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FOUR CORNERS GEOLOGICAL SOCIETY

Welcome to 2023!

JANUARY MEETING

SPEAKER: ***Dr. Bob Krantz, FLC/UA/GeoStructure LLC***

TITLE: ***The Geologic and Fluid Evolution of the Paradox Basin***

DATE: ***Thursday, January 19, 2023***

TIME & ***5:30 - 6:30 pm Social, Drinks and Lots of Various Small Plates!*** *Will fill you up,, make you happy, and includes 2 drink tickets*

LOCATION ***Room 710, Sitter Family Hall (Geology Bldg) Fort Lewis College: Happy Hour at The Wall of Time Lobby***
6:30 pm - 7:30 pm. Speaker, followed by raffle
ZOOM meeting will start at 6:30 pm.

ZOOM LINK: ***Join Zoom Meeting:***
https://fortlewis.zoom.us/j/99917767909
Meeting ID: 999 1776 7909

COST: ***$20/person.***
Please RSVP by Monday January 16th if possible.
PLEASE go to the website to pay and register:
https://fourcornersgeologicalsociety.org/event Or you can email Jeff Geslin at jkgeslin@gmail.com

10 (Wow!) students will be sponsored by by the FCGS. To sign up, please contact Dr. Geslin at jkgeslin@gmail.com

The Geologic and Fluid Evolution of the Paradox Basin

Bob Krantz

ABSTRACT:

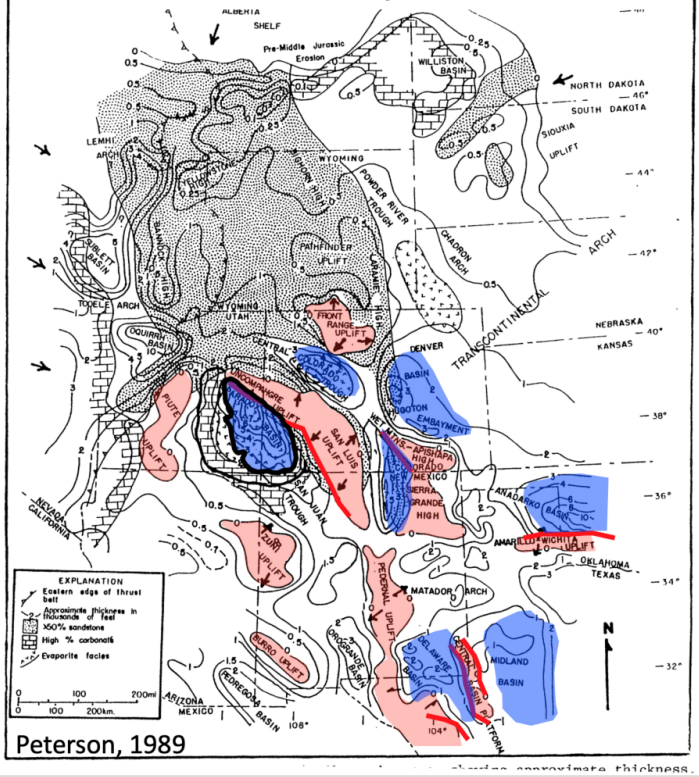
The Paradox Basin of southeastern Utah and southwestern Colorado has had a long and complex history. In 2017 a team based at the University of Arizona, along with faculty and students from New Mexico Institute of Technology and Fort Lewis College began a four year project to characterize the geologic and fluid evolution of the basin. Specific investigations included structural and tectonic elements, especially faults and fractures, ore deposits, modern and ancient hydrologic systems, diagenesis and alteration, basin modeling, and geochronology. Our ultimate goal was a integrated history of fluid-rock interactions.

This presentation will review a preliminary synthesis of significant geologic and fluid events, divided into 10 major episodes. The history is represented by the evolution of a basin cross section, with tectonic movements, structures, fluids, and other phenomena, along with burial history, paleo-geography, and new geochronology, especially for faults.

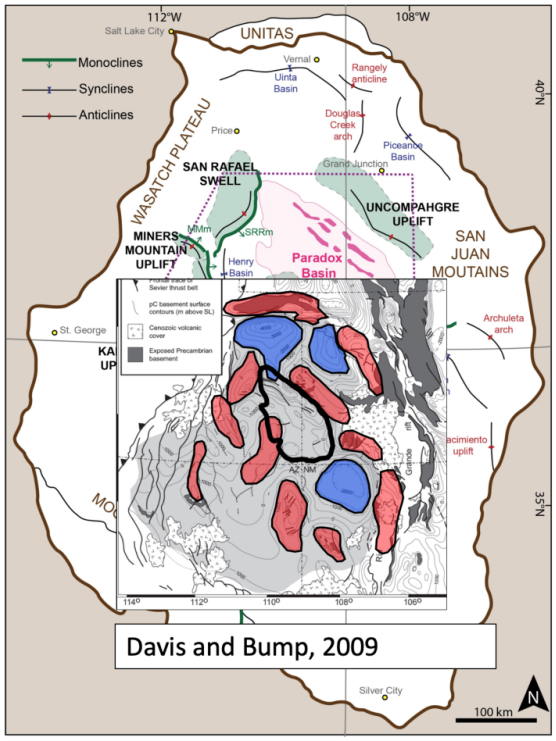
One significant project outcome is the significance of the Laramide in the Paradox Basin. Perhaps under-appreciated, Laramide age events include significant tectonic and fluid episodes. New data and ideas also help to constrain the "unknown" basin burial and uplift history during much of Cenozoic time. Much work remains to be done, and we may have generated more questions than answers.

