

## PROGRAM GUIDE

115th Annual Meeting  
Glenwood Springs, Colorado



JUNE 11–15, 2023  
Hotel Colorado



WELCOME TO  
COLORFUL  
COLORADO







The Association of American State Geologists (AASG) is an organization of the chief executives of the state geological surveys in 50 states and Puerto Rico. The responsibilities of the various state surveys differ from state to state, depending on the enabling legislation and the traditions under which the survey evolved. Almost all function as a basic information source for their state governments' executive, legislative, and judicial branches. Some have regulatory responsibilities for water, oil and gas, land reclamation, etc.

The first state survey was established in 1823 in North Carolina. By 1840, there were at least 15 state surveys, most of which were charged with the discovery of mineral, energy, land, and water resources in their state or territory. The State Geologists began formal meetings with the U.S. Geological Survey in 1879, the year that organization was established. Since 1908, the Association has met regularly to discuss issues of common interest and to initiate united actions when warranted.

# AASG PRESIDENT'S WELCOME



Welcome to Colorado and the 115th Annual Meeting of the Association of American State Geologists (AASG). Colorado is known for its stunning and varied landscapes, including the towering Rocky Mountains, beautiful alpine lakes, colorful canyons, mighty rivers, sprawling sand dunes, and the high plains. All would agree that Colorado is one of the most beautiful states in the country. With the highest average elevation of any state, it has some of the best hiking, camping, and skiing in the nation. In addition to its amazing landscapes, Colorado boasts large thriving cities and beautiful resort towns. Glenwood Springs, our venue for this meeting, is one such resort town that resides along the Colorado River, not far from its headwaters, and is well known for its therapeutic hot springs.

We gather in this beautiful setting as geoscientists representing state geological surveys, federal agencies, and other geoscience organizations, with a goal of strengthening our many enduring partnerships. Our collective mission is to provide unbiased geoscience information for the public good. We do so through analysis of the geologic framework, assessment of natural resources (e.g., water, mineral, and energy), and evaluation of geologic hazards (e.g., earthquakes, floods, landslides, and sinkholes). Our major objectives include fostering public safety, resilient infrastructure, more efficient and cost-effective exploration for natural resources, and environmentally sound and sustainable economic development. To accomplish these objectives, we endeavor to broadly disseminate our knowledge through reports, geologic maps, articles in scientific journals, databases, web applications, and social media.

Although challenging to convey all that we do in a five-day meeting, we capture the essence of our many contributions through a combination of 1) plenary sessions focused on major programs that unite our diverse state geological surveys with key partners, 2) topical breakout sessions that highlight activities of AASG committees, including geologic mapping, natural resources, geologic hazards, environment, data dissemination, education, workforce, and diversity, and 3) field trips that connect our mission to exemplary local examples while facilitating friendly discussion and networking with our colleagues and friends. A common theme through all of these activities is a candid appraisal of current opportunities and challenges in the geosciences and how these relate to society as a whole.

We are continually reminded that our products are critical to modern society. Recent successes in enhancing funding for key programs demonstrates effective communication about the wide applicability and importance of these contributions. These enhancements have benefitted both state geological surveys and federal agencies, but moreover are benefitting the citizens of this vast and diverse country. These advances also demonstrate that we are most successful when working together in partnerships built on mutual respect, trust, and communication.

So, as you marvel at the beautiful landscapes and inspiring geology of Colorado, please take some time to digest the many facets of our collective contributions across the multiple disciplines of the geosciences. Society needs unbiased geoscience more than ever to meet the many challenges of our time. Also, please use this opportunity to establish or strengthen collaborations, develop or renew friendships, and listen and learn from your friends and colleagues.

I wish to thank our gracious hosts, including Matt Morgan and his entire team at the Colorado Geological Survey. We are greatly indebted for all of their efforts in staging this fantastic meeting.

Finally, it has been a great pleasure to serve as AASG President for the past year. I have learned so much from all of you, including my fellow State Geologists, AASG Associate Members, AASG Honorary Members, and those with the USGS and other organizations. It has truly been an honor working with you and getting to know many of you better. I look forward to continued interactions for years to come. I wish all of you many rewarding experiences during the meeting. Enjoy Colorado!

James E. Faulds, PhD

State Geologist of Nevada

Nevada Bureau of Mines and Geology, University of Nevada, Reno

# AASG 2023 HOST WELCOME



The Colorado Geological Survey (CGS) at the Colorado School of Mines is delighted to welcome our colleagues and friends to the 115th Annual Meeting of the Association of American State Geologists (AASG). Colorado in the summer is an amazing place to be and Glenwood Springs is in the heart of it all! The main attraction of the town is its hot springs and vapor caves which were often visited by indigenous peoples for their therapeutic qualities. Originally named “Defiance”, the town of Glenwood Springs was incorporated in 1885. A railroad stop was added shortly thereafter which brought in many tourists and colorful figures, such as “Doc” Holliday and President Theodore Roosevelt. The Hotel Colorado, built in 1893, often hosted dignitaries such as Roosevelt, who stayed at the hotel for an entire summer.

The section of Interstate-70, which winds through Glenwood Canyon and passes through town, is an engineering marvel that took the labor and ingenuity of many skilled workers (including geologists). This “golden spike” section joined the east and west segments of I-70 in 1992 to complete the entire highway. Some of the geologic units along this route are prone to debris flows and rockfall which often close parts of the highway and wreak havoc upon travelers, demonstrating the continued need for engineers and geologists in the area.

Starting at the town of Dotsero, near the east entrance of the canyon, one can view the youngest volcanic rocks in Colorado (only 4200 years old). Head west down the canyon to Glenwood Springs and you will drop nearly 400 vertical feet through a stack of sedimentary rocks and pass by the “Great Unconformity”, where the Cambrian-age Sawatch Sandstone rests on 1.7-billion-year-old igneous and metamorphic rocks. Within about an hour’s drive from town, you can gaze upon the majestic Maroon Bells, view an active rock glacier on Mt. Sopris, or observe evidence of salt tectonics that is causing the Grand Hogback Monocline to “unfold.” The geology of Colorado is yours to explore.

Even though I am a newly minted State Geologist, I have had the very fortunate opportunity to work with many of you during my tenure at CGS. Many state geological surveys are built upon solid relationships with other government agencies. These relationships are especially important if we want to be productive and solve problems. Our society is dealing with a broad range of geoscience-related issues such as the growing need for domestic critical minerals, the energy transition, groundwater resource management, development into geologically hazardous areas – and of great significance to me – K-12 earth science education and public outreach. The session program that we have assembled covers these and many more important topics and it is our hope that you glean not only new insights but also new relationships that can help your agency tackle these and other crucial issues.

This meeting could not take place without the generous support of our sponsors. Advertisements for the various sponsors are placed in this program guide and also near the registration table. Please take the time and thank their representatives, visit their websites, or drop a “thank you” email.

In closing, please reach out to me or any of the meeting organizers should you need assistance during your visit. I wish all of you an enjoyable experience and very productive meeting in Colorado!

## **Matt Morgan**

Director and State Geologist  
Colorado Geological Survey

*“The geology of Colorado is written in the rocks...the scenery of Colorado is incomparable...words cannot convey the beauty and harmony of the assemblage.”*

*-Russell D. George, Colorado State Geologist, 1907-1928*

# AASG 2023 MEETING HOST

The Colorado Geological Survey (CGS) plays a pivotal role in advancing geologic research, supporting land-use decision-making, and promoting public awareness and understanding of Colorado's unique geology. Through a wide range of activities, including geologic mapping, mineral resource and groundwater studies, geologic hazard assessments, research initiatives, and public outreach, CGS has served as a valuable source of information for stakeholders, policymakers, and the public since its establishment in 1907 and statutory reinstatement in 1967. As an independent state agency under the umbrella of the Colorado School of Mines (CSM), the CGS contributes directly to the sustainable development, safety, and stewardship of Colorado's geological resources. A combination of state general funds, state severance tax funds, external grants, fee-based services, and cooperative agreements finance its operations.



Collaboration is at the core of the CGS mission. Survey staff actively partner with federal, state, and local agencies, educational and professional organizations, museums, and other groups to enhance our capabilities and broaden our impact. Since relocating to CSM a decade ago, extensive collaboration within this Tier One research university setting—exchanging data, expertise, and research findings—further enhances our understanding of the state's geology.

Traditional geologic mapping is the foundation of many CGS programs and projects. Since 1992, the CGS has participated in the STATEMAP portion of the US Geological Survey's National Cooperative Geologic Mapping Program and produced more than 150 1:24,000-scale quadrangles across 25 counties. Data from these maps are served to the public as GIS datasets, map services, and digital files.

Another significant area of CGS work involves mapping and assessing geologic hazards throughout Colorado. The state's diverse geologic landscape presents many challenging hazards, including landslides, debris flows, rockfall, swelling and collapsible soils, flooding, and occasional earthquakes. The CGS conducts comprehensive assessments to identify high-risk areas and inform land-use planning, zoning regulations, and building codes. By integrating geologic hazard information into local and state-wide decision-making processes, the CGS helps to minimize risk, facilitate responsible land development, and ensure the safety and resilience of communities.

