2017

4th Annual

Texas Hydro-Geo Workshop

With Hands-on experience in real-world field settings!
NSS membership offers worldwide caver camaraderie, the NSS Journal of Cave and Karst Studies, and more.

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Welcome to the 2017 Texas Hydro-Geo Workshop

The Texas Hydro-Geo Workshop was created to bring students, educators, and practitioners together in a field setting as a hands-on learning experience. Participants will have the opportunity to explore many different techniques for the collection and analysis of data from soil, rock, and water media. The workshop is structured to provide participants with the opportunity to work with leading researchers and practitioners from across the state and nation. Please make sure that you take full advantage of this unique, valuable opportunity.

This event has been made possible by the great generosity of our host, Tom Summers, owner of Cave Without a Name and his wonderful staff, including Patty Perlaky, Mike Burrell, and Ted Rybicki. They are stewards of an outstanding natural treasure – Cave Without a Name. Please treat the cave and property with great respect. We practice a “Leave No Trace” ethic for the event.

The Workshop is not possible without the many countless hours contributed by volunteer members of the Bexar Grotto of the National Speleological Society. Visit the Grotto’s website at caves.org/grotto/bexargrotto.

In addition, we must also thank our many sponsors that have stepped up with both financial support and contributions of in-kind services and equipment. Their involvement has provided a much richer and expanded experience while helping to keep costs low.

We have been amazed at the continued interest and response for the workshop; participants travel from across Texas and surrounding states, as well as internationally. We hope you find the event educational and fun. Make sure that you have an enjoyable and safe experience, and thank you for coming.

Geary M. Schindel, P.G. Gregg Williams
Chief Technical Officer Bexar Grotto of the
Edwards Aquifer Authority National Speleological Society
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Events

Registration opens ...................................................................................................................Friday 4 pm
Module Sign-up .....................................................................................................................Friday 7 pm
Socializing, Lightening Talks (in the Pavilion) ..................................................................Friday, 7pm
Modules .................................................................................................................................Saturday, 9 am-5 pm
  Sunday, 9 am-noon
Field Lunch Competition (in the Pavilion) .........................................................................Saturday, 12-1 pm
Rock Identification Contest Results (in the Cave) ............................................................Saturday, pm
Group Photo (at the Cave Entrance) .................................................................................. Saturday, 6:47 pm
Yodeling & Hog Calling Competition (in the Cave) ............................................................ Saturday, 8 pm
Keynote, Thomas Adams (in the Cave) ............................................................................... Saturday, 7 pm
Lightening Talks (in the Pavilion) ..................................................................................... Saturday, 9-11 pm
Workshop Ends .....................................................................................................................Sunday, noon
Keynote Speaker

Dr. Thomas Adams

“Following in their Footprints: How dinosaur tracts tell a story of the past”

Dr. Adams is Curator of Paleontology and Geology at the Witte Museum in San Antonio, Texas.

From Texas, Alaska, and Mongolia, Thomas Adams travels through the lost world of prehistoric trace fossils to discover the clues as to dinosaur behavior, ecology, and ancient environments. Organisms (animals and plants) leave traces that preserve their behavior, as well as information about the environment in which they lived. These traces can be in the form of tracks, trails, burrows, feces (or copralite), and borings. Sometimes the only evidence of an ancient organism or even an entire ecosystem is preserved as trace fossils. Adams received his Bachelor of Science degrees in geology and in zoology/physiology from the University of Wyoming and M.Sc. and Ph.D. in geology from the Roy M. Huffington Department of Earth Sciences at Southern Methodist University in Dallas, Texas. He has conducted research in Mongolia, Alaska, Texas, and Wyoming and has been involved with additional expeditions in Colorado and Utah. His current research is focused on crocodyliform evolution and biodiversity in Texas, vertebrate paleoichnology, 3D digital modeling and reconstruction of fossils, and paleobiogeography of Mesozoic ecosystems.

Contests

Field Lunch Contest

Contest for the best field lunch based on a number of criteria including nutrition, taste, preservation, presentation, and the whim of the judges. Please try to make it field applicable – Spartan may win over a French presentation. A nice book will be presented as a prize (and the right to help serve breakfast on Sunday). Winner announced after the Keynote address.

Rock Identification Contest

This event will require contestants to identify a series of rocks. The winner – whomever identifies the most rocks in the least amount of time – will be awarded a prize and bragging rights. Winner announced after the Keynote address.

Yodeling and Hog Calling Contest

This contest is back by popular demand. The winner(s) of the contest will be awarded a nice book or other prize along with one year bragging rights as the Champion Workshop hog caller or yodeler. Last year’s winner, Ms. Carol Patterson, will be this year’s judge.
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Vendors/Exhibitors

Be Sure To Visit Vendors Row in front of the Pavilion).