**** ZOOM LINK ****

Ancestral Rockies Uplifts and Basins

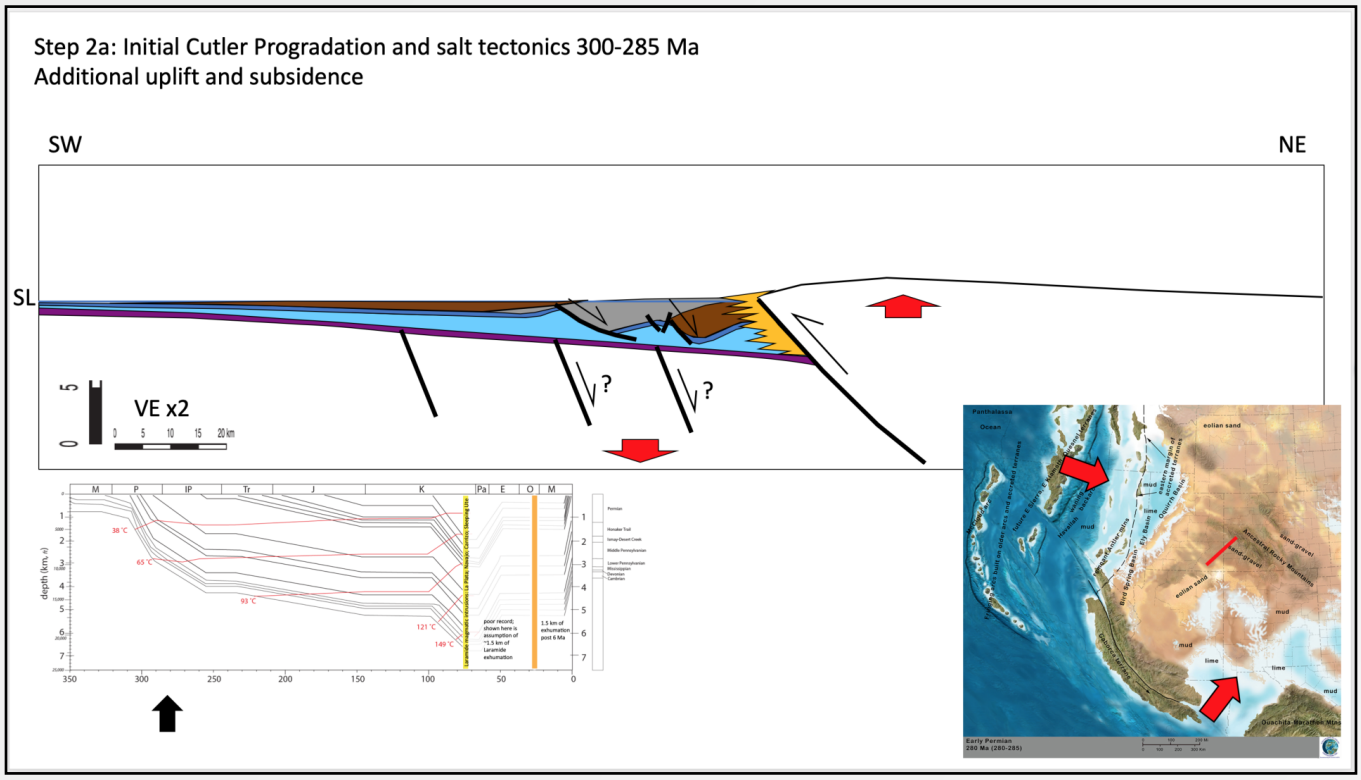


Laramide Uplifts and Basins



The Geologic and Fluid Evolution of the Paradox Basin

Bob Krantz



above: Mi Vida Mine

below: Cashin Mine

**** ZOOM LINK ****

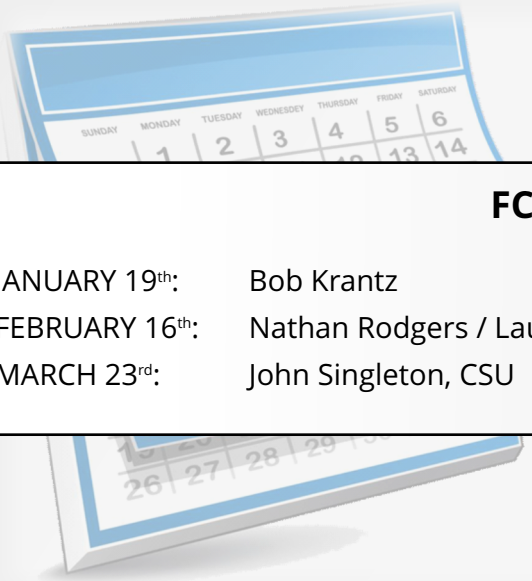
Our Speaker:

BOB KRANTZ: FLC, UA and GeoStructure LLC

Bob holds a BS in geology from the University of Utah, and MS and PhD in geology from the University of Arizona. After grad school Bob completed a post-doc fellowship at the Universite de Rennes, France, before joining the research lab at ARCO. While still at ARCO, Bob transferred to international exploration, mostly in Latin America, and then to production with ARCO Alaska. After the merger with Phillips Petroleum, Bob became a structural geology advisor for Alaska exploration and production. With the subsequent merger with Conoco, Bob moved to Houston and joined the ConocoPhillips subsurface technology group, working on global E&P problems.

In 2011 Bob became an adjunct professor in the Geosciences Department at the University of Arizona. Bob joined the Geosciences Department at Fort Lewis College as an affiliate faculty in 2019. After retiring from ConocoPhillips in 2016, Bob formed a consultancy, GeoStructure LLC.

Bob's interests include structural geology, especially faults and fractures and their impacts on subsurface fluids, tectonics and integrated geologic histories, 3D geologic interpretation and the development of spatial cognitive skills, and geologic education.



FCGS 2023 MEETING DATES

JANUARY 19th:	Bob Krantz	APRIL 20th:	FLC Student Presentations
FEBRUARY 16th:	Nathan Rodgers / Lauren Broes	MAY:	Possible Spring Party
MARCH 23rd:	John Singleton, CSU		

