Contests (cont.) Mem Conservation Section Lunch 400	Luminary Series - Engel (12:30) Aud AVP All-hands Luncheon 319 Speleobooks 50-year Celebration McD Rick Stanton Book Signing (12:30) McD Vertical Techniques Workshop (cont.) Mem	Biospeleogy Lunch 413 Speleophilatelic Section Lunch 317 NCKWS Lunch Meeting 103 Arts & Letters Salon Meeting 300 Survey Section Lunch (1:00) 318	Luminary Series - Bunnell (12:30) Aud Geology Section Lunch (11:30) 405
Afternoon	West Virginia Exploration (cont.) Aud BOG Closed Meeting Paull NCPC Meeting 318 Cave Diving Session (Cont.) 319 Speleology for Cavers (cont.) 413 Communications & Electronics Session 100 Vertical Climbing Contests (cont.) Mem	U.S. Exploration Session (cont.) Aud Cons. & Mgmt. Session (cont.) (1:00) 400 Convention Development 300 Vertical Training Commission Meeting 100 Vertical Climbing Contests Mem Vertical Reblay Course Mem JSS Vertical Activities Mem Painting with Cheryl - Adults (2:00) 404	International Exploration (cont.) Aud Congress of Grottos 400 Cultures of Caving Session 319 NSF Open Meeting 300 Vertical Techniques Workshop (cont.) Mem Peter Jones' Pottery Demo. (1:00) Pot Cave Formation Repair Wksp (cont.) Cave	Archaeology & Paleontology Session 400 NSS Nature Preserves Meeting 319 Carlsbad Caverns Volunteer Meeting 100 Speleophilatelic Section Meeting 317 Convention Debrief 103 Cave Writer's Workshop (cont.) (1:00) 300 Cave Photography Workshop Cave Cartography Class (cont.) Cave	Geology & Geography Session (cont.) Aud Survey & Cartography Session 400 BOG Open Meeting (if needed) Paull
Evening	Howdy Party (6:00) Camp	Amateur Radio Exams (5:00) Camp Fellows & New Members Recep (7:00) Aug Open Mic (7:30) Camp Thailand Rescue Presentation (9:00) Aud	Auction (7:00) Aud Campground Party (7:00) Camp	Salon Awards - short show (5:30) Aud Salon Awards - long show (7:30) Aud Storytelling Contest (7:30) Camp	Awards Banquet (7:00) Gainer After-banquet Party Camp

Event locations are shown next to the event. Abbreviations used:

number	Room number in Eshleman Science Center	Cave	Off-site in a local cave	Mem	Memorial Gym
Aud	Harper-McNeely Auditorium	Draw	Myles Painting & Drawing Studio	Myl	Myles Atrium
Aug	Augusta Dance Pavilion	Gainer	Gainer Center on Lee Street Extended	Paull	Paull Gallery (2nd floor in Myles)
Camp	Campground	McD	McDonnell Center	Pot	Myles Ceramics Studio

Unless otherwise noted, morning events run from 9:00 to 12:00 AM and afternoon events run from 2:00 to 5:00 PM.

Please check the daily schedules in the Program for details about events. Additions and revisions to this schedule will appear in the *Cow's Tales* newsletter each day.