Barton Springs Edwards Aquifer Conservation District
Bat Conservation International
Edwards Aquifer Authority
Texas Cave Management Association
Texas Speleological Survey
United States Geological Survey
Eureka Water Probes

And check out Cave Without A Name's Mineral and Gift Shop.
Store hours are 10 am-5 pm

Steering Committee

Geary Schindel Edwards Aquifer Authority
Gregg Williams Bexar Grotto of the National Speleological Society
Jessica Buckles Bexar Grotto of the National Speleological Society
Mike Burrell Cave Without A Name
Eric Holman Office of Homeland Security
Alan Dutton UT San Antonio, retired
Brian Smith Barton Springs Edwards Aquifer Conservation District
Alf Hawkins Environmental Geophysics Associates
Allan Clark US Geological Survey
Amy Clark UT San Antonio
Benjamin Schwartz Texas State University
Robert Brinkmann Hofstra University
Calvin Alexander University of Minnesota
Evelynn Mitchell St. Mary’s University
James Ward Angelo State University
Jim Major Terracon Environmental
Joe Yelderman Baylor University
Kevin Bryant Terracon Environmental
Marcus Gary Edwards Aquifer Authority, UT Austin
Mark Childre Laredo Community College
Mark Dobson DNA Geosciences, Inc.
Mustafa Saribudak Environmental Geophysics Assoc.
Ron Green Southwest Research Associates
Mike Cheng UT Rio Grande Valley
Yongli Gao UT San Antonio Center for Water Research
Kevin Urbanczyk Sul Ross University
Brian Hunt Barton Springs Edwards Aquifer Conservation District
Eric Wolff DNA Geosciences, Inc.
Jack Sackrider Westwind Environmental Services
Sriram Madabhushi Booz Allen Hamilton
Important Information

Safety  Your safety is our highest concern and we have a Module specifically on Field Safety, however, you are responsible for your own safety and wellbeing while at the workshop. For those not familiar with the site, Cave Without A Name is located in the Texas Hill Country, and most of the property is undeveloped and maintained as a wildscape. Be aware of your surroundings and avoid hazardous plants or animals. Do not walk around at night without a flashlight. Note the location of the First Aid Station on the map (page 18). The station is continually manned by Eric Holman.

Fire Ants  The pest that you are most likely to come across is fire ants. These imported beauties are very common and well named. Their sting burns like touching a hot poker and can ruin your day. Please watch where you are standing, and observe your feet often. Anything that looks like an ant mound is a fire ant mound – give them plenty of room and don’t disturb them. To prevent potential bites, don’t store food in your tent and keep your tent flaps closed and secure. If bit, brush ants off with your hands and remove trousers if necessary.

Snakes  This region of Texas is one of the few areas of the country that is home to all four major types of venomous snakes – rattlesnakes, copperheads, water moccasins, and coral snakes. They are not aggressive but should be treated with respect. Please point out any snakes to people near you and to a volunteer or Module instructor as soon as possible. There is no upside to handling these animals, so don’t try to pick them up or play with them – even dead ones can bite.

Mammals  Other hazards in the area may include skunks, raccoons, porcupines, deer, wild hogs, and the rare mountain lion. While it is rare that you will see any of these animals, please give them plenty of room if you do.

Heat and Hydration  In addition to the wildlife, heat and sun exposure are also a common problem. Drink plenty of water and stay hydrated. If you’re not urinating on a regular basis, your urine is a dark color, or if you develop a headache or dizziness, you are probably not drinking enough water. Seek shade and let a volunteer know. We will try and get you hydrated before it turns into heat exhaustion or heat stroke. Heat related problems can be minimized by wearing a hat, thin loose-fitting clothes, and seeking out shade where available and drink plenty of water.

Recommended Items  Bring a folding chair so that you can sit at certain Modules and for a place to sit when eating and camping. In addition to normal camping equipment, bring a flashlight, field book for note taking, pencils and pens, a small ruler or scale, and calculator. Be prepared for hot, cold, and wet weather.

Water  The water from spigots in the campground is non-potable (NOT drinkable). Bring drinking water. Please try and minimize waste of water. Reusable cups and water bottles are mandatory.
Food  There will be a Food truck on site for Friday dinner. CASH ONLY; there is no ATM on-site. Breakfast on Saturday and Sunday is provided, as is dinner on Saturday night. Bring a field lunch for Saturday. There will be a lunch contest for the best prepared, presented, and unique lunch. Also, bring reusable plates, cups, and utensils for meals. Washing stations provided with soap are set up at the Pavilion.

Sanitation  Please use the portable toilets. They are cleaned and stocked on a regular basis. Be careful with your phones and car keys when using the toilets. The liquid will stain most items brown, yellow, or blue. Anything you drop in the toilet is your responsibility to fish out – if you want to. Please don’t throw cans or bottles into the toilets. Hand sanitizer are strategically placed around the site for your use.

Camping  Cave Without A Name has made their property available at no cost to the Workshop. We’re trying to crowd a lot of happy campers into this finite spot. If your group spreads out too far, you will have people camping among you. Don’t Balkanize the campground. Please extend a hand and be aware that we’re all part of a close-knit family working in the geosciences. Share your campsite with others and trade experiences about your school and program. The Campground Marshall will be the final arbitrator to address any issues.