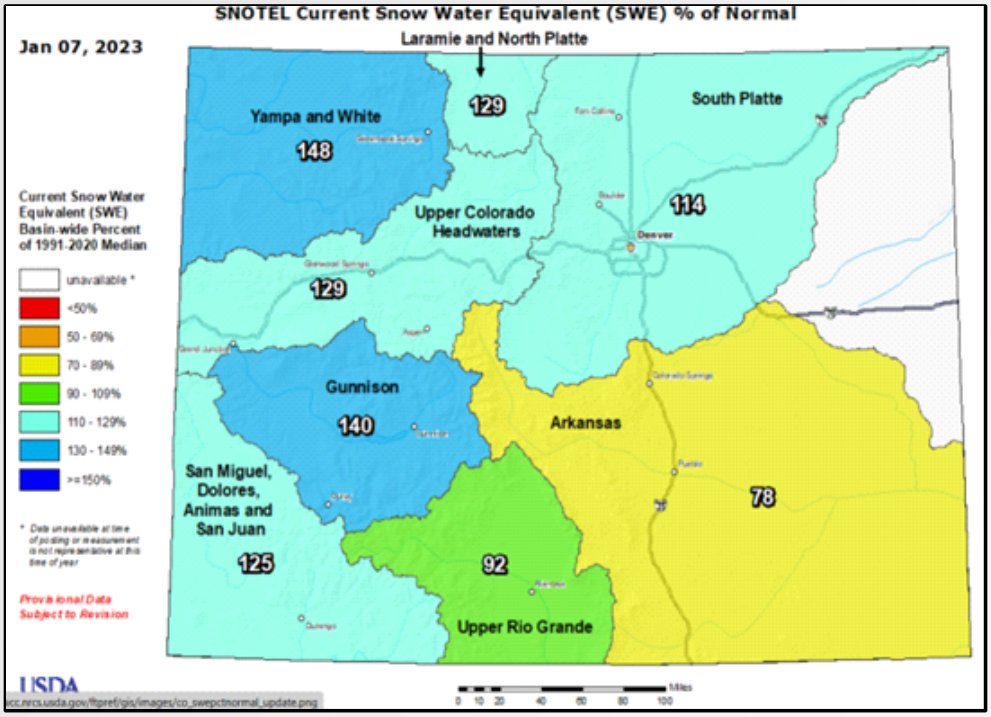
"PREZ SEZ" by Jeff Geslin

Happy New Year FCGS members! I hope that everyone had good holiday season. The new year has started and the FCGS is back in action. **Society activities…** Chris Heine has put together a series of excellent speakers for our meetings in early 2023. Bob Krantz will be talking this month about work he has been doing in the Paradox basin. I find Late Paleozoic tectonics and basin evolution in the western US to be fascinating. It should be a really interesting talk. We'll start with appetizers and drinks at 5:30 pm, followed by Bob's talk at about 6:30. Chris has also lined up talks by geoscientists from the Colorado Geologic Survey (February) and Colorado State University (March). We will finish the spring series with student research presentations in April.

Out and about… Winter made a big entrance in Southwestern Colorado this year. We've had several large storms that resulted in a lot of snow fall. According to the US Department of Agriculture, SW Colorado is currently at 125% of snow water equivalent relative to 1991-2020 median values (see map below). Since drought is a serious issue for us this has been a welcome weather pattern. According to the US government's National Integrated Drought Information System, in January 2022 our region was in "moderate to severe drought", with some areas in "extreme drought." By this week we had progressed to "abnormally dry." Of course, we need to continue to get a succession of snow storms to really change the long-term drought trends for our area. So, keep your fingers crossed for more snow, and get out and enjoy what is already on the ground.

Best regards,

Jeff



From the US Department of Agriculture National Water and Climate Center, Colorado Snow Survey (Colorado Snow Survey Homepage (usda.gov))

Be of Good Cheer

and

Toast to Snow and Field Trips in 2022!

IN MEMORY OF JOHN YOULE - we miss you, John….

With great sadness we mark the passing of our remarkable friend and colleague, John Youle, on December 3, 2022. He passed away in a freak accident while body surfing in Mexico. He leaves a big hole in our hearts and in our geo-community. John moved to Durango in 2014 to work for Red Willow Production, bringing his decades of geological expertise and endless enthusiasm with him. He quickly joined the Four Corners Geological Society and was soon organizing all sorts of activities and helping in countless ways. As President-Elect and President of the Society he started the tradition of awarding the "Mug O'Merit" to our speakers and was also infamous for scheduling board meetings at Carvers for a bit of good cheer along with Society business. He is remembered for his wide-ranging knowledge of geology and innovative thinking, his mischievous sense of FUN, his kindness and warmth, and for his limitless love for his wife and life partner, Maura, and for his family. The link to his obituary in the Durano Herald is here.

Below are a few memories of John.

Jim Corken:

I really liked John. I met him on the 2017 SJB trip and we really hit it off. I didn't see him that often but always considered it an honor when John was present.

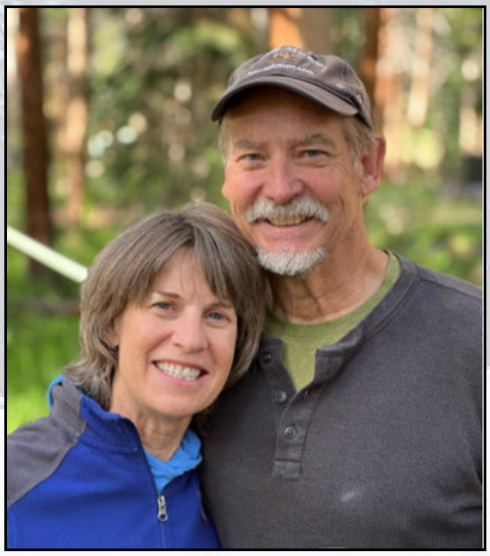
Gary Gianniny, FLC:

I was impressed by John's keen geological eye when we were discussing all kinds of stratigraphy, and especially some of the work he did on incised valleys. When John first moved to Durango after joining Red Willow I remember us both being exceptionally fond of Carver Brewing's Vapor Trail IPA. For several years we found or made up excuses to meet up at Carvers whenever we found out that it was on tap!

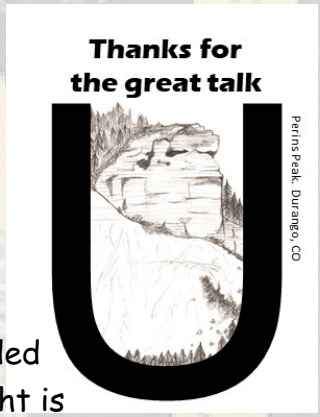
Jay LeBeau, Onshore Subsurface Manager, Red Willow Production Co.

I had the good fortune to cross paths twice in my career with John Youle. I first met him in graduate school in the early 90's at the University of Kansas as we pursued our masters degrees. He was kind and so intelligent. His talent and enthusiasm for geology I always admired and remembered in the years as our careers progressed. I crossed paths with John once again in 2014 when he was hired as a Business Development Geologist for Red Willow Production Company. His passion and enthusiasm for geology and the petroleum geology profession had not diminished. I thoroughly enjoyed our discussions and the debates were always fun and educational in terms of geology and life in general. John's loss was felt by me and his colleagues here at Red Willow, he will be missed.