There have been five State Geologists and Directors since reforming:

- Matthew L. Morgan (2022–present)
- Karen A. Berry (2013–2022)
- Vincent Matthews III (2004–2012)
- Vicki J. Cowart (1993–2003)
- John W. Rold (1969–1993)

## CGS' MAJOR ACTIVITIES

- *Geologic Hazards and Emergency Response*
- *Groundwater Resources*
- *Mineral Resources and Energy*
- *Geologic Mapping*
- *Land-Use Reviews*
- *GIS and Publications*
- *Education and Outreach*



The Colorado Geological Survey office on CSM campus, Golden, Colorado.

With the rich legacy of mineral resources in Colorado, and the current national focus on critical minerals used in a wide range of technologies, the CGS staff is actively engaged—with two neighboring states, Wyoming and Utah—in Department of Energy CORE-CM research projects. We are part of the USGS Earth MRI program—mapping, sampling, and evaluating potential critical mineral resources in the Wet Mountains and La Plata Mountains. Based on the need from local governments, we are mapping and characterizing aggregate mineral resources at the county level.

The CGS plays a crucial role in assessing statewide groundwater resources — evaluating their availability, quality, and sustainability. This information aids both local and statewide stakeholders in making informed choices on water resource management while balancing competing demands on groundwater. As an “Upper Colorado River Basin” and headwater state, our hydrogeological research plays a vital role in mapping the future of this important resource in the Western US. The online “Colorado Groundwater Atlas”—created in collaboration with the Colorado Department of Public Health and Environment—is an example of our commitment to supply critical groundwater data, information, and expertise directly to the wider public.

The CGS recognizes the importance of public outreach and education in fostering geologic literacy and awareness. Through field trips, public lectures, and extensive free online resources, our staff engages with the general public, educators, and students, imparting geologic knowledge and promoting a deeper understanding and appreciation of Colorado’s geological heritage. The CGS website, accessible using the QR code below, includes more than 900 free-for-download publications, maps, datasets, and GIS packages. The RockTalk blog, based on an earlier and very popular print circular, was started in 2017 and supplies important updates and educational material to an ever-widening community of enthusiastic subscribers.





*The AASG acknowledges the generous contributions of the following organizations, without whose support this meeting would not have been possible.*

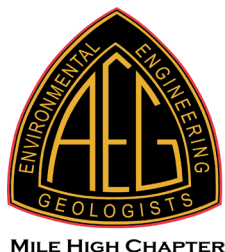
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# MEETING ATTENDEES

## State Geological Surveys

<b>Scott Ausbrooks*</b>	Arkansas Geological Survey	<b>Jessica Moore*</b>	West Virginia Geological Survey
<b>Dick Berg*</b>	Illinois State Geological Survey	<b>Matt Morgan*</b>	Colorado Geological Survey
<b>Claudio Berti*</b>	Idaho Geological Survey	<b>Robert Morrow</b>	South Carolina Geological Survey
<b>Gale Blackmer*</b>	Pennsylvania Geological Survey	<b>Richard Ortt*</b>	Maryland Geological Survey
<b>Phillip Bradley</b>	North Carolina Geological Survey	<b>Ken Papp</b>	Alaska Geological & Geophysical Surveys
<b>Carey Bridges*</b>	Missouri Geological Survey		
<b>Erin Campbell*</b>	Wyoming State Geological Survey	<b>Phil Pearthree*</b>	Arizona Geological Survey
<b>Jill Carlson</b>	Colorado Geological Survey	<b>Jerry Prewett</b>	Missouri Geological Survey
<b>Eric Carson*</b>	Wisconsin Geological and Natural History Survey	<b>Keith Schilling*</b>	Iowa Geological Survey
		<b>Lesley Sebol</b>	Colorado Geological Survey
<b>Jim Chapman</b>	North Carolina Geological Survey	<b>Meghan Seremet*</b>	Connecticut Geological Survey
<b>Tim Cowman*</b>	South Dakota Geological Survey	<b>Amber Steele</b>	Missouri Geological Survey
<b>Jessica Czajkowski</b>	Washington Geological Survey	<b>Laila Sturgis</b>	New Mexico Bureau of Geology and Mineral Resources
<b>Ruarri Day-Stirrat*</b>	Oregon Department of Geology and Mineral Industries		
		<b>Berry "Nick" Tew*</b>	Geological Survey of Alabama
<b>Benjamin DeJong*</b>	Vermont Geological Survey	<b>Todd Thompson*</b>	IU - Indiana Geological and Water Survey
<b>William Doar</b>	South Carolina Geological Survey		
<b>David T. Dockery III*</b>	Mississippi Department of Environmental Quality	<b>Jennifer Thornburg</b>	California Geological Survey
		<b>Scott Tinker*</b>	Bureau of Economic Geology-University of Texas at Austin
<b>Nelia Dunbar*</b>	New Mexico Bureau of Geology and Mineral Resources		
<b>Clare Falcon*</b>	Louisiana Geological Survey	<b>Sherilyn Williams-Stroud</b>	Illinois State Geological Survey
<b>James Faulds*</b>	Nevada Bureau of Mines and Geology, UNR	<b>Seth Wittke</b>	Wyoming State Geological Survey
		<b>David Wunsch*</b>	Delaware Geological Survey
<b>Scot Fitzgerald</b>	Colorado Geological Survey	<b>John Yellich*</b>	Michigan Geological Survey
<b>Greg Guthrie</b>	Geological Survey of Alabama		
<b>William Haneberg*</b>	Kentucky Geological Survey	<b>*State Geologists</b>	
<b>Casey Hanell*</b>	Washington Geological Survey		
<b>Heather Hanna</b>	North Carolina Geological Survey		
<b>Nicholas Hayman*</b>	Oklahoma Geological Survey		
<b>Scott Howard*</b>	South Carolina DNR - Geological Survey		
<b>Michael Hylland</b>	Utah Geological Survey		
<b>D. Mark Jones*</b>	Ohio Geological Survey		
<b>James Kalbas*</b>	Kansas Geological Survey		
<b>William Keach*</b>	Utah Geological Survey		
<b>Andrew Kozlowski*</b>	New York State Museum		
<b>Clinton Kromhout</b>	Florida Geological Survey		
<b>Jeremy Lancaster</b>	California Geological Survey		
<b>Jonathan Lovekin</b>	Colorado Geological Survey		
<b>Katherine Luciano</b>	South Carolina Geological Survey		
<b>Jason McClaughry</b>	Oregon Department of Geology and Mineral Industries		
<b>Guy "Harley" Means*</b>	Florida Geological Survey		
<b>John Metesh*</b>	Montana Bureau of Mines and Geology		



## Other Professionals

<b>David Applegate</b>	U.S. Geological Survey	<b>Michael Marketti</b>	U.S. Geological Survey/NCGMP
<b>Jonathan D. Arthur</b>	American Geosciences Institute	<b>Jeff Mauk</b>	U.S. Geological Survey
<b>Hannah Boggs</b>	U.S. Geological Survey, CSS	<b>Mark McKoy</b>	U.S. Department of Energy, National Energy Technology Laboratory
<b>Grant Bromhal</b>	U.S. Department of Energy		
<b>Megan Carr</b>	Bureau of Ocean Energy Management, DOI	<b>Darcy McPhee</b>	U.S. Geological Survey
<b>Donna Charlevoix</b>	EarthScope Consortium	<b>Christine Millette</b>	U.S. Geological Survey
<b>Jeannine Cody</b>	U.S. Geological Survey	<b>Kelly Murphy</b>	U.S. Geological Survey
<b>Joseph Colgan</b>	U.S. Geological Survey	<b>Geoffrey Plumlee</b>	U.S. Geological Survey
<b>Margo D. Corum</b>	NASEM/BESR	<b>Lindsay Powers</b>	U.S. Geological Survey/NGGDPP
<b>Warren Day</b>	U.S. Geological Survey	<b>Margo Regier</b>	National Academy of Sciences
<b>Elizabeth Duffy</b>	The Federal Affairs Office	<b>Jeffrey Reidenauer</b>	Bureau of Ocean Energy Management
<b>Kevin Gallagher</b>	U.S. Geological Survey	<b>Kate Ritzel</b>	U.S. Geological Survey/NCGMP
<b>Stephanie Gaswirth</b>	National Park Service	<b>Sally Roberts</b>	U.S. Geological Survey
<b>Jonathan Godt</b>	U.S. Geological Survey	<b>Sarah Ryker</b>	U.S. Geological Survey
<b>Michael Grimm</b>	U.S. Geological Survey	<b>Carma San Juan</b>	U.S. Geological Survey
<b>Gavin Hayes</b>	U.S. Geological Survey	<b>Layne Scherer</b>	National Academies of Sciences, Engineering, and Medicine
<b>Terri Hogue</b>	Colorado School of Mines		
<b>Karen Jenni</b>	U.S. Geological Survey	<b>Jenna Shelton</b>	U.S. Geological Survey - NCGMP
<b>Aaron Johnson</b>	AIPG	<b>Deana Sneyd</b>	ASBOG
<b>Michaela Johnson</b>	U.S. Geological Survey - NGGDPP	<b>Ren Thompson</b>	U.S. Geological Survey
<b>Randy Kath</b>	National Association of State Boards of Geology	<b>Kenzie Turner</b>	U.S. Geological Survey
	American Geosciences Institute	<b>Michael Weathers</b>	U.S. Department of Energy
<b>Christopher Keane</b>	U.S. Geological Survey	<b>Kasey White</b>	Geological Society of America
<b>Darcee Killpack</b>	U.S. Geological Survey	<b>Colin Williams</b>	U.S. Geological Survey
<b>Teresa Kirschling</b>	U.S. Geological Survey	<b>Laura Wittke</b>	University of Wyoming Geological Museum
<b>Alicia Lindauer</b>	U.S. Geological Survey		
<b>Randy Locke</b>	University of Illinois, Prairie Research Institute	<b>Kristine Zellman</b>	U.S. Geological Survey