Behavior  We have a strict No Drama policy and expect participants to behave in a professional manner during the entire event. If you have a High Maintenance personality, consider not attending (if in doubt, ask your friends or professors). Everyone is encouraged to have fun but obey Texas state laws. There are private residences on Cave Without A Name property; please be respectful of their privacy and don’t approach them unless invited. If you have any concerns, see the Campground Marshall. Please be kind and understanding as we work through any issues that may arise. Treat all volunteers with respect, they are cooking your food and cleaning the John's and herding cats. If you are verbally or physically abusive to the volunteers or other participants, or are a danger to yourself or others, we reserve the right to ask you to leave or have you removed from the property. No guns or fireworks allowed. Remember, this is a rural county and we’re friends with the sheriff. He is a nice guy and provides free accommodations upon demand, complements of Kendall County tax payers.

Alcohol Policy  The Bexar Grotto recognizes that the use of alcoholic beverages by those of legal age is a matter of personal choice. However, students in attendance are ultimately governed by the policies of their higher education institution. Bexar Grotto requires that those who choose to drink on the Cave Without A Name grounds while attending the Texas Hydro-Geo Workshop abide by state law, the regulations of their respective higher education institution and/or organizations, and Cave Without A Name regulations, and expects that such individuals will conduct themselves responsibly, mindful of the rights of others. Campground Marshals reserve the right to request that law enforcement remove anyone in violation of the above requirements. No alcoholic beverages will be served or sold in conjunction with the Hydro-Geo Workshop.

Waste  If you brought it with you, take it home. This includes all of your trash.
Module Descriptions

Field Techniques and Career Development

How to Collect Field Locational Data Using GPS

1 hour / Limit 10 participants / Location B

The Global Positioning System is a space-based navigation system that provides time and location information and has revolutionized how we collect locational data in the field. Data can now be collected on hand held units or even your cell phone. Collecting GPS data involves both hardware and software that must be understood to obtain the best results (or repeatable results). This Module is designed to help you understand and get the most out of your GPS system or cell phone in the field and discusses GPS selection, use of datums and coordinate systems, how to mark waypoints and tracks, how to navigate to a fixed point, and how to transfer data from the GPS unit to your computer. Presented by Roger Andrade, Edwards Aquifer Authority.

Note: If you have a GPS unit, please bring it along with your user’s manual. Some GPS units will be available for use in the Module.

Field Safety

1 hour / Limit 20 participants / Location H

Considering field work may be in remote locations and in weather extremes, this Module discusses issues ranging from safety, personal hygiene, common first aid issues in the field, wild animals, weather, dehydration, being stranded overnight, personal locator beacons, and wild people. Presented by Eric Holman, Department of Homeland Security.

FLIR Infrared Camera and Radon Analysis

2 hours / Limit 15 participants / Location L

The use of a FLIR infrared Camera will be demonstrated. The camera can be used to find cave entrances, springs discharging below stream surfaces, and contrast between different soil types, depth to bedrock, etc. Presented by Joe Yelderman and Stephanie Wong, Baylor University.

Field Instruments (map, compass, rock hammer)

2 hours / Limit 25 participants / Location 1

Participants will utilize maps and Brunton Compass to collect basic data including location, strike and dip, basic field surveying, sample collection, and descriptions. This Module is offered by Mariah Bonham and Taylor Bruecher, Edwards Aquifer Authority.

Developing Scientific and Field Notebooks

1 hour / Limit 20 participants / Location L

Instructions and guidance on the preparation of scientific and field notebooks. Using well-documented and comprehensive notebooks to support analysis, laboratory experiments, and field surveys will greatly facilitate successful completion of modest-sized to the most complex projects. Well-prepared and documented notebooks will also provide defensible records for future recall and to support quality record management. This Module will provide hands-on guidance and suggestions to the preparation of defensible and useful documentation. Presented by Ron Green, Southwest Research Institute and Rick Klar, Raba Kistner Environmental.
Data Presentation for Best Management Decisions

2 hours / Limit 15 participants / Location 2

Good decision making requires well presented data—geologic, hydrologic, geophysical, boring logs, groundwater, chemical, biological, aquifer, modeling, etc. But we do not always present data in a way that allows public stakeholders, regulators, and other agency representatives to make the best decisions possible. The vital link between the excellent field skills we learn in data gathering, the analytical techniques we use to process and reduce the data, and the presentation of the data that facilitates decision making is often missing. As data gathering capabilities increase exponentially in the future, we will continue to be challenged to reduce, process, analyze, interpret, and extract useful information that helps stakeholders make appropriate and timely decisions. This hands-on session addresses some solutions that connect the data we gather with optimizing management decisions. Presented by Sriram Madabhushi, P.G., Booz Allen Hamilton, and Sarah Gilbert, P.G. of Oneida Total Integrated Enterprises.