IN MEMORY OF JOHN YOULE - some photos



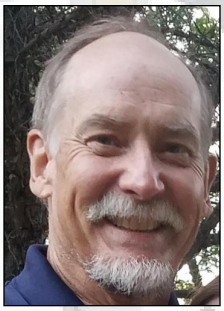
John and Maura, aka Juan & Mo

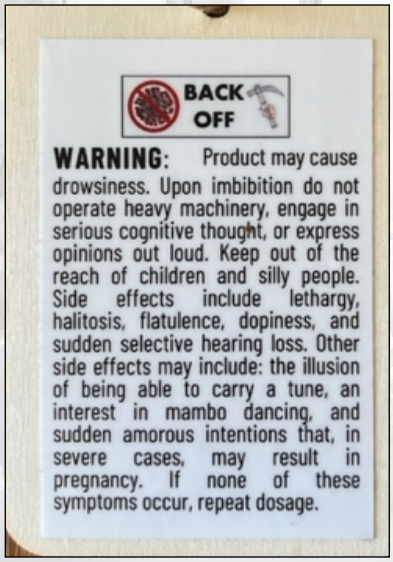


John's original "Mug O'Merit" awarded for FCGS Speaker gifts. On the right is the back art, showing his and his daughter's original artwork of Perrin's Peak

The photos below show the beer John made during the early days of corona virus lockdown. The cover art was done by his daughter Bridie and shows witch doctor - Dr. John in his Scottish kilt with his rock hammer ready to take out the Corona virus. While this famous beer was fermenting, he stored it in their downstairs bathtub and it blew up all over the ceiling. But, according to Maura, it ***was*** *a lovely-tasting Very Pale Ale.!*

And - John swore that "imbibition" is a real word!





FCGS Field Trip News

NEWS FROM THE FIELD TRIP COMMITTEE

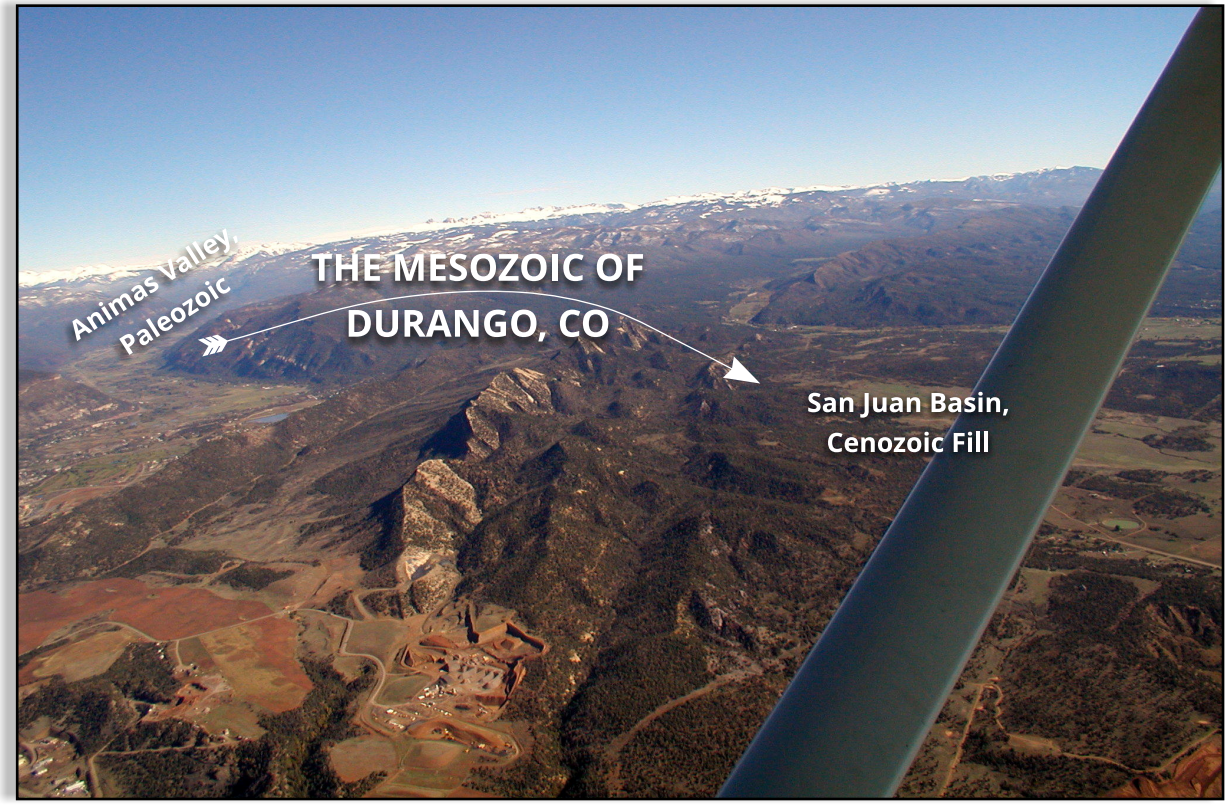
The Field Trip Committee is in the early stages of planning four field trips in 2023, as listed below. Details are still being worked out but please keep these trips in mind as you make your travel plans for spring, summer and fall. We hope to see everyone on the outcrop this year.

Please note that ALL field trip participants must be members of the Four Corners Geological Society.

1. THE MESOZOIC OF THE DURANGO AREA

Date: Saturday, April 15th
Leaders: Gary Gianniny and David Gonzales
Cost: TBD
Limit: TBD but typically 25
Transportation: TBD but either vans or carpooling

Trip Description: This is a one-day trip looking at the Triassic Chinle (Dolores) Fm. through the Cretaceous McDermott Fm. (a.k.a. the Purple Cliffs). As we travel from the lower Animas Valley south to Bodo Park we look at a section that spans the period between the breakup of Pangea to the Laramide Orogeny; a journey from near-equatorial to middle latitudes, from arid to humid climates and from dominantly westerly to dominantly easterly drainages. This was a transition from stability within the interior of a supercontinent to a position marginal to an interior seaway in a foreland basin, inboard of an active subduction zone and overthrust belt. How were these regional events recorded here? Join us as Fort Lewis College Professors Gary Gianniny and David Gonzales explain the sedimentologic and tectonic signature of the Mesozoic in Durango, Colorado.



FCGS Field Trip News

There will be two FLOW (Fort Lewis College on the Water) float trips offered in the early summer. The FLOW program is like a commercial river trip in that boats, oarsmen, gear and food are all supplied. This arrangement increases the cost over our usual member-run trips but allows us a set opportunity to float not available through the lottery system. Learn more about FLOW here: *https://www.fortlewis.edu/academics/schools-departments/multidisciplinary-programs/fort-lewis-on-the-water/flow-home* .

2. RMAG FLOAT TRIP ON LOWER SAN JUAN RIVER (57 MILES)

Although this trip is being run by the Rocky Mountain Association of Geologists, it is open to non-members. RMAG has an ad in the January Outcrop (below) but nothing on their website yet (https://www.rmag.org/).