## Honorary Members and Emeriti

<b>Karen Berry</b>	Colorado	<b>Vicki McConnell</b>	AASG
<b>William Kelly</b>	New York	<b>Karl Muessig</b>	New Jersey
<b>Robert Marvinney</b>	Maine	<b>John Parrish</b>	California
<b>Vincent Matthews</b>	Colorado	<b>Jonathan Price</b>	Nevada

## Guests

<b>Terri Ausbrooks</b>	Guest of Scott Ausbrooks	<b>Tammy Means</b>	Guest of Harley Means
<b>Kim Cowman</b>	Guest of Tim Cowman	<b>Charles Meertens</b>	Guest of Lindsay Powers
<b>Eileen Dallabrida</b>	Guest of David Wunsch	<b>Yvonne Metesh</b>	Guest of John Metesh
<b>Gratia Deane</b>	Guest of William Kelly	<b>Elizabeth Muessig</b>	Guest of Karl Muessig
<b>Carolyn Dockery</b>	Guest of David Dockery	<b>Elisabeth Price</b>	Guest of Jonathan Price
<b>Guinevere Falcon</b>	Guest of Clare Falcon	<b>Edward Sague</b>	Guest of Karl Muessig
<b>R. Nick Falcon</b>	Guest of Clare Falcon	<b>Virginia Sague</b>	Guest of Karl Muessig
<b>Cheryl Marvinney</b>	Guest of Bob Marvinney	<b>Linda D.P. Thompson</b>	Guest of Todd Thompson
<b>Susan Matthews</b>	Guest of Vince Matthews	<b>Karen Yellich</b>	Guest of John Yellich

# SCHEDULE AT-A-GLANCE

SUNDAY, JUNE 11

MONDAY, JUNE 12

TUESDAY, JUNE 13

June 11 Sunday	June 12 Monday	June 13 Tuesday
	<b>BREAKFAST</b> <i>(included all attendees)</i> 7:00-7:45 am <b>Devereux Ballroom</b>	<b>BREAKFAST</b> <i>(included all attendees)</i> 7:00-8:00 am <b>Devereux Ballroom</b>
	<b>OPENING PLENARY SESSION</b> <b>Devereux Ballroom</b> 8:00-10:00 am	<div> <b>BREAKOUT SESSION COASTAL (Means)</b>  <b>Roosevelt Room</b>            8:30-10:00 am         </div> <div> <b>BREAKOUT SESSION DEI (Ortt)</b>  <b>Colorado Room</b>            8:30-10:00 am         </div>
	<div> <b>AASG Closed Session</b>  <b>Roosevelt Room</b>            10:15 am-12:15 pm         </div> <div> <b>Colorado Mining History and History of the Glenwood Springs Area</b>  <b>Colorado Room</b>            10:15 am-12:15 pm         </div>	<div> <b>BREAKOUT SESSION DATA PRES. (Day-Stirrat)</b>  <b>Roosevelt Room</b>            10:15-11:45 am         </div> <div> <b>BREAKOUT SESSION HAZARDS (Hanell)</b>  <b>Colorado Room</b>            10:15-11:45 am         </div>
	<b>LUNCH</b> (included) 12:15-1:15 pm <b>Devereux Ballroom</b>	
	<b>BREAKOUT SESSION WATER (Schilling)</b> <b>Roosevelt Room</b> 1:15-2:45 pm	<b>BREAKOUT SESSION MINERALS (Berg)</b> <b>Colorado Room</b> 1:15-2:45 pm
	<b>BREAKOUT SESSION GEOTHERMAL (Berti)</b> <b>Roosevelt Room</b> 3:00-4:30 pm	<b>BREAKOUT SESSION ENERGY (Hayman)</b> <b>Colorado Room</b> 3:00-4:30 pm
	<b>WELCOME DINNER</b> <i>Dean Terri Hogue, Colorado School of Mines</i> <i>(included all attendees)</i> <b>Devereux Ballroom</b> 6:00-9:00 pm	<b>POST-TRIP EVENING SOCIAL</b> Dinner at Hotel Colorado (optional extra cost) 6:00-9:00 pm
	<b>Hospitality Suite</b> <b>Devereux Suite</b> 9:00-11:00 pm	<b>Hospitality Suite</b> <b>Devereux Suite</b> 9:00-11:00 pm

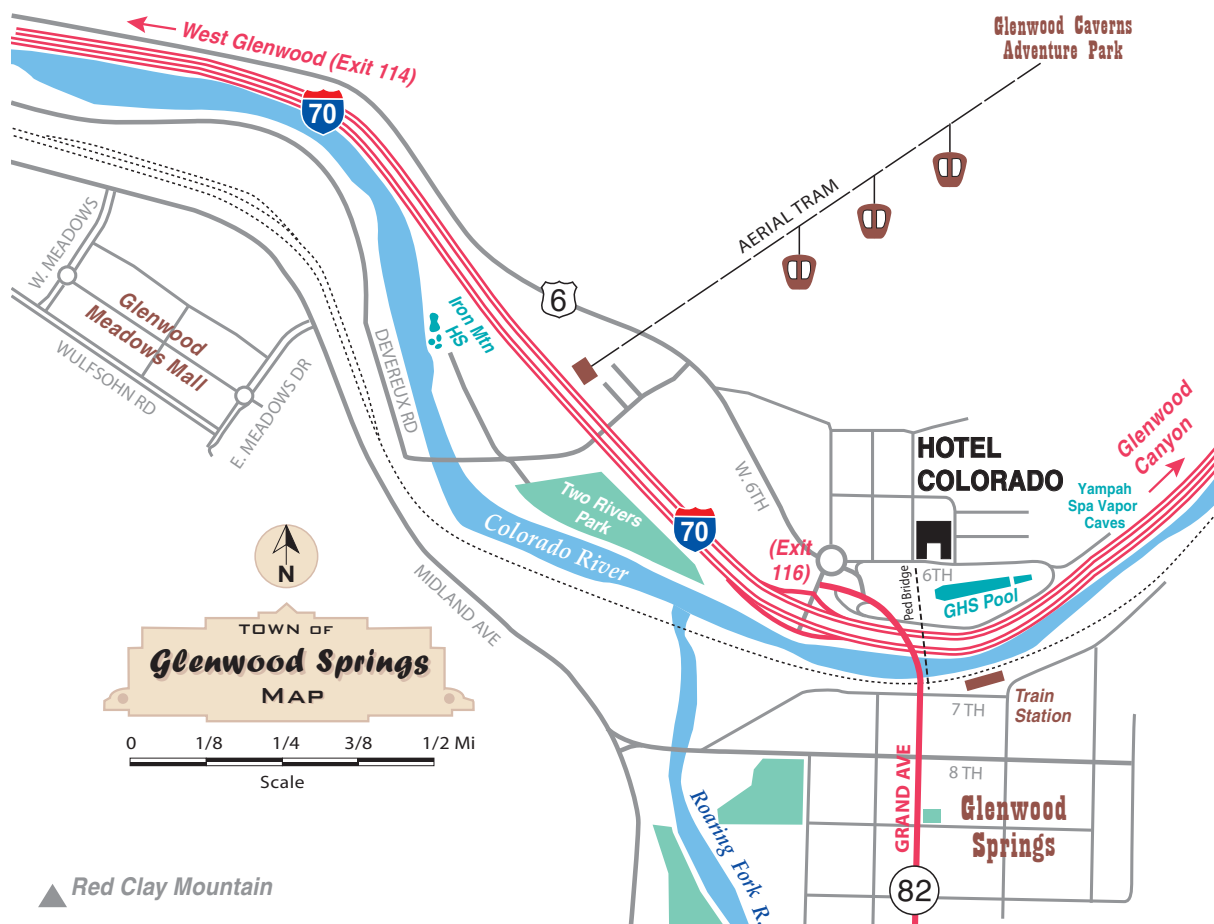
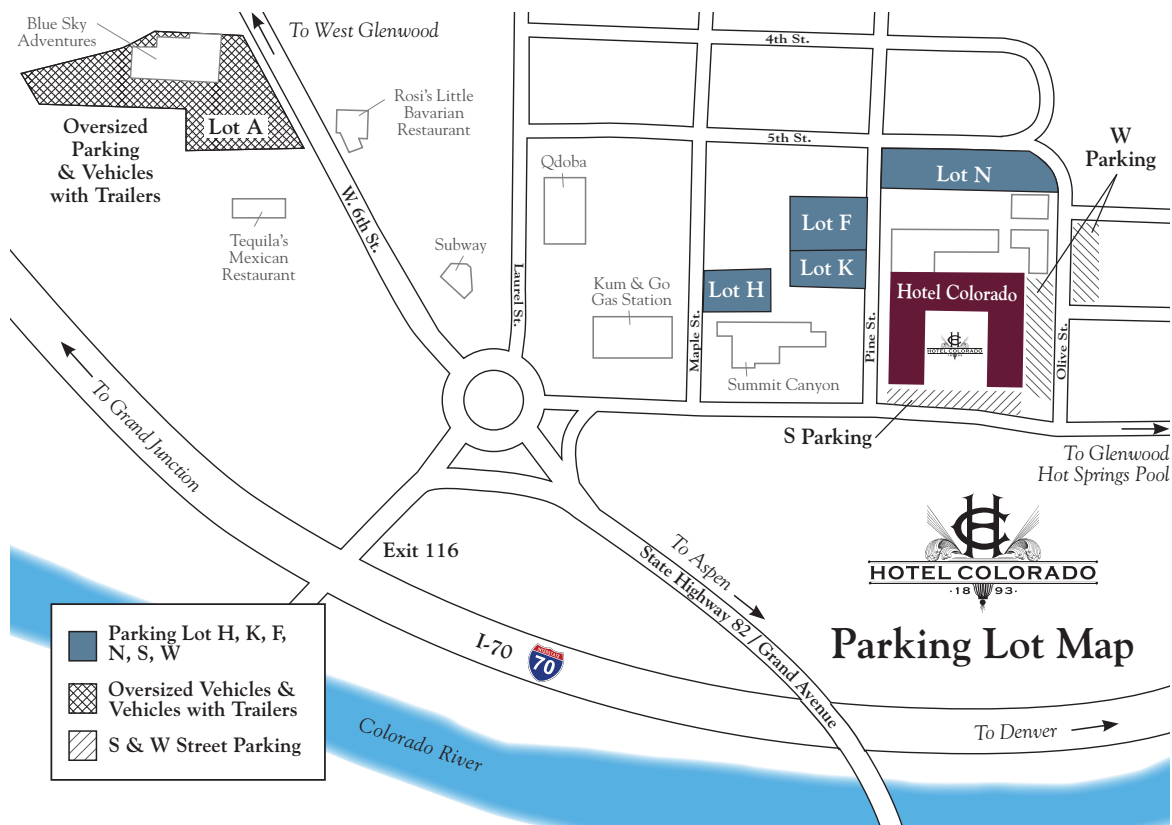
# SCHEDULE AT-A-GLANCE