ESRI Collector for ArcGIS Mobile App

2 hours / Unlimited participation / Location Pav-3

Participants will be introduced to Collector for ArcGIS, a mobile app offered through ESRI software. Participants must bring an Android or Apple mobile device (including smart phones and iPads) to participate. This program is becoming the standard for field data collection, including locational data, observational data, and photo documentation. Presented by Taylor Bruecher.

Note: The free app can be downloaded beforehand from http://www.esri.com/products/collector-for-arcgis.

Career Development

1 hour / Unlimited participation / Location VR-4

Come discuss important aspects of career development from the beginning of your academic program to your professional career. This will include the importance of networking, mentors, continuing education, and staying active in your professional association. Presented by various professionals representing the fields of geology, hydrology, environmental science, and the petroleum industry; USGS Representatives: Tom Fett, Bud Holzman, Ryan Banta, and Richard Rieman.

Coffee Shop Science Talk

2 hours / 20 participants / Location VR-5

If you were at a coffee shop in Lampasas or Bandera, TX, would you be able to explain your science to the person sitting next to you? You have an exciting story to tell! This Module will share concepts and insights for taking your science out of the conference room and into the coffee shop. As scientists, our work is very important to the general public, yet we may not be sharing essential knowledge in a way that is engaging, memorable, or actionable. We’re going to talk about making personal connections, reading your audience to maintain the connection, condensing our science into a compelling story, and warming up body and voice. We’ll provide some tips for talking to the media and policy makers. As a bonus, we will show an example of a technical presentation re-hashed into a fun presentation intended for a general audience—hint hint, these tips can go the other way to engage technical audiences as well. Presented by Sylvia Pope and Saj Zappitello, City of Austin Watershed Protection Department.
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**Introduction (8:30-9:00)**

- **Pav**

**Dinner**

**Breakfast**

**Lunch Contest**

- **Pav**

**Rock Identification Contest**

- **J**

**Yodeling Contest**

- **Cave**

**Lightening Talks**

- **Pav**

**Keynote Address**

- **Cave**

**How to Collect Field Locational Data Using GPS**

- **B**

**Field Safety**

- **H**

**FLIR Infrared Camera**

- **L**

**Field Instruments (map, compass, rock hammer)**

- **1**

**Developing Scientific and Field Notebooks**

- **L**

**Data Presentation for Best Management Decisions**

- **2**

**ESRI Collector for ArcGIS Mobile App**

- **Pav-3**

**Career Development**

- **VR-4**

**Coffee Shop Science Talk**

- **VR-5**

**Environ and Geotech Drilling, Logging, and Sampling**

- **OF**

**Water Well Drilling**

- **D**

**Mudlogging 101**

- **E**

**Surface Geophysics (Ground Penetrating Radar)**

- **7**

**Surface Geophysics (Natural Potential)**

- **G**

**HR 3D Resistivity Imaging to Locate Caves and Voids**

- **9**

**Groundwater Investigation Methods**

- **C**

**Stream Gauging**

- **10-OF**

**Tracer Testing in Karst**

- **11-CV**

**Surface Water Sampling**

- **2**

**Hydrogeology/Well Monitoring**

- **2**

**Potentiometric Surface Mapping**

- **Pav-14**

**Data Collection and Interpretation of Complex Aquifers**

- **VR-15**

**Nuts and Bolts of Eureka Manta2 Water Quality Sondes**

- **1**

**Rainwater Harvesting and Design**

- **A**

**Emerging Chemicals of Concern in Water**

- **Pav-17**

**Cave Geology**

- **CV**

**Karst Feature Evaluation Using the TCEQ Forms**

- **3**

**Stalagmites as Paleoclimate Archives**

- **G**

**Structure and Stratigraphy**

- **3**

**Fossils of the Glen Rose & Edwards Limestone**

- **J**

**Carbonate Geochemistry in Karst Systems**

- **K**

**Rock Identification**

- **J**

**Cave Management and Karst Resources**

- **E**

**Field Trip to Herff Falls at Cibolo Preserve (Sunday)**

- **1**

**Safety in the Vertical Environment**

- **F**

**Cave Mapping with LiDAR**

- **CV-21**

**Aquatic Subterranean Crustaceans**

- **22**

**Karst Invertebrate Habitat Assessments**

- **Pav-23**

**Cave Mapping**

- **CV-24**

**Field Trip to Wild Cave**

- **3**

**Breakfast**

- **9-10**

- **10-11**

- **11-12**
Well Drilling and Environmental Monitoring

Environmental and Geotechnical Drilling, Logging, and Sampling

3 hours / Limit 25 participants / Location 6-OS

Introduction to environmental and geotechnical sampling of soil using manual methods and drilling rigs. Topics will include an overview of field and drill rig safety, sampling methods and equipment, sample collection, and soil boring logging. Samples of common soils will be provided for students to observe and classify. A drilling rig will be on site to demonstrate drilling techniques. Modules will be presented by Kevin K. Bryant and Jim R. Major, Terracon Consulting Engineers and Scientists and Robert Joiner, Eric Castillo, Gary May, Justin May, Juan Martinez, and Donny May, Vortex Drilling.