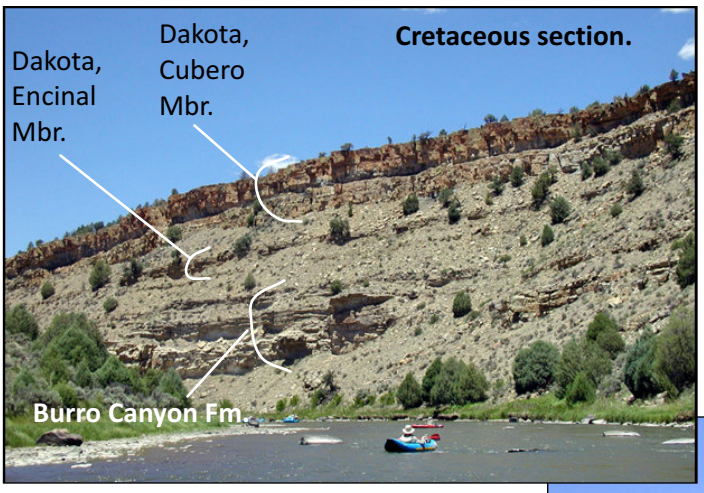
Dates:	June 3rd meet in Bluff. June 4-8th float Mexican Hat to Clay Hills. Drive out on 8th.
Transportation:	FLC vans (or possibly optional to drive yourself to Bluff).
# Days:	5 days / 4 nights on river.
Leaders:	Dr. Gary Gianniny, Fort Lewis College and Dr. Rip Langford, UTEP.
Organizer:	Estimated pricing $1400 members / $1475 non-members.
Limit:	20 participants.

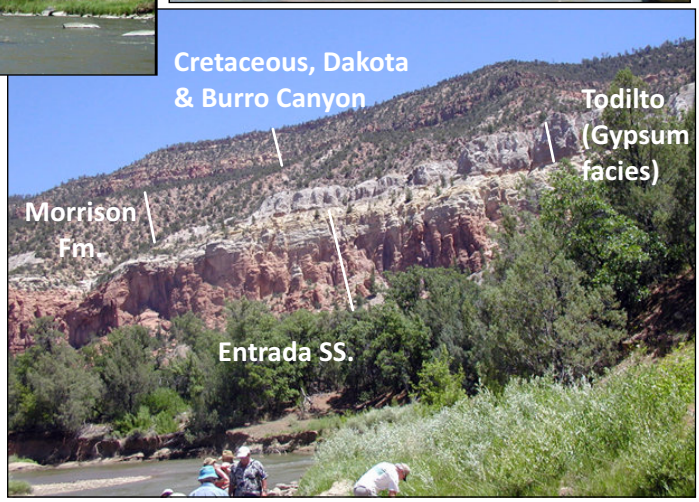
Trip Description: *(RMAG has not yet released a trip description but...).* The lower San Juan River exposes the Pennsylvanian Hermosa Group, which is age-equivalent to the section seen along the Hermosa Cliff trend north of Durango. Whereas the Durango section was deposited on the eastern, active margin of the Paradox Basin, the San Juan River exposures formed on a stable, broad, shallow shelf on the western margin. Lithologies outcropping along the river are outcrop analogs for producing intervals at Aneth oil field. Geologists rafting through these folded Pennsylvanian and Permian strata can examine phylloid algal bioherms (oil reservoirs), organically-enriched black shale (source rocks) and basinally-restricted evaporites (seals). Higher up in the canyon, cross-bedded carbonate grain stones appear in the younger Honaker Trail Formation, followed upwards by rhizolith channel-fill conglomerates in the Permian Halgiato Formation. Honaker Trail and side canyons provide opportunities to hike.

3. FCGS FLOAT TRIP ON THE CHAMA RIVER (31 MILES)

Dates:	FLOW calendar not set but either putting on June 30, July 21 or July 28. Stay tuned!
# Days:	3 days / 2 nights on river.
Leaders:	TBD but will be geologists from the NMBGMR who wrote the new Chama geologic river guidebook published in 2021.
Organizer:	David Schiowitz
Cost:	TBD but estimated pricing $700-$800
Limit:	18 participants (not including leaders and guides)

Trip Description: The Chama River, in NW New Mexico, is a tributary of the Rio Grande, flowing south from headwaters in the San Juan Mountains of Colorado to Abiquiu, then east around the Jemez volcanics into the Rio Grande rift zone. This trip runs from below the El Vado dam through a designated Wild and Scenic River section to the Big Eddy take-out above Abiquiu Reservoir. The exposed geologic section on this stretch is entirely Mesozoic, cutting down from the Cretaceous, Dakota Sandstone to the Triassic, upper Chinle Formation as we travel south. The FCGS last floated the Chama in 2004. That trip, led by members Don Owen and Chip Head (who had to drop out), focused on the exposed Cretaceous sandstones which are outcrop analogs to producing petroleum reservoirs in the nearby San Juan Basin. This trip will be led by several geologists from the New Mexico Bureau of Geology and Mineral Resources (NMBGMR), who published a new geologic river guidebook for the Chama in 2021. The guidebook can be found here: https://geoinfo.nmt.edu/publications/search/home.cfml?StartRow=1&index=geoinfo-pubs&Title=The+Rio+Chama&submit=+Find+Publications+





FCGS Field Trip News

4. A TOUR OF JURASSIC LAKE T'OO'DICHI: ALKALINE, SALINE WETLANDS OF THE MORRISON FORMATION IN THE FOUR CORNERS AREA

Dates: Provisionally Friday-Sunday, September 22-24, 2023. Backup dates are Sept 15-17th or Sept 30-Oct 1. Will know by the end of January.
 # Days: 3 days, 2 nights
Leaders: Dr. Christine Turner and Mr. Neil Fishman, Retired USGS
Organizers: Kim Gerhardt & others
Cost: TBD
Limit: 25 including leaders. To include FLC students & FCGS members.

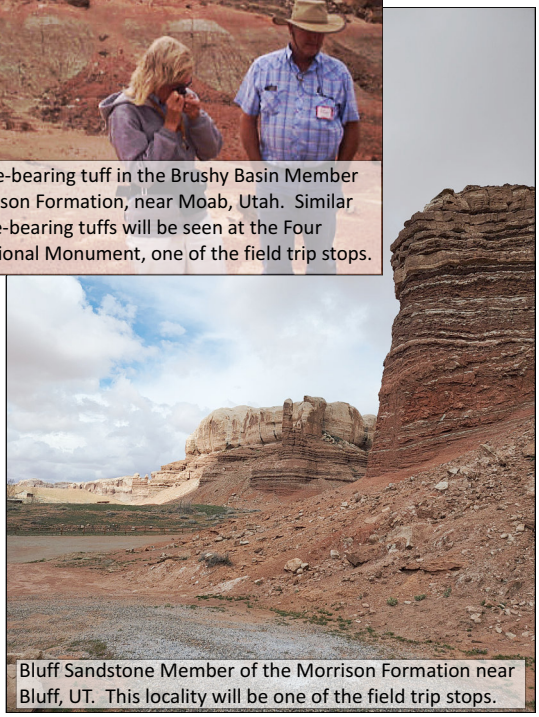
Field trip co-leaders, Neil Fishman and Christine Turner, standing on an analcime-bearing tuff at Beclabito Dome, New Mexico. This locality will be one of the field trip stops.