WEDNESDAY, JUNE 14

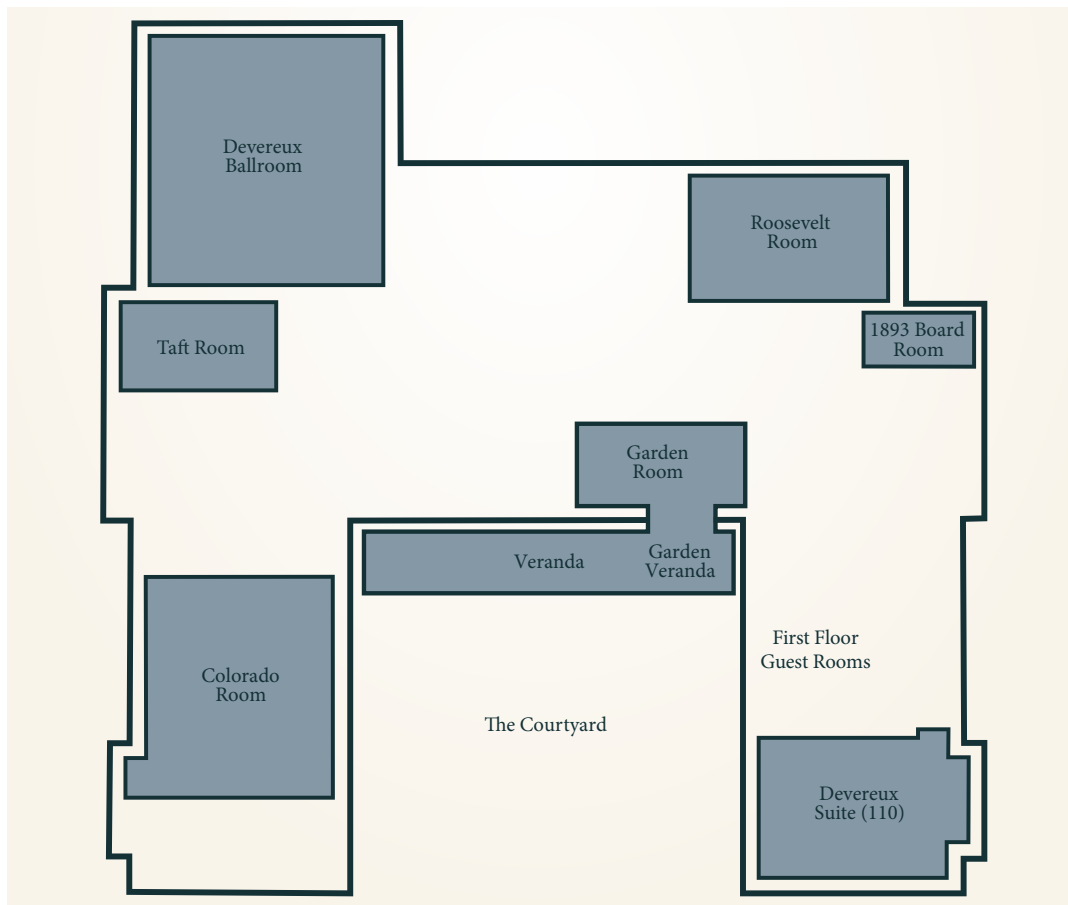
THURSDAY, JUNE 15

June 14 Wednesday			June 15 Thursday
REGISTRATION 7:00-10:00 am	<b>BREAKFAST</b> <i>(included all attendees)</i> 7:00-7:45 am <b>Devereux Ballroom</b>		<b>BREAKFAST</b> <i>(included all attendees)</i> 7:00-8:00 am <b>Devereux Ballroom</b>
		<b>JOINT BREAKOUT SESSION</b> <i>Challenges and Opportunities for State Surveys:</i> <b>EDUCATION &amp; WORKFORCE</b> (DeJong/LePain) <b>Devereux Ballroom</b> 8:00-9:30 am	<b>POST-MEETING FIELD TRIP</b> <i>(optional)</i> 8:15 am-5:00 pm  <b>Geologic Potpourri of the Southwest Corner of the White River Uplift (WRU)</b> by Dr. Vince Matthews, Peter Barkmann, and Jonathan White, Colorado Geological Survey (breakfast and lunch included)
	<b>GUEST FIELD TRIP</b> <i>(optional)</i>	<b>BREAKOUT SESSION MAPPING</b> (Blackmer) <b>Roosevelt Room</b> 9:45-11:15 am	
		<b>BREAKOUT SESSION ENVIRONMENT</b> (Oxner-Jones) <b>Colorado Room</b> 9:45-11:15 am	
	10:00 am-4:00 pm Glenwood Caverns Adventure Park -- Two Cave Tours and Thrill Rides in a Mountain-Top Setting  (lunch included)	<b>LUNCH</b> (included) 11:30 am-12:30 pm <b>Devereux Ballroom</b> Sponsored by AASG Foundation	
		<b>CLOSING PLENARY SESSION</b> <b>Devereux Ballroom</b> 12:30-2:30 pm	
		<b>AASG Closed Session</b> <b>Devereux Ballroom</b> 2:45-4:45 pm	
		<b>AASG Meeting Group Photos</b> 4:45 pm	
<b>CLOSING RECEPTION AND BANQUET</b> <i>(included all attendees)</i> <b>Devereux Ballroom</b> <b>"Colorado's Newest Mass Extinction"</b> Dr. James Hagadorn Denver Museum of Nature and Science 6:30-9:00 pm			
<b>Hospitality Suite</b> <b>Devereux Suite</b> 9:00-11:00 pm			





# MEETING ROOMS



# DAILY SCHEDULE

## Sunday, June 11

7:00–8:00 a.m.	<b>REGISTRATION</b>	
8:15 a.m.–5:00 p.m.	<b>PRE-MEETING FIELD TRIP</b> <b>Late Cenozoic Evolution of the Colorado River: Evidence for Neogene Uplift, Climate Change &amp; Drainage Integration</b> Andres Aslan, Colorado Mesa University <i>(breakfast and lunch included)</i>	
12:00–6:00 p.m.	<b>REGISTRATION</b>	
6:00–9:00 p.m.	<b>WELCOME DINNER</b> Dean Terri Hogue, Colorado School of Mines <i>(included for all attendees)</i>	Devereux Ballroom