Well Drilling

3 hours / Limit 20 participants / Location D

Water and monitoring wells provide access to groundwater and are the primary feature used for the collection of water quality data and determination of aquifer properties. Water wells are also the primary source of water for domestic and livestock in many rural areas. Water wells also play an important part in providing water for municipal, industrial, and agricultural use. Water well drilling and construction is a highly-specialized skill. Representatives from C&C Drilling will discuss drilling safety, demonstrate water well construction and development techniques, what data can be obtained from water wells and water well drilling, and how scientists can best work with drillers to obtain high quality data. Kyle Courtney with C&C Groundwater Services, Boerne, Texas.

Mudlogging 101

2 hours / 15 participants / Location E

Oil and gas exploration and development activities are dependent on the understanding of the geology of an area. Drilling activities include basic hands-on to higher tech versions of logging the rock that is being drilled through. This module will present examples of the difference between a rock in hand and rock cuttings from the drilling process. How the understanding of the rocks (type and “pay”) influence the exploration and drilling processes will be discussed. Learn what the possum belly, dog house and rat hole are.

Surface and Borehole Geophysics

Surface Geophysics (Ground Penetrating Radar)

2 hours / Limit 20 participants / Location 7

Demonstrates ground penetrating radar (GPR), a commonly used near surface geophysical method. Transects will be run over both known and unknown features and the data will be interpreted with the participants. This method can be used to detect features such as filled sinkholes, pipes, archaeological features, graveyards, and shallow caves. Presented by Evelynn Mitchell, St. Mary’s University.
Surface Geophysics (Natural Potential)

3 hours / Limit 20 participants / Location 8

Introduction of the Natural Potential (NP) surface geophysical method for the location of subsurface voids. NP will be conducted over known portions of Cave Without a Name or other karst features to demonstrate how this surface geophysical method is useful in delineating the subsurface in a karst terrain. Mustafa Saribudak and Alf Hawkins, Environmental Geophysical Associates.

High Resolution 3D Resistivity Imaging to Locate Caves and Voids

4 hours / Limited 20 participants / Location 9

Provides hands-on training by deploying the SuperSting resistivity imaging system in high resolution 3D resistivity imaging surveys that are ideal for locating caves, voids, depth to bedrock and other geotechnical targets. Data will be comprised of tightly spaced lines and then inverse modeled with the EarthImager 3D Inversion Software for a quick and accurate representation of the subsurface. 3D models will be rapidly collected with single lines of resistivity data that complete in 7 minutes and data will be displayed in real time on the Android App. Presented by Hector Hinojosa and Jason Greenwood of Advanced Geosciences, Inc. Austin, Texas.

Groundwater Investigation Methods

3/4 hours / Limit 20 participants / Location C

Introduction to the technologies typically used for groundwater resource investigations. Students will be introduced to: 1) drilling methods, 2) the role of the geologist in the field during drilling, 3) downhole video and electric logging tools (downhole camera, Optical Borehole Imager (OBI), resistivity, gamma, caliper, fluid sampler, and flow tools), and 4) e-log interpretation. There will be a live demonstration of video and geophysical logging in an onsite water well during the Module. Example e-logs will be reviewed and interpreted. At the end of the Module, students will have an opportunity to correlate borehole cuttings and an e-log from a 1150’ deep well in West Texas. Presented by Mark Dobson and Eric Wolff, DNA Geosciences, Inc., and Ed Miller and Mike Miller, GeoCam, Inc.

Stream Gauging

3 hours / Limit 40 participants / Location 10-OS

Meets 15 minutes before at the Pavilion to coordinate carpool to Kreutzberg Canyon Natural Area.* This Module will introduce students to the fundamentals of stream gauging on the nearby Guadalupe River. Participants will set up a stream transect, measure a stream profile and perform discharge measurements of the river. Participants will use a variety of acoustic velocity meters, incorporating wading and current profiling techniques. Calculated stream flows will be compared to upstream and downstream USGS stream gauges. Participants should bring clothing and sturdy shoes for wading in the river. Presented by Marcus Gary, and Ms. Jessica Quintanilla, Edwards Aquifer Authority, and Sam Burch, Sul Ross State University; and James Ward, Angelo State University.

* Directions and map on page 18.
Tracer Testing in Karst

3 hours / Limit 20 participants / Location 11-CV

Introduces participants to the fundamentals of groundwater tracer test design and execution. This includes field preparation, dye selection, dye injection, water and charcoal packet collection and laboratory and field analysis. Samples will be collected using an automatic water sampler and analyzed in the field using a filter fluorometer. Students will also process charcoal packets and analyze eluant for dye. This Module will be taught by Steve Johnson, Edwards Aquifer Authority, Mark Hiler, Texas State University; and Ralph Ewers, Ewers Water Consultants.