Trip Description: What rock formation is green, purple, orange and blue, known for dinosaur fossils and hosts uranium? The Morrison Formation! It's all around us in the Four Corners Area, but how much do we really know about the depositional systems that formed it? Join us as we travel from the interior to the margins of the oldest, largest, alkaline, saline wetland in the geologic record with retired USGS geologists Dr. Christine Turner and Neil Fishman. In their interpretation, unusual pore water chemistry related to the alteration of silicic ash from calderas to the west resulted in a diagenetically zoned distribution of zeolitic minerals in the Brushy Basin Member only found west of the Uncompahgre uplift. We will also observe and discuss the tectonic, stratigraphic and sedimentologic aspects of the entire Morrison (including the Salt Wash and Bluff Sandstone Members) as we traverse the depositional basin in the greater Four Corners region.

Analcime-bearing tuffs in the Brushy Basin Member of the Morrison Fm., Arches National Park. Similar analcimic tuffs will be seen at Beclabito Dome, New Mexico, one of the field trip stops.

Clinoptilolite-bearing tuff in the Brushy Basin Member of the Morrison Formation, near Moab, Utah. Similar clinoptilolite-bearing tuffs will be seen at the Four Corners National Monument, one of the field trip stops.

Brushy Basin Member of the Morrison Formation near Montezuma Creek, UT. This locality, another stop on the field trip, contains tuffs that are variably altered and contain one or more authigenic minerals (e.g., clinoptilolite, analcime).



Bluff Sandstone Member of the Morrison Formation near Bluff, UT. This locality will be one of the field trip stops.

FCGS Foundation News

Four Corners Geological Foundation Student Awards Update

One of our MS Thesis Grant recipients, **Samuel G. Martin,** graduated in 2021 from New Mexico Institute of Mining and Technology, after receiving $1000 from FCGF for work on his thesis "STRUCTURAL EVOLUTION OF THE RESERVE GRABEN, NEW MEXICO, USA: IMPLICATIONS FOR LATE CENOZOIC EXTENSION IN THE RIO GRANDE RIFT - SOUTHERN BASIN AND RANGE PROVINCE".

His research found that overall, the timing and kinematics of faulting in the study area are similar to those of southwestern North America. Far-field stresses, governed mainly by the tectonic regime at the plate's western boundary of North America, have usually been considered a first order control on development of the Basin and Range Province, and this study suggests those stresses dominated deformation at least as far inboard as western New Mexico. Specifically, an early dextral component of slip on the graben's main border fault may have been related to the end of an earlier phase of NE-SW regional extension in a back-arc tectonic setting (e.g., Dickinson, 2002), while the middle-Miocene NW-SE extension that dominated the Reserve graben's development may have been related to lengthening of the transform boundary at the plate's western margin, since it coincides with a change in extension direction and accelerated rifting throughout much of southwestern North America. If this is the case, the results of this study suggest the regional change in extension direction occurred around 15 Ma (from Martin, 2021).

Samuel thanked the Four Corners Geological Foundation and Society, among other supporters, for their funding and encouragement during this work. He said, "this support has made a large part of his research possible." Since graduating, Samuel has started a PhD program in geology at the University of British Columbia! We look forward to hearing more from this young scientist.

FCGS December Meeting Snaps

Thanks to Tim Rynott for the photos!

NEWS FROM AROUND THE REGION

Project Manager – Alaska critical minerals exploration and development program

An Alaska-based mineral resource exploration and development company has an opening for a full-time Project Manager. The ideal candidate will be a geologist or geological engineer with more than 10 years' experience in mineral exploration and advanced project development, ideally in the northern parts of North America (as the project is based in Alaska).

The project manager should have a solid understanding of most aspects of project management and resource development, including drilling, sampling, QA/QC, geology, geochemistry, camp management and related logistics. Understanding related to environmental protection and permitting, engineering, metallurgy, and resource modeling is considered a plus. The project manager will manage drill planning and drilling, ensure the best possible sample quality, manage day-to-day camp operations during the field season, and coordinate the work of contractors, consultants, engineers, and metallurgists.

The project is located on the Seward Peninsula, and having residence in the State of Alaska with good air-travel connection is a plus. Alternatively, the Project Manager should be willing to relocate to Alaska.

About half the year (field season) will primarily be committed to technical work and half to managing logistics and operations. A good portion of field-season time shall be spent in the town of Nome and remotely onsite, with occasional breaks.
Remote camp experience is critical. Good verbal and written communication skills are essential. The company has a strong commitment to the highest standards in safety, employee protection and development, community engagement, and environmental responsibility. The project manager must be an individual who shares these values.

Lost River Mining Inc. is focused on advancing these critical minerals properties to an economic decision point(s). Interested individuals should contact info@lostriverak.com

Denver Mining Club January Schedule
Golden Corral Buffet & Grill 3677 South Santa Fe Drive, Sheridan, CO 80110 – Southwest side at Santa Fe Dr. & Hampden Ave.
Purchase of buffet lunch required (Teachers eat for FREE)
Every Monday, except when noted, 11:30 a.m. - 1:00 p.m. (+/-).
Visitors always welcome!

January 9.--Lindsey V. Maness, Jr., Geologist and Suellen Barnhard, Earth Treasures Tours. "Nome Gold."

January 16.--Ali Jaffri, CEO, Applied Stratigraphix LLC. "Controlling Parameters on Lithium Clay Deposits - Lessons Learnt from the Central San Juan Caldera Complex of Colorado."

January 23.--Deborah Miles, Geophysicist & Professional Engineer. “What the Frac?”

January 30.--Silvia Pettem, Richard Mittasch, and Peyton Jackson, Friends of Caribou Cemetery. “Cornwall to Caribou and the Caribou Cemetery Restoration Project.”