## Monday, June 12

7:00 a.m.–5:00 p.m.	<b>REGISTRATION</b>	
7:00–7:45 a.m.	<b>BREAKFAST</b> <i>(included for all attendees)</i>	Devereux Ballroom
8:00–10:00 a.m.	<b>Opening Plenary Session</b> <i>(see pg. 17 for details)</i>	Devereux Ballroom
10:00 a.m.–4:00 p.m.	<b>GUEST FIELD TRIP</b> Redstone and Aspen, with optional shuttle trip to view the iconic Maroon Bells <i>(lunch included)</i>	
10:15 a.m.–12:15 p.m.	<b>AASG Closed Session</b> Roosevelt Room	<b>Colorado Mining History</b> (Gary Curtiss)  <b>What Does Glenwood Springs History Have To Do With Geology?</b> (Bill Kight) Colorado Room
12:15–1:15 p.m.	<b>LUNCH</b> <i>(included for all attendees)</i>	Devereux Ballroom
1:15–2:45 p.m.	<b>BREAKOUT SESSIONS 1–2</b>	
	<b>1. Water</b> (Schilling) Roosevelt Room	<b>2. Minerals</b> (Berg) Colorado Room
3:00–4:30 p.m.	<b>BREAKOUT SESSIONS 3–4</b>	
	<b>3. Geothermal</b> (Berti) Roosevelt Room	<b>4. Energy</b> (Hayman) Colorado Room
	<b>DINNER ON YOUR OWN</b>	
9:00–11:00 p.m.	<b>HOSPITALITY SUITE</b>	Devereux Suite



# DAILY SCHEDULE

Tuesday, June 13		
7:00–8:00 a.m.	<b>BREAKFAST</b> <i>(included for all attendees)</i>	Devereux Ballroom
7:00 a.m.–12:00 p.m.	<b>REGISTRATION</b>	
8:30–10:00 a.m.	<b>BREAKOUT SESSIONS 5–6</b>	
	<b>5. Coastal</b> (Means) Roosevelt Room	<b>6. DEI</b> (Ortt) Colorado Room
10:15–11:45 a.m.	<b>BREAKOUT SESSIONS 7–8</b>	
	<b>7. Data Preservation</b> (Day-Stirrat) Roosevelt Room	<b>8. Hazards</b> (Hanell) Colorado Room
12:15–6:00 p.m.	<b>MID-MEETING FIELD TRIP</b> Glenwood Springs to Aspen: Geologic Hazards in the Roaring Fork Valley <i>(lunch included)</i>	
6:00–9:00 p.m.	<b>POST-TRIP EVENING SOCIAL</b> Dinner at Hotel Colorado - Colorado Room <i>(optional extra cost)</i>	
	<b>DINNER ON YOUR OWN</b>	
9:00–11:00 p.m.	<b>HOSPITALITY SUITE</b>	Devereux Suite
Wednesday, June 14		
7:00–7:45 a.m.	<b>BREAKFAST</b> <i>(included for all attendees)</i>	Devereux Ballroom
7:00–10:00 a.m.	<b>REGISTRATION</b>	
8:00–9:30 a.m.	<b>JOINT BREAKOUT SESSION 9</b>	
	<b>Challenges and Opportunities for State Surveys: Education and Workforce</b> (DeJong/LePain)	Devereux Ballroom
10:00 a.m.–4:00 p.m.	<b>GUEST FIELD TRIP</b> Glenwood Caverns Adventure Park--Two cave tours and thrill rides in a mountain-side setting <i>(lunch included)</i>	

# DAILY SCHEDULE

## Wednesday, June 14 continued...

9:45–11:15 a.m.	<b>BREAKOUT SESSIONS 10–11</b>	
	<b>10. Mapping</b> (Blackmer) Roosevelt Room	<b>11. Environment</b> (Oxner-Jones) Colorado Room
11:30 a.m.–12:30 p.m.	<b>LUNCH</b> <i>(included for all attendees)</i>	
12:30–2:30 p.m.	<b>CLOSING PLENARY SESSION</b> <i>(see pg. 29 for details)</i>	
2:45–4:45 p.m.	AASG Closed Session	
4:45 p.m.	AASG Meeting Group Photos	
6:30–9:00 p.m.	<b>CLOSING RECEPTION AND BANQUET</b> <b>Colorado's Newest Mass Extinction</b> Dr. James Hagadorn, Denver Museum of Nature and Science <i>(included for all attendees)</i>	
9:00–11:00 p.m.	<b>HOSPITALITY SUITE</b>	

## Thursday, June 15

7:00–8:00 a.m.	<b>BREAKFAST</b> <i>(included for all attendees)</i>	Devereux Ballroom
8:15 a.m.–5:00 p.m.	<b>POST-MEETING FIELD TRIP</b> <i>(optional)</i> <b>Geologic Potpourri of the Southwest Corner of the White River Uplift</b> Dr. Vince Matthews, Peter Barkmann, and Jonathan White, Colorado Geological Survey <i>(breakfast and lunch included)</i>	



*Travertine cliffs at Rifle Falls State Park - Field Trip Stop*

# OPENING PLENARY SESSION

**Monday, June 12, 8:00–10:00 a.m.**

*Devereux Ballroom*

8:00–8:05 a.m.	<b>AASG President Welcome and Remarks</b> Jim Faulds, AASG President, Nevada State Geologist
8:05–8:15 a.m.	<b>Host Welcome and Remarks</b> Matt Morgan, Colorado State Geologist
8:15–8:20 a.m.	<b>Welcome and Remarks</b> Senator Perry Will, Colorado General Assembly
8:20–8:25 a.m.	<b>Welcome and Remarks</b> Representative Elizabeth Velasco, Colorado General Assembly
8:25–8:35 a.m.	<b>Strengthening our AASG-USGS Partnerships</b> David Applegate, USGS Director
8:35–8:45 a.m.	<b>Ever-Evolving - Future of Core Science Systems</b> Kevin Gallagher, USGS Associate Director for Core Science Systems
8:45–9:05 a.m.	<b>USGS Energy and Minerals Directions in 2023-24</b> Sarah Ryker, USGS Associate Director for Energy and Mineral Resources
9:05–9:25 a.m.	<b>Collaboration in the Natural Hazards Mission</b> Michael Grimm, USGS Associate Director for Hazards
9:25–9:50 a.m.	<b>Sustainability and the Geoscience Enterprise - Exploring our Grand Challenges</b> Jon Arthur, AGI Executive Director
9:50–9:55 a.m.	<b>Discussion: Events Code of Conduct</b> Jim Faulds, AASG President, Nevada State Geologist
9:55–10:00 a.m.	<b>Host Administration Instructions</b> Matt Morgan/Jill Carlson, Colorado Geological Survey



# BREAKOUT SESSIONS

**Monday, June 12, 1:15–2:45 p.m.**

## 1. WATER

*Roosevelt Room*

*Chair: Keith Schilling, State Geologist, Iowa Geological Survey*

The exploration and quantification of available water resources was foundational for the formation of many state geological surveys and it continues to be a driving motivation for many surveys today. Many STATEMAP proposals consider groundwater resources to be the most important justification for mapping certain regions or counties. The topic of the Water session is a focus on how state surveys are using STATEMAP and derivative mapping programs to advance the science of groundwater quantity and quality assessments within the states.

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| 1:15–1:25 p.m. | <b>Introduction to STATEMAP and Groundwater Resources</b><br>Keith Schilling, Iowa State Geologist, AASG Water Committee Chair   |
| 1:25–1:35 p.m. | <b>How the STATEMAP Program Benefits Florida's Groundwater Knowledge</b><br>Clint Kromhout, Florida Geological Survey  |
| 1:35–1:45 p.m. | <b>3D Hydrologic Modeling in New Mexico</b><br>Laila Sturgis, New Mexico Bureau of Geology & Mineral Resources   |
| 1:45–1:55 p.m. | <b>Depositional Systems Modeling of Aquifer Sand Bodies and Recharge of the Mississippi River Valley Alluvial Aquifer in Mississippi</b><br>David Dockery, Mississippi State Geologist         |
| 1:55–2:05 p.m. | <b>Using STATEMAP Coreholes to Characterize Deep Groundwater in Northern Pennsylvania</b><br>Gale Blackmer, Pennsylvania State Geologist   |
| 2:05–2:15 p.m. | <b>Geology and Groundwater Resources of La Plata County, Colorado</b><br>Lesley Sebol, Colorado Geological Survey  |
| 2:15–2:25 p.m. | <b>Modern Detailed Geologic Mapping and Collaborative Approaches to Addressing Water Scarcity Issues in Oregon</b><br>Jason D. McClaughry, Oregon Department of Geology and Mineral Industries |
| 2:35–2:45 p.m. | <b>3D Framework Mapping of Fractured Bedrock in Support of Water-Stressed Municipalities in an Otherwise Wet State</b><br>Benjamin DeJong, Vermont State Geologist                             |
|                | <b>Open Discussion</b> ( <i>if time allows</i> )<br>Keith Schilling, Iowa State Geologist, AASG Water Committee Chair—Challenges faced by State Geological Surveys                             |

## 2. MINERALS

*Colorado Room*

*Chair: Dick Berg, State Geologist, Illinois State Geological Survey*

The AASG is heavily engaged with the USGS on mapping and assessing resource potentials for critical minerals through the Earth MRI program and Member State Geological Surveys (SGSs) have benetted from additional funding opportunities. This has expanded to now include opportunities as well with the US DOE through their CORE-CM program, as well as some opportunities with the DOD and the NSF. It is a rapidly expanding program that requires considerable flexibility to adapt to new requests and also to recruit and maintain needed personnel. Therefore, AASG's Minerals Committee is committed to providing an overview of past and present information pertaining to the status of United States' minerals issues as they pertain to the viability and success of SGSs to address these issues in a timely and effective manner.