Surface Water Sampling

2 hours / Limit 15 participants / Location 12-OS

Meets 15 minutes before at the Pavilion to coordinate carpool to Kreutzberg Canyon Natural Area, map Page 23. This Module will cover water quality sampling. Topics covered will include parameter selection, sampling equipment selection, sample collection, collection of field parameters (pH, temperature, conductivity, dissolved oxygen (DO), turbidity, and alkalinity), Chain of Custody (COC), packing and shipping samples, and personal protective equipment. Historical laboratory data will be presented and compared to current Maximum Contaminant Levels (MCL). Participants will get wet and should bring appropriate footwear and a change of clothes. Presented by Phil Pearce and Debbie Duran, SWCA, Inc.

Hydrogeology/Well Monitoring

2 hours / Limit 15 participants / Location 13-OS

This Module will discuss the design and present a hands-on Module pertaining to groundwater data collection, modeling and how such a model is applied and utilized in the industry. The purpose of this Module is to guide the participants through the procedure of gathering groundwater data, designing a basic model and analyzing the data. Participants will produce a piezometric surface using ArcGIS and establish a groundwater gradient. With this data, the group will be led in discussion regarding topics such as hydraulic interconnectedness, transmissivity, pollutant transport, drawdown curves, and the cone of depression. Presented by Curt Campbell, Brandon Wilcox, and Jack Sackrider, Westward Environmental, Micah Voulgaris, Cowcreek Groundwater Conservation District.

Potentiometric Surface Mapping

2 hours / Limit 20 participants / Location Pav-14

Participants will use synthetic data and create a potentiometric surface map. This is an important first step in conducting a groundwater investigation. The data will be used to calculate the direction of groundwater movement and contaminant transport. Additional data will be presented that will be used to calculate the apparent groundwater velocity in a sand and gravel aquifer. Presented by Alan Dutton, UT San Antonio and Mike Cheng, UT Rio Grande Valley.

Data Collection and Interpretation of Complex Aquifers

1 hour / 15 participants / Location VR-15

Classroom examples of aquifer characterization and monitoring often don’t cover the complexity inherent in many aquifers or how to distinguish between complex aquifer systems with multiple vertical components. This module will provide some examples of complex aquifer systems and stacked aquifers, will describe some techniques for recognizing these complexities, and will cover some techniques for analyzing data from such systems.
Nuts and Bolts of Eureka Manta2 Water Quality Sondes

1 hour / 10 participants / Location VR-16

A hands-on introduction to sensor technologies available for multi-parameter water quality sondes; navigating the multi-probe control software; operating control devices; including a hand-held field PC with Windows Mobile; calibration of pH, conductivity and optical DO, depth and turbidity sensors; spot checking or profiling (site to site) and unattended logging; care and maintenance of water quality sondes; and managing data from real-time telemetry stations. Presented by Joanna Howerton, Eureka Water Probes.

Rainwater Harvesting and Design

1 hour / Limited 20 participants / Location A

Rainwater Harvesting is an ancient technique used by many past civilizations who didn’t have ready access to potable water. Integrating these simple ideas have come back into favor in the 21st century due to changing weather patterns and conservation values. This Module will be geared toward both beginners and experts about the many designs and uses of rainwater and will include system design techniques, case studies, and product reviews. Presented by Wade Kolb with Westward Environmental, Inc.

Emerging Chemicals of Concern in Water

1 hour / Limit 15 participants / Location Pav-17

Water resources are constantly being exposed to new and emerging chemicals. Many of these synthetic or man-made chemicals, have long-term consequences as they enter the environment. As we understand more about these toxic chemicals, their potential harmful effects on the human health and the environment are being brought into light. In this Module, we discuss physical and chemical properties of some of these chemicals, their use and prevalence in the industry, health effects and emerging regulations. We will also discuss release of these chemicals into the environment, detection and investigation techniques, their nature and behavior in the environment. Some challenges of delineation and remediation of these contaminants will also be offered. The Module will be presented by Sriram Madabhushi, P.G., Booz Allen Hamilton, Sarah Gilbert, P.G. of Oneida Total Integrated Enterprises.

Karst and Geologic Evaluations

Cave Geology

3 hours / Limit 20 participants / Location 18-CV

An introduction to the process of cave and karst geology using Cave Without A Name as an example. Discussions will include cave initiation and destruction, cave formations, caves as part of the geologic record, cave data and climate change, cave hydrology, and methods for cave and karst research. Presented by George Veni, National Cave and Karst Research Institute.
Karst Feature Evaluation Using the TCEQ Forms

3 hours / Limit 20 participants / Location 19

Participants will utilize Texas Commission on Environmental Quality (TCEQ) field evaluation forms to document and evaluate karst features. This process is performed on properties being developed on the recharge zone of the Edwards Aquifer. Karst features on Cave Without A Name property will be located and evaluated. Advanced evaluation techniques that complement TCEQ requirements will also be presented. Presented by George Veni, National Cave and Karst Research Institute.