For more information contact Dick Beach. Tel: 303-986- 6535; E-mail: dickbeach@alumni.mines.edu; Website: www.denverminingclub.org

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“OSHA Update and Safety Tips for Environmental Consultants”
Cynthia E. Braun, President, Principal Health & Safety Consultant, Braun Safety Associates, LLC
January 10, 2023, 11:45 am-1 pm; In-Person and Virtual
Davis Graham and Stubbs, LLP, 1550 17th Street, Suite 500, Denver, CO 80202

Do OSHA regulations apply to environmental consulting work? Has OSHA ever fined an environmental consulting company? Do environmental consulting firms need a health & safety program? The answer is: YES, YES, YES!

Join us for this eye-opening session for a review of environmental consulting hazards and risks, and to hear what’s new with OSHA. But beware -- this isn’t your grandmother’s same ol’ update. You’ll be treated to a relevant and scintillating OSHA Update, while gathering recommendations for your company’s written health and safety program to protect your biggest asset – your employees. Christmas might be over, but wait – there’s more! Find out which environmental firms were fined $46,900-$787,000 in the past few years for safety violations, and learn what OSHA’s proposed regulations and budget are for 2023. You’ll leave repeating and believing that Safety is Something We Can Live With!

For more information and Virtual Registration, please go to https://coems.org/events/cems-hybrid-luncheon-osha-update-and-safety-tips-for-environmental-consultants-january-10/

After registering, you will receive a confirmation e-mail containing detailed information about joining the webinar. If you lose your registration or confirmation, or have questions, please do not hesitate to contact CEMS via e-mail admin@coems.org.

In Person Registration: Members may either bring their own lunch and attend the meeting for no charge, or they may request that CEMS order a box lunch for them. The cost of the box lunch for members is $18.00; for non-members, $21.00. PLEASE give your name, company name and phone number via email to admin@coems.org. PLEASE INDICATE IF YOU ARE RESERVING A BOX LUNCH OR BRINGING YOUR OWN. In-person reservations must be received by Friday, January 6, 2023 BEFORE 5:00 PM. Payment will be accepted at the door with prior reservation. Please cancel your reservation by Friday, January 6, 2023 if you are unable to attend. It is the policy of the Society to bill for meals reserved but unclaimed. You may also pay with credit card via PAYPAL at the above website.

AEG-Mile High Chapter January Dinner and Talk
Tuesday, January 10, 2023; 5:30 - 8:30 pm MT; In-person only
Trailhead Taphouse & Kitchen, 811 12th Street, Golden, CO 80401
Social hour begins at 5:30, announcements and introductions at about 6:45, talk will begin at about 7 pm.

Speaker: Ryan Marsters, Lithos Engineering
Topic: "The Spiro Mine Tunnel Water Supply System Rehabilitation"

Summary:
The Spiro Mine Tunnel was constructed from 1916 to 1924 to drain water levels for a honeycomb complex of mines near Park City, Utah. Historical usage has transitioned from mining support to a skier subway, laboratory, and now as a key water supply component. Early construction relied on drill and blast techniques to excavate layered sedimentary rocks. Early support used timber lagging, which subsequently failed and required periodic replacement with steel sets, split sets, chain link, and more timber. To secure long-term water supply, a multi-faceted approach was taken to rehabilitate the failing initial 400 LF of tunnel with modern support techniques and retain the architectural flavor of the area. Not only was the tunnel support rehabilitated, but the water delivery system beneath the tunnel was replaced as well. This presentation will discuss the design elements, construction issues, and ongoing work.

Professionals: Dinner is available but not included in the meeting price. If you plan to have dinner at Trailhead, please order when you arrive and finish eating by the time the talk begins at about 7.

Currently enrolled students: The chapter will pay for STUDENT dinners and non-alcoholic beverages, but you MUST make a reservation so I can make you a name badge -- this is how Trailhead will know to put student dinners on the chapter's tab. Please order when you arrive and finish eating by the time the talk begins at about 7.

Non-student reservations: https://www.aegmilehigh.org/chapter-meeting-reservations/attend-chapter-meeting-2022
Student reservations: https://www.aegmilehigh.org/reservations

CSM Van Tuyl Lectures

1) Thursday, January 12, 2023; 4 PM MST; In-person and Zoom
Colorado School of Mines, Friedhoff Hall 1&2
Joint Geology & Geological Engineering, Geophysics, Earth & Society Programs, USGS Geologic Hazards Science Center, Office of Global Initiatives Lecture

David Applegate, USGS Director
"Science in Service to Society: The Evolving Role of the U.S. Geological Survey"

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Abstract:
Since its founding, the U.S. Geological Survey (USGS) has been dedicated to delivering science to inform decisions on some of the most consequential issues facing our nation. That was the case in 1879 when the order of the day was to characterize the resources of an expanding nation. It is very much the case today when a growing population requires safe and abundant water resources, critical minerals for our energy future, healthy ecosystems that foster our quality of life and fulfill our stewardship responsibilities, and disaster-resilient communities prepared to thrive despite the natural hazards we face in a warming world. Relying on a talented, dedicated workforce and a wide array of partnerships, the USGS combines foundational mapping, monitoring, remote sensing, and sampling of our changing Earth systems with the technical expertise to analyze, model, and interpret these data. We seek to deliver real-time situational awareness, long-term assessments, and other scientific information in ways that are relevant, meaningful, and useful to those who need it most, when they need it most.

Before and after the lecture there will be a reception from 3:30-4 pm and from 5-5:30 pm with appetizers and drinks.

Zoom link: https://mines.zoom.us/j/97138652271?pwd=U0ZTMHlzRjIydkJCd04ySURPTnhNdz09

2) January 19; 4:00 pm - 5:00 pm MST; In-person and Zoom
Colorado School of Mines, Berthoud Hall 241

Judy Hannah, Colorado State University
Topic/ Abstract TBA

After the lecture there will be a get-together from 5-6 pm in BE 243 with pizza and sodas.
Zoom link: https://mines.zoom.us/j/96880360450?pwd=RWpNV1ZFZ2RZREMxNDJZUHNLTHRIZz09
For more info on Van Tuyl Lectures, go to https://geology.mines.edu/events-calendar/lectures/

Extractive Metallurgy Chapter of Denver January Dinner
January 12, 2023; 6:00 pm; IN-PERSON
The Club at Rolling Hills, 15707 W 26th Ave., Golden, CO 80401
https://www.theclubatrollinghills.org.