1:15–1:30 p.m.	<b>Critical, Strategic, and Essential: A Sustainable Approach to Mineral Resource Studies</b> Colin Williams, U.S. Geological Survey
1:30–1:45 p.m.	<b>Earth MRI: Progress on Mapping Critical Minerals</b> Warren Day, U.S. Geological Survey
1:45–2:00 p.m.	<b>Building New Databases on Abandoned Mines and Non-Coal Mine Waste</b> Jeff Mauk, U.S. Geological Survey
2:00–2:15 p.m.	<b>Utah-Minerals, Critical Minerals, and Earth MRI</b> Bill Keach, Utah State Geologist
2:15–2:30 p.m.	<b>Alaska: 2023 Earth MRI Update</b> Ken Papp, Alaska Division of Geological and Geophysical Surveys
2:30–2:45 p.m.	<b>Open Discussion</b> Dick Berg, Illinois State Geologist, AASG Minerals Committee Chair

# BREAKOUT SESSIONS

**Monday, June 12, 3:00–4:30 p.m.**

## 3. GEOTHERMAL

*Roosevelt Room*

*Chair: Claudio Berti, State Geologist, Idaho Geological Survey*

Geothermal represents a source of renewable and low carbon emission energy readily available, in some form, across the United States. As such, it falls under the purview of individual state geological surveys to have a scientific and technical mandate involving assessment and quantification of unrecognized, potential, and proven geothermal resources.

In the global effort to reach a low- to zero-carbon emission economy, geothermal energy stands as a valuable and viable resource. New exploration techniques and emerging technologies are attracting numerous new startup companies into this field, in an effort that both parallels and expands from the “classic” geothermal plays, building on the enormous progress achieved by long-term operators in this sector.

Increased funding from the Department of Energy and large investments from the private sector have been fostering a large number of projects and initiatives that readily connect to the mission of state geological surveys, and this breakout session will highlight opportunities for both individual states and state coalitions and partnerships.

3:00–3:20 p.m.	<b>Opportunities for Engagement Between the USDOE Geothermal Technologies Office and State Surveys</b> Mike Weathers, DOE-GTO Hydrothermal Resources Program
3:20–3:40 p.m.	<b>Big-Data Powered Exploration for Geothermal Resources in the Great Basin*</b> Kellen Gunderson, Zanskar Geothermal
3:40–3:55 p.m.	<b>Geothermal Research in the Western U.S.: The Role of State Surveys and Federal/State Partnerships</b> Jim Faulds, Nevada State Geologist, AASG President
3:55–4:10 p.m.	<b>Geothermal Energy in Illinois and the Midwest</b> Dick Berg, Illinois State Geologist
4:10–4:25 p.m.	<b>Strategic Utilization of Low-Temperature Geothermal Resources in the Eastern U.S.</b> Jessica Moore, West Virginia State Geologist, AASG Vice President
4:25–4:30 p.m.	<b>Open Discussion</b> Claudio Berti, Idaho State Geologist, AASG Geothermal Committee Chair



## 4. ENERGY

*Colorado Room*

*Chair: Nick Hayman, State Geologist, Oklahoma Geological Survey*

We use the term “the energy transition” to mean a significant change in the energy portfolio of the US, as a diverse array of energy sources, transport, and emissions mitigation techniques are integrated in the economy. A major driver of the transition is to lower CO<sub>2</sub>- and CH<sub>4</sub>-emissions in order to mitigate anthropogenic climate change. The concept of “net-zero (greenhouse-gas emissions)” envisions reasonable economic growth with an “all (resources) of the above strategy”. “All of the above” includes wind and solar power, deployment of an electric vehicle fleet and increase in battery storage, expansion of hydrogen fuel production and use, and increase in carbon-capture-and-storage (CCS) sites. Economic wedge models suggest that net zero is an achievable goal. However, the model wedges are defined primarily with economic, and not geological data beyond basic resource assessment, an area where the state surveys can make a great impact. By the same token, future widespread geothermal energy use or expanded nuclear technologies, are not generally incorporated in these analyses except in experimental test-cases, but are also areas where state geological surveys can play a role.

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| 3:00–3:10 p.m. | <b>AASG Energy Committee: Repurposing for the Energy Transition</b><br>Nick Hayman, Oklahoma State Geologist, AASG Energy Committee Chair   |
| 3:10–3:25 p.m. | <b>USGS Energy Resources Science Center, the Native Hydrogen Assessment Project and Overview of the USGS Energy Program</b><br>Geoffrey Ellis and Alicia Lindauer, U.S. Geological Survey |
| 3:25–3:40 p.m. | <b>The DOE Fossil Energy and Carbon Management Program</b><br>Mark McKoy, U.S. Department of Energy/NETL  |
| 3:40–3:55 p.m. | <b>Carbon Management: a GPI Perspective</b><br>Matt Fry, Great Plains Institute   |
| 3:55–4:10 p.m. | <b>The Bureau of Ocean Energy Management’s Role in the Energy Transition</b><br>Megan Carr, Bureau of Ocean Energy Management   |
| 4:10–4:20 p.m. | <b>Moderated Discussion I: Workforce Challenges in Energy</b><br>Jay Kalbas, Kansas State Geologist   |
| 4:20–4:30 p.m. | <b>Moderated Discussion II: Positioning the Energy Committee to Assist AASG and our Stakeholders</b><br>Clare Falcon, Louisiana State Geologist   |

# BREAKOUT SESSIONS

**Tuesday, June 13, 8:30–10:00 a.m.**

## 5. COASTAL

*Roosevelt Room*

*Chair: Harley Means, State Geologist, Florida Geological Survey*

Most coastal issues are not state-specific and are common to many states. Climate change and the associated consequences of a warming planet pose the greatest risk to the health and welfare of the estimated 147 million people who live in coastal areas in the U.S. Other coastal issues that affect state geologic surveys include seismic hazards, saltwater intrusion, pollution, siting of offshore energy resources, and locating strategic minerals. States are developing resiliency plans to mitigate some of these problems and geoscientists from state surveys have a critical role to play in providing geologic data and unbiased science to guide the development of mitigation plans.

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| 8:30–8:45 a.m.  | <b>Overview of Florida's Offshore Bathymetric Mapping Program</b><br>Harley Means, Florida State Geologist                   |
| 8:45–9:00 a.m.  | <b>Offshore Critical Minerals</b><br>Jeffrey Reidenauer, Bureau of Ocean Energy Management (BOEM)                            |
| 9:00–9:15 a.m.  | <b>Coastal Mapping Updates and Opportunities*</b><br>Ashley Chappell, National Oceanic and Atmospheric Administration (NOAA) |
| 9:15–9:30 a.m.  | <b>Alaska's Coastal Hazards Program: Serving Communities in Need*</b><br>Nora Nieminski/Jen Athey, Alaska DGGS               |
| 9:30–10:00 a.m. | <b>Open Discussion</b><br>Harley Means, Florida State Geologist, AASG Coastal Committee Chair                                |

*\*Virtual Presentation*

## 6. DIVERSITY, EQUITY, and INCLUSION (DEI)

*Colorado Room*

*Chair: Richaerd Ortt, State Geologist, Maryland Geological Survey*

This year has been the first year of the DEI committee. As such, the goal of the committee was to seek information regarding the status of DEI within AASG, other earth science organizations, and the scientific community at large. The results of this will be mostly presented in this breakout session.