Note: Participants should arrive with their notebooks, pens, and whatever field equipment they deem useful for evaluating karst features. They should also visit the TCEQ website to download and bring one copy of the TCEQ assessment table (https://www.tceq.texas.gov/assets/public/compliance/field_ops/eapp/F-0585_geologic_assessment_table.pdf), and instructions for geologists (https://www.tceq.texas.gov/assets/public/compliance/field_ops/eapp/F-0585_geologic_assessment_instructions.pdf). Some forms will be available at the Module.

Stalagmites as Paleoclimate Archives

2 hours / 20 participants / Location G

Stalagmites are arguably the best archives of terrestrial climate change over time and as such, have been increasingly utilized for scientific study over the past few decades. This Module will introduce students to the concept of speleothems as recorders of paleoclimate information, with topics covering conservative sample collection, age dating, methods of geochemical analysis, and age model construction. Discussions will include the use of in-situ sampling techniques as well as ways in which to strike a balance between maximizing the information gained from the geochemical analysis of stalagmites and the conservation of irreplaceable cave formations. Stalagmite samples used for paleoclimate reconstructions will be available for the students to examine. Presented by Jessica Buckles, Chris Ray, and Yongli Gao; UT-San Antonio.

Structure and Stratigraphy

3 hours / Limit 25 participants / Location 20

A discussion of the depositional setting of the rocks forming the Edwards and Trinity aquifers. The discussion will touch on the faulting of the Balcones Fault Zone and then layout the current stratigraphy and hydro-stratigraphy of both the Edwards and Trinity aquifers. Presented by Allan Clark, US Geological Survey; Amy Clark, University of Texas, San Antonio; and Mark Childre, Laredo Community College.

Fossils of the Glen Rose & Edwards Limestone

1 hour / Limit 15 participants / Location J

This Module presents invertebrate fossils from the surrounding Glen Rose and Edwards limestones. The fossils will be used to determine strike and dip of the Corbula-type fossil layer. Presented by Ted Rybicki, P.G.

Carbonate Geochemistry in Karst Systems

2 hours / Limit 15 participants / Location K

An introduction to carbonate minerals, depositional environments, as well as processes and reactions in karst systems. Participants will receive an introduction to the principal classification schemes for carbonate rocks, depositional forms on both the surface and subsurface, as well as how to distinguish common carbonate minerals using a variety of field and laboratory techniques. Presented by Kevin Blackwood, East Central University.
Rock Identification

1 hour / Limit 15 participants / Location J

This Module will present methods to identify rocks that are common to Texas and the western United States. Here is a good opportunity to refresh your skills and learn some of the tricks of the trade for field identification with an economic geologist. Presented by Ted Rybicki, P.G.

Cave Management and Karst Resources

4 hours / Limit 20 participants / Location E

Caves have attracted humans for thousands of years as places for shelter, recreation and other activities, not all good. This module will discuss management of surface and subsurface cave and karst resources including: conservation, restoration, recreation, science and environmental education. It will also touch upon geodiversity, biodiversity and wilderness concepts.

Field Trip to Herff Falls at Cibolo Preserve (Sunday)

3 hours / Limit 14 participants / Location 1

Meets 15 minutes before at the Pavilion. This Module will visit the Herff Falls, a narrow canyon through a large exposure of caprinid rudist reef, located at Cibolo Preserve. Cibolo Preserve is a 644-acre natural habitat laboratory located just east of Boerne. A uniquely preserved cross-section of history and nature in central Texas, the land is notable for its beauty, variety of flora and fauna, geological features and areas of archaeological interest. One and a half miles of Cibolo Creek bisects the Cibolo Preserve, before entering the Herff Falls, where shortly thereafter the water sinks in a series of swallets downstream. Participants should wear proper footwear for walking on the karst surface and bluffs. Presented by Donna Taylor, Cibolo Nature Center and Farm.

Caves and the Caving Environment

Safety in the Vertical Environment

2 hours / Limit 10 participants / Location F

Discusses safety for working above, below and on cliff faces and around vertical caves, and includes demonstrations on safety, equipment, minimum skills, and training and resources. Presented by Bennett Lee and Gregg Williams, Bexar Grotto of the NSS.

Cave Mapping with LiDAR

2 hours / Limit 10 participants / Location 21-CV

FLiDAR is an active scanning technology that generates high density 3D point clouds of cave features. The Riegl terrestrial laser scanner (model VZ-400i) will be setup in multiple locations within the cave in order to get as much coverage as possible. The point clouds from the multiple scan locations will be registered together to create a 3D model of the cave interior. Presented by Kevin Urbanczyk, and Corbin Carsrud, Sul Ross State University.
Aquatic Subterranean Crustaceans
1 hour / Limit 15 participants / Location 22
Discusses the process of collecting, identifying and describing small aquatic crustaceans and other invertebrates from caves in Texas and elsewhere. A slide show and video will highlight the biodiversity, ecology, biogeography and conservation efforts dealing with the most significant cave species. Presented by Tom Iliffe, Department of Marine Biology, Texas A&M University at Galveston.