We will have the pleasure of a presentation by Dr. Nelson Mora, Chief Technology Office at Jetti Resources, who will speak on **"Updates on Jetti Resources Technology on Chalcopyrite Leaching."**

Dr. Nelson Mora is Chief Technology Officer at Jetti Resources. He is a chemical engineer and expert in heap leaching with over 20 years of experience in improving and expanding base metal extraction processes. Before joining Jetti, Dr. Mora held leadership roles spanning technology, projects and operations at Vale, Xstrada Copper and BHP Billiton. Dr. Mora holds a PhD in Applied Science from RMIT University in Melbourne, Australia, and has completed the Advanced Management Program at the University of Pennsylvania's Wharton School of Business.

Abstract:
The formation of a passivating layer on the mineral surface during conventional leaching inhibits further copper extraction. Jetti Resources has developed a catalytic technology that disrupts existing passivating layers and prevents their initial formation, thus extending the leaching reaction. This presentation provides an overview of the technology, the results of its commercial implementation and gives an update on deployment plans.

Bring a friend so that he or she can also enjoy the great company and presentation. The meeting dinner will be $35 per person. Student attendee dinners are complimentary.

The Executive Committee will meet at 5:30 PM.

Please RSVP by Tuesday, Jan 10th by 8:00 PM.
Erik Stepperud (720) 331-3222, stepperude@hazenresearch.com
Or Solly Zitron (720) 840-9203, zz@zzitron.com

MMSA Colorado Section January Luncheon
January 13, 2023; 11:30 AM – 1:30 PM; In-person
Denver Marriott West, 1717 Denver West Marriott Boulevard, Golden, CO 80401

Christopher Wyatt
"On the Road to Deep Sea Polymetallic Manganese Nodule Mining: Potholes, Detours, and Speed Traps"

The talk will focus on recent developments including recent mining pilot test, new contract areas, improvement in exploration, equipment developments, and regulatory changes that are increasing the odds of commercial development. With average grades of 1.5% copper, 1.5% nickel and 0.5% cobalt along with other valuable by-product minerals these "batteries in a rock" may assist in the energy transition that is underway.

To get more info or to register, go to https://www.eventbrite.com/e/mmsa-colorado-section-january-luncheon-tickets-503736719087?aff=odeccpebemailcampaigns&utm_source=eventbrite&utm_medium=ebcampaigns&utm_campaign=12863399&utm_term=ctabutton&mipa=ABIdvVtscSfhrWbXccVaYm9S3PDcsdZWZoORAZB45yaHynCGJjI2u2ppfjxstcznieCr4x1jTM_JONj4Ju6v8P8cWRP6SoBToQPczgO_5xJh--6WzEGk_wnXrpiFIqjHkO64_MRnIXPjiiRd2vhVaGjYUbyjIvg-msml_86Xro4BZShkqn0oyNILYi58csF_gNDxvuIbjwd93hwHejyXl0v48ydh18WSB7zDPSUVhjawuV99HBE7SQ3O8zxx7xCXXXOb29fZ2qbRaElfwKhCkIMUm0j8yz6Nbg

RMAG JANUARY LUNCH TALK
January 18, 2023; 12:00 pm - 1:00 pm; In-person and virtual
Maggiano's Little Italy, 500 16th St. Mall, #150, Denver, CO 80202

"State of Energy": Trisha Curtis, Petronerds President and CEO

Abstract:
As we start the new year, we'll take a step back to examine the global overview of the state of energy. Covering topics from oil and energy, U.S. shale oil and gas production themes and outlook. As well as addressing the realities of ongoing geopolitical impacts from China and Russia and what that means for potential recession risks.

To register or get more info, go to
https://www.rmag.org/index.php?src=events&submenu=Events&srctype=detail&category=RMAG%20Luncheons&refno=244

MINEXCHANGE 2023
SME Annual Conference & Expo and CMA 125th National Western Mining Conference
Feb. 26 – March 1, 2023
Denver Convention Center

As the mining industry steps into the spotlight, supplying the minerals critical to powering a green economy, the focus on ESG, innovation and health & safety is more important than ever. Immerse yourself in the new safety strategies, exiting advances in AI, and important initiatives for a sustainable future at MINEXCHANGE. At MINEXCHANGE, professional development moves beyond the expected to the vital insights you need to evolve with the future of mining.

Early bird registration ends on January 19.
To get more info or to register, go to https://www.smeannualconference.com/

FOUR CORNERS GEOLOGICAL SOCIETY

P.O. Box 1501, Durango, CO 81302

MEMBERSHIP RENEWAL or APPLICATION: June 1, 2022 to May 31, 2023

NEWSLETTERS SENT BY EMAIL ONLY

*Name: _____

*Address: _____ City: _____ State: _____ Zip: _____

*Email: _____ Phone: _____

*Employer: _____

***Please check your interests:**

- ☐ Sedimentology & stratigraphy
- ☐ Structure & tectonics
- ☐ Mineralogy, petrology, geochemistry
- ☐ Igneous geology, volcanology
- ☐ Ore geology and hard rock mining
- ☐ Other mineral extraction
- ☐ Petroleum geology
- ☐ Geophysics
- ☐ Geological engineering
- ☐ Geomorphology
- ☐ Quaternary geology
- ☐ Hydrology & water resources
- ☐ Environmental geology
- ☐ Geography / GIS
- ☐ Other interest (see box)

Please Identify a Membership Category:

Active Member	$25	Any person engaged in the practice or teaching of geology or who holds a Bachelor's Degree in geological science from a college of acceptable academic standards. Degree requirement may be waived if applicant has adequate professional experience. **Highest Degree, Type and Year:* _____ **College / University:* _____
Associate Member	$25	Any person who is a graduate of a college of acceptable academic standards with major studies related to, or associated with, geology. Degree requirement may be waived if applicant has adequate professional experience. **Highest Degree, Type and Year:* _____ **College / University:* _____
Student Member	Free	Any undergraduate or graduate student majoring in geology at a college of acceptable academic standards. **College / University:* _____ **Year expected to graduate:* _____
Emeritus Member	Free	An Active Member of 65 years old or older who has been a member for 25 years including time spent in military service. **Year emeritus status was awarded*: _____
Honorary Member	Free	An Active Member who has contributed distinguished service to the profession of geology and to the betterment of the FCGS. Determination is made by the FCGS Executive Committee. **Year honorarium was awarded:* _____.

Other Professional Interests:

**** Required information for new members. Current Members, please update.***

Please either print, complete and return this form with your check for dues made payable to: "Four Corners Geological Society" **and mail to the address above or go online to fourcornersgeologicalsociety.org .**

Please donate to the Foundation to support student research. Make out your check to: "Four Corners Geological Foundation" and include it in the envelope with your dues.