In the fall of 2022, the DEI committee launched a survey of all State Geological Surveys gathering some fundamental details and then probing into what each Survey has performed or attempted to accomplish in the sub-areas of Diversity, Inclusion, Equity, Justice, and Accessibility. The survey highlighted many topics including differences mostly focused on the way our organizations are governed (academic, executive branch agency, subagency) but also in how we embrace many of the different components of DEIJA. Specifically, many geological surveys are attempting to do better with diversity, but few are focusing on equity or justice. These results will be presented during this breakout session. **MAKE SURE YOU ATTEND!!**

8:30–8:35 a.m.	<b>Introductions</b> Rich Ortt, Maryland State Geologist and AASG DEI Committee Chair
8:35–9:00 a.m.	<b>Advancing Antiracism, Diversity, Equity, and Inclusion in STEM Organizations</b> Presenter TBD, National Academies of Sciences, Engineering, and Medicine
9:00–9:25 a.m.	<b>Workforce Diversity in the Geosciences</b> Christopher Keane, American Geosciences Institute (AGI)
9:25–9:50 a.m.	<b>AASG DEI Survey Results</b> Rich Ortt, Maryland State Geologist
9:50–10:00 a.m.	<b>Questions and Answers</b> All Participants

# BREAKOUT SESSIONS

**Tuesday, June 13, 10:15–11:45 a.m.**

## 7. DATA PRESERVATION

*Roosevelt Room*

*Chair: Ruarri Day-Stirrat, State Geologist, Oregon Department of Geology and Mineral Industries*

State Geological Surveys play a primary role in preserving geological and geophysical data for their respective states. Funding for these efforts may come from various federal, state, and industry sources. Since 2005, the USGS NGG-DPP has funded a range of data preservation initiatives by states, and the IIJA of 2021 amended and expanded the original legislation. State geological surveys are encouraged to fully utilize this federal appropriation. By integrating data preservation activities with other federal funding opportunities, states can solidify and justify future appropriations for this crucial program. The importance of preserving geological data has never been higher, as evidenced by the DOE's recent focus on battery minerals, platinum group elements, and rare earth elements. These data are essential for addressing emerging challenges and advancing scientific knowledge in these strategic areas.

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| 10:15–10:25 a.m. | <b>Data Preservation: Getting the Most out of the USGS National Geological and Geophysical Data Preservation Program</b><br>Lindsay Powers, USGS NGGDPP Program Coordinator |
| 10:25–10:45 a.m. | <b>Using NGGDPP Applications to Improve Access to Geological Data and Materials: ReSciColl and NIBI</b><br>Michaela Johnson, USGS NGGDPP Associate Program Coordinator      |
| 10:45–10:55 a.m. | <b>Specimen Preservation Planning</b><br>John Metesh, Montana State Geologist   |
| 10:55–11:05 a.m. | <b>Data Preservation ‘Wins’ at Alaska’s Geological Survey *</b><br>Jen Athey, Alaska Division of Geological and Geophysical Surveys   |
| 11:05–11:15 a.m. | <b>Techniques for Preserving Paper Media: Maps, Documents, and Photographs</b><br>Scott Ausbrooks, Arkansas State Geologist   |
| 11:15–11:25 a.m. | <b>Preserving the Past and Preparing for the Future</b><br>Nelia Dunbar, New Mexico State Geologist   |
| 11:25–11:35 a.m. | <b>Using Data Preservation Funding to Advance Critical Mineral Initiatives in Iowa</b><br>Keith Schilling, Iowa State Geologist   |
| 11:35–11:45 a.m. | <b>Demo Discussion</b><br>Ruarri Day-Stirrat, Oregon State Geologist, AASG Data Committee Chair   |
| 11:45 a.m.       | <b>Adjourn for Field Trip</b>   |



## 8. HAZARDS

*Colorado Room*

*Chair: Casey Hanell, State Geologist, Washington Geological Survey*

The AASG Hazards Committee focuses on topics related to geologic hazards including, but not limited to, earthquakes, tsunamis, volcanoes, landslides, sinkholes, and hazardous minerals such as asbestos, mercury, arsenic, uranium, and radon. State geological surveys in many states have a significant role in helping decision makers, stakeholders, and the public understand the geologic hazards around them. This year, the committee has been singularly focused on implementation of the National Landslide Preparedness Act (NLPA). The original Law authorized funding amounts for USGS (\$25M), NSF (\$11M), and NWS (\$1M), however appropriation amounts were significantly lower, around \$9M for USGS. Encouragingly, appropriations have been increasing since the original passage of the bill. The recently passed 2022 Omnibus Bill includes a significant increase in funding to implement the NLPA, with \$14.9M for USGS, which specifically includes \$1M to start the competitive grant program to states to further landslide hazard work. The NLPA will be up for reauthorization in 2024 and there will be opportunity for AASG to provide feedback on implementation to date and suggestions for changes to the Act. As such, the Hazards breakout session at the AASG Annual Meeting will be singularly focused on landslides and discussion of the NLPA.

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| 10:15–10:40 a.m. | <b>Post-Fire Debris-Flow Hazards in Colorado: Their Identification and Mapping and the Development of Early Warning Systems</b><br>Jonathan Lovekin, Senior Engineering Geologist, Colorado Geological Survey |
| 10:40–11:10 a.m. | <b>Update on National Landslide Preparedness Act Implementation</b><br>Jonathan Godt, USGS Landslide Hazards Program Coordinator  |
| 11:10–11:45 a.m. | <b>Group Discussion: Landslide Programs in State Surveys and Intersection with the National Landslide Preparedness Act</b><br>Casey Hanell, Washington State Geologist, AASG Hazards Committee Chair          |
| 11:45 a.m.       | <b>Adjourn for Field Trip</b>   |

# JOINT BREAKOUT SESSIONS

Wednesday, June 14, 8:00–11:15 a.m.

## 9. JOINT SESSION: WORKFORCE AND EDUCATION

*Devereux Ballroom*

*Chairs: Ben DeJong, State Geologist, Vermont Geological Survey; David LePain, State Geologist, Alaska Geological and Geophysical Surveys*

The Workforce and Education committees have joined forces to address common challenges associated with building a future workforce through broad and targeted education and recruitment efforts. The shared focus of these committees is to promote geology and the geosciences as a career choice and to encourage early- and mid-career geologists to consider employment opportunities with state geological surveys. Waning enrollment and administrative support of “classic” geology programs at colleges and universities combined with increased competition for a shrinking pool of qualified career geologists are contributing to significant challenges in recruiting and retaining the workforce needed for state geological surveys to fulfill their missions. This breakout session explores challenges in education and workforce development and discusses solutions to reverse the decline in geoscience graduates and qualified geoscientists available to help surveys fulfill their critically important missions.

8:00–8:20 a.m.

### **Introduction to Geoscience Education and Workforce Challenges (...and Opportunities)**

Ben DeJong, Vermont State Geologist, AASG Education Committee Chair

8:20–8:50 a.m.

### **Lightning Talks**

Carey Bridges, Missouri State Geologist

Jim Faulds, Nevada State Geologist, AASG President

Nelia Dunbar, New Mexico State Geologist, AASG Secretary

Ken Papp, Alaska Division of Geological and Geophysical Surveys

Bill Haneberg, Kentucky State Geologist

8:50–9:25 a.m.

### **Panel Discussion: Strategies for Overcoming Workforce and Education Challenges**

Moderator: Amber Steele, Missouri Geological Survey

Panelists: Nelia Dunbar, New Mexico State Geologist, AASG Secretary

Carey Bridges, Missouri State Geologist

Jim Faulds, Nevada State Geologist, AASG President

Ken Papp, Alaska Division of Geological and Geophysical Surveys

Bill Haneberg, Kentucky State Geologist

Christopher Keane, American Geosciences Institute

8:35–8:50 a.m.

### **Analytics Presentation from Membership Survey**

Amber Steele, Missouri Geological Survey

9:25–9:30 a.m.

### **Wrap-up and Closing Comments**

Ben DeJong and Ken Papp

## 10. MAPPING

*Roosevelt Room*

*Chair: Gale Blackmer, State Geologist, Pennsylvania Geological Survey*

This breakout session continues the conversation with USGS regarding how states are able to use USGI funding to advance their own mapping goals while also advancing USGI. It includes summaries of progress from STATEMAP and the National Geologic Synthesis, talks from several states about their USGI successes, and time for a robust discussion.

9:45–9:50 a.m.	<b>Introduction</b> Gale Blackmer, Pennsylvania State Geologist, AASG Mapping Committee Chair
9:50–10:00 a.m.	<b>The STATEMAP Contribution to the U.S. Geoframework Initiative: Past, Present, and Future</b> Jenna Shelton, USGS Associate Program Coordinator for STATEMAP and USGI
10:00–10:10 a.m.	<b>Using USGI to Advance Pennsylvania’s Mapping Goals</b> Gale Blackmer, Pennsylvania State Geologist, AASG Mapping Committee Chair
10:10–10:20 a.m.	<b>Indiana’s Progress Toward 3D Mapping</b> Todd Thompson, Indiana State Geologist
10:20–10:30 a.m.	<b>Driving Utah’s Mapping Needs: Integrating SMAC, STATEMAP, and USGI</b> Bill Keach, Utah State Geologist
10:30–10:45 a.m.	<b>Building a National Synthesis from State &amp; Federal Geologic Map Contributions</b> Joe Colgan and Sam Johnstone, USGS National Geological Synthesis Project
10:45–11:15 a.m.	<b>Wrap up</b> Gale Blackmer, Pennsylvania State Geologist, AASG Mapping Committee Chair

## 11. ENVIRONMENT

*Colorado Room*

*Chair: Mark Oxner-Jones, State Geologist, Ohio Geological Survey*

Environmental protection is an interdisciplinary field, and geologic surveys are the stewards of the data and knowledge of the geologic factors that can advance or constrain societal progress. Hardly any project or initiative can be undertaken that is not subject to (or has impacts upon) geophysics, geochemistry, subsurface geology, mineral and energy availability, soils, hydrogeology, seismicity or geohazards. This extends even to projects that would appear to have little to no physical aspect, such as cryptocurrency mining (which has turned out to be enormously energy intensive). The continued thriving of human society, whether on Earth or on some other celestial body, depends on the science of geology to quantify the risks and locate the resources:

The breakout will focus on environmental justice. Beyond being concerned with impacts upon specific communities, a focus on environmental justice has the potential to improve environmental protection in general, because environmental harms are avoided rather than shifted to those less well-equipped to oppose them.

9:45–9:50 a.m.	<b>Introduction</b> Mark Oxner-Jones, Ohio State Geologist, AASG Environment Committee Chair
9:50–10:10 a.m.	<b>Perspectives from Colorado’s Environmental Justice Advisory Board</b> Steven Arauza, Colorado Department of Public Health and Environment
10:10–10:30 a.m.	<b>Overview of Conservation Colorado</b> Beatriz Soto, Director, Conservation Colorado
10:30–10:50 a.m.	<b>Trends in Emerging Contaminants in USEPA Region 8*</b> Karen Simpson, Emerging Contaminants Coordinator for Drinking Water, USEPA Region 8
10:50–11:15 a.m.	<b>Open Discussion</b> Mark Oxner-Jones, Ohio State Geologist, AASG Environment Committee Chair

*\*Virtual Presentation*



## Welcome Dinner

**Sunday, June 11, 6:00 p.m.–9:00 p.m. (Cost included in general registration fee for all attendees and guests)**

**Welcome and opening remarks by Dr. Terri Hogue, Dean of Earth and Society Programs, Colorado School of Mines**

### ABOUT DR. HOGUE

Dr. Terri Hogue currently serves as Dean of the Earth and Society program (ESP), where she oversees nine academic departments on the Colorado School of Mines (Mines) campus as well as the Colorado Geological Survey. ESP includes approximately 200 faculty, 59 degree programs, 2000 students, and \$40M in research funding. Dr. Hogue was the department head of the Civil and Environmental Engineering (CEE) department prior to her appointment as Dean. She has also served as the director of the Hydrologic Science and Engineering interdisciplinary graduate program and director of the ConocoPhillips WE<sup>2</sup>ST center. Her research focuses on watershed and urban hydrology and the nexus of water, human, and ecosystem interactions. She has received over \$20M in research funding during her career, coming from a range of federal agencies including the EPA, NSF, NASA, USGS, and NOAA, as well as various state and local agencies. She has graduated 27 PhD students and has 130 journal publications to date. Dr. Hogue has served on numerous professional boards and committees, including a 6-year term on the National Academies Board on Atmospheric Sciences and Climate (BASC). She currently serves as a member of the Army Science Board, and as part of her duties chairs the Environmental Advisory Board for the US Army Corp of Engineers. She has received a range of awards, including an NSF Career Award and the Robert E. Horton lectureship in Hydrology from the American Meteorological Society.



*Dr. Terri Hogue, Dean of Earth and Society Programs at the Colorado School of Mines.*

## Closing Reception and Banquet

### Presentation: "Colorado's Newest Extinction"

Wednesday, June 14, 6:30 p.m.–9:00 p.m. (Cost included in general registration fee for all attendees and guests)

#### **Dr. James Hagadorn, Curator of Geology at the Denver Museum of Nature & Science**

About the presentation: The Dyer Formation is a little-known but paleontologically rich carbonate succession that is well exposed in the White River Plateau of northwestern Colorado. It is notable because it records one of the biggest mass extinctions in earth history--the end-Devonian event. This dramatic biotic change is not represented by a dramatic disappearance of fossils, but by dramatic changes in the geochemistry of the limestones and dolostones that span the Devonian-Carboniferous boundary. Such rocks preserve the signature element of the end-Devonian, including the Hangenberg isotopic excursion, in which seawater chemistry shifted to delta carbon thirteen values of over seven per mil. This change is associated with appearance of facies that are rich in ooids, stromatolites, and other microbial structures, and the excursion is often preceded by the presence of detrital dolomite siltstone and/or evidence of meteoric diagenesis and emergence.

### ABOUT DR. HAGADORN

With interests in deep time and soft rocks, he has enjoyed getting to know our spectacularly exposed geology and trying to peel back its onion-like layers to better understand our planet. Colorado and the Grand Canyon are two of his favorite natural laboratories. An established scientist and steward of collections, James also reaches out to the community whenever possible to help illustrate how science and scientific thinking are relevant to everyone.



*Dr. James Hagadorn, Curator of Geology at the Denver Museum of Nature & Science.*

# FIELD TRIPS AND OPTIONAL EXCURSIONS

## Late Cenozoic Evolution of the Colorado River: Evidence for Neogene Uplift, Climate Change and Drainage Integration

**Sunday, June 11, 8:15 a.m.–5:00 p.m. (Cost: \$175/person, breakfast and lunch provided)**

**Led by Andres Aslan, Colorado Mesa University**

The Colorado River system, as the single river system that drains the western slope of the Colorado Rocky Mountains, is a sensitive gauge of the uplift history and landscape evolution of the western U.S. This trip focuses on the Upper Colorado River basin and evaluates the hypothesis that the river system and modern Colorado Rockies are being shaped by neotectonic epeirogenic uplift of the Colorado Rockies, interacting with climatic and geomorphic forcings. The view presented here is that this epeirogenic uplift is primarily related to mantle buoyancy.

Trip stops will include: 1) Carbondale area to view the remnants of the late Miocene paleo-land surface that records the start of regional denudation, 2) Dotsero area to view the Yellowstone Lava Creek B tephra associated with ca. 640 ka ancestral Colorado River gravels. This stop involves a short hike with about 350 ft of elevation gain, 3) Glenwood Canyon to discuss the canyon's incision history, and the 4) Rifle area to examine Quaternary Colorado River terraces and debris-fan complexes that record river incision over the past ~2 Ma. This last stop also involves a short hike with about 350 ft of elevation gain.

## Guest Field Trip - Redstone Historic District, Maroon Bells (optional) and Aspen

**Monday, June 12, 10:00 a.m.–4:00 p.m. (Cost: \$120/person, lunch provided)**

**Led by Jill Carlson, Colorado Geological Survey**

The historic mining town of Redstone was established in the late 19th century by industrialist John Cleveland Osgood as a company town for coal miners and cokers who supplied coke to foundries in Pueblo, Colorado. As an experiment in “enlightened industrial paternalism,” or “welfare capitalism,” Osgood constructed 84 cottages for married workers and a 40-room dormitory for bachelor miners, now the Redstone Inn, all with indoor plumbing and electricity, as well as modern bathhouse facilities, a club house with a library and a theatre, and a school. Most of these Craftsman-era Swiss-style cottages are still used as homes. The coking ovens are still visible, and a few have been restored. Historic coal mining equipment is on display near the ovens. We will have lunch in Redstone, then participants may either get dropped off in Aspen to shop and sightsee, or take an optional (and surprisingly informative!) shuttle to view the iconic Maroon Bells. If time allows, we will visit quirky Carbondale on our way back to Glenwood Springs.

## Glenwood Springs to Marble: Geologic Hazards Along the Roaring Fork and Crystal River Valleys

**Tuesday, June 13, 12:15 a.m.–6:00 p.m. (Included with full registration, lunch provided)**

**Led by Jonathan Lovekin, Amy Crandall, and Jill Carlson, Colorado Geological Survey**

Mountain uplift, salt dome dissolution, and river erosion have created a dynamic geomorphic environment in the river valleys that feed into the Colorado River at Glenwood Springs. Field trip stops include areas of active debris flow, rockfall, and landslide areas that have closed or impacted roads and infrastructure this spring. Other visible geologic hazards along the trip include sinkholes and ground subsidence from evaporite dissolution and landslides. The dramatic impacts from snow avalanches, landslides, and debris fans are on full display in the town of Marble, where development pressure continues to impact and be impacted by geology. Road conditions permitting, a stop will include the entrance of the world-famous Yule Marble quarry at Treasure Mountain.

## Mid-Meeting Post-Field Trip Dinner & Social

**Tuesday, June 13, 6:00 p.m.–9:00 p.m. (Cost: \$92/person)**

Following the mid-meeting field trip, join your colleagues for a dinner in the Colorado Room at the Hotel Colorado. You'll have plenty of time to sit back, relax, and discuss the day's events and exciting geology of the area. Following dinner, you may enjoy libations in the adjacent Copper Top Bar and Lounge.

## Guest Field Trip - Glenwood Caverns Adventure Park

**Wednesday, June 14, 10:00 a.m.–4:00 p.m. (Cost: \$120/person, lunch provided)**

**Led by Jill Carlson, Colorado Geological Survey**

Glenwood Caverns Adventure Park bills itself as "America's only mountain-top theme park!" We will take gondolas up to the park, tour the King's Row and Fairy Caverns, enjoy thrill rides and an amazing view of the Roaring Fork Valley from the Mine Wheel (a ferris wheel ride), play laser tag, and check out the 4D theater. Lunch vouchers provided. This will be a small group, so we can do some exploring in Glenwood Springs if we decide that 6 hours of theme park is more than enough.

## Post-Meeting Field Trip, Geologic Potpourri of the Southwest Corner of the White River Uplift (WRU)