Karst Invertebrate Habitat Assessments
3 hours / Limit 20 participants / Location Pav-23
Walks participants through the entire process of conducting a karst feature survey from pre-field preparation to reporting the evaluation of features for karst invertebrate habitat in accordance with current U.S. Fish and Wildlife Service Karst Invertebrate Survey Requirements. Participants will learn how to work with a crew to identify, document, and assess karst features for the presence or absence of karst invertebrate habitat on the Cave without a Name property. Presented by Brian Cowan and Clover Clamons, Zara Environmental LLC.

Note: Participants may want to preview the following document however, copies will be provided: http://www.fws.gov/southwest/es/Documents/R2ES/Karst_Survey_Procedures_20150528.pdf.

Cave Mapping
3 hours / Limit 10 participants / Location 24-CV
Discussion on cave surveying and resource documentation and participants will survey a cave or portion of cave passage on the property using a field book, compass, and clinometer. On display will be an existing cave sketch, survey notes, and cave survey programs used to reduce the field data. Presented by Marvin Miller, Joe Mitchell, and Steve Gutting, Bexar Grotto of the NSS.

Field Trip to Wild Cave
3 hours / Limit 15 participants / Location 25-OS
Meets 15 minutes before at the pavilion. Visit to a wild cave within walking distance of CWAN property. The cave is mostly a walking stream cave and you will get wet up to your waist and muddy so it may not be for everyone. Presented by Jon Cradit, Edwards Aquifer Authority and Tom Florer, Mike Harris, MJ Gibbons, Gregg Williams, Kori Dunaway, Leia Hill, Nate Clark, Bexar Grotto of the NSS.

NOTE: Bring gloves and wear sturdy, closed toe shoes. Sandals or flip flops are not acceptable and will not be allowed in the cave. Helmet with mounted light will be provided but you may bring your own. You will also need a change of clothes and shoes for after the trip and a plastic bag for your wet items.
Module Presenters

Alan Dutton
Alf Hawkins
Allan Clark
Amy Clark
Bennett Lee
Brandon Wilcox
Brian Cowan
Brian Smith
Bud Holzman
Chris Ray
Clover Clamons
Corbin Carsrud
Curt Campbell
Debbie Duncan
Donna Taylor
Donny May
Doug Schnoebelen
Ed Miller
Eric Castillo
Eric Holman
Eric Wolff
Evelyn Mitchell
Gary May
George Veni
Gregg Williams
Hector Hinojosa
James Ward
Jack Sackrider
Jason Greenwood
Jessica Buckles
Jessica Quintanilla
Jim Major
Joanna Howerton
Joe Yelderman
Joe Mitchell
Jon Cradit
Juan Martinez
Justin May
Kevin Blackwood
Kevin Bryant
Kevin Urbanizk
Kori Dunaway
Kyle Courtney
Lea Hill
Marcus Gary
Mariah Bonham
Mark Childre
Mark Dodson
Mark Hiler
Marvin Miller
Micah Voulgaris
Mike Cheng
Mike Harris
Mike Miller
MJ Gibbons
Mustafa Saribudak
Nate Clark
Pat Seiser
Philip Pearce
Ralph Ewers
Richard Rieman
Rick Klar
Robert Joiner
Roger Andrade
Ron Green
Ryan Banta
Sam Burch
Sarah Gilbert
Saj Zappitello
Sriram Madabhushi
Stephanie Wong
Steve Gutting
Steve Johnson
Sylvia Pope
Taylor Bruecher
Ted Rabicki
Thomas Adams
Tom Fett
Tom Florer
Tom Iliffe
Tom Summers
Wade Kolb
Yongli Gao

Volunteers

Co-Chair
Geary Schindel
Volunteer Coordinators
Jordan Rasmussen, Stephanie Connolly
Co-Chair
Gregg Williams
On-site Registration
Fran Hutchens, Sue Schindel, Leia Hill
Treasurer
Pam Campbell
Breakfast and T shirts
Sue Schindel
Secretary
Michelle Smith
Web Developer
Randy Baker
Logistics
MJ Gibbons
Web Registration
Bennett Lee
Sanitation
Mike Harris
Program & Designer
Jill Orr
Campground Marshall
Tom Florer
Safety
Eric Holman
Off-site modules meet at the Pavilion.
Kreutzberg Canyon Natural Area
143 Mark Twain Road, Boerne, TX 78006

Head west onto Cave Without A Name Rd. 0.4 miles
Slight left onto Kreutzberg Rd 0.7 miles
Turn right onto Mark Twain Dr.
Turn right into Kreutzberg Canyon Natural Area.
Follow this road north 1 mile to the river-side parking area.
SPONSORS

Advanced Geosciences Inc.
Barton Springs Edwards Aquifer Conservation District
Cave Without A Name
Cow Creek Groundwater Conservation District
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H.E.B.
Karst Works, Inc.
National Ground Water Association
National Speleological Society
Raba Kistner Environmental
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San Antonio Geophysical Society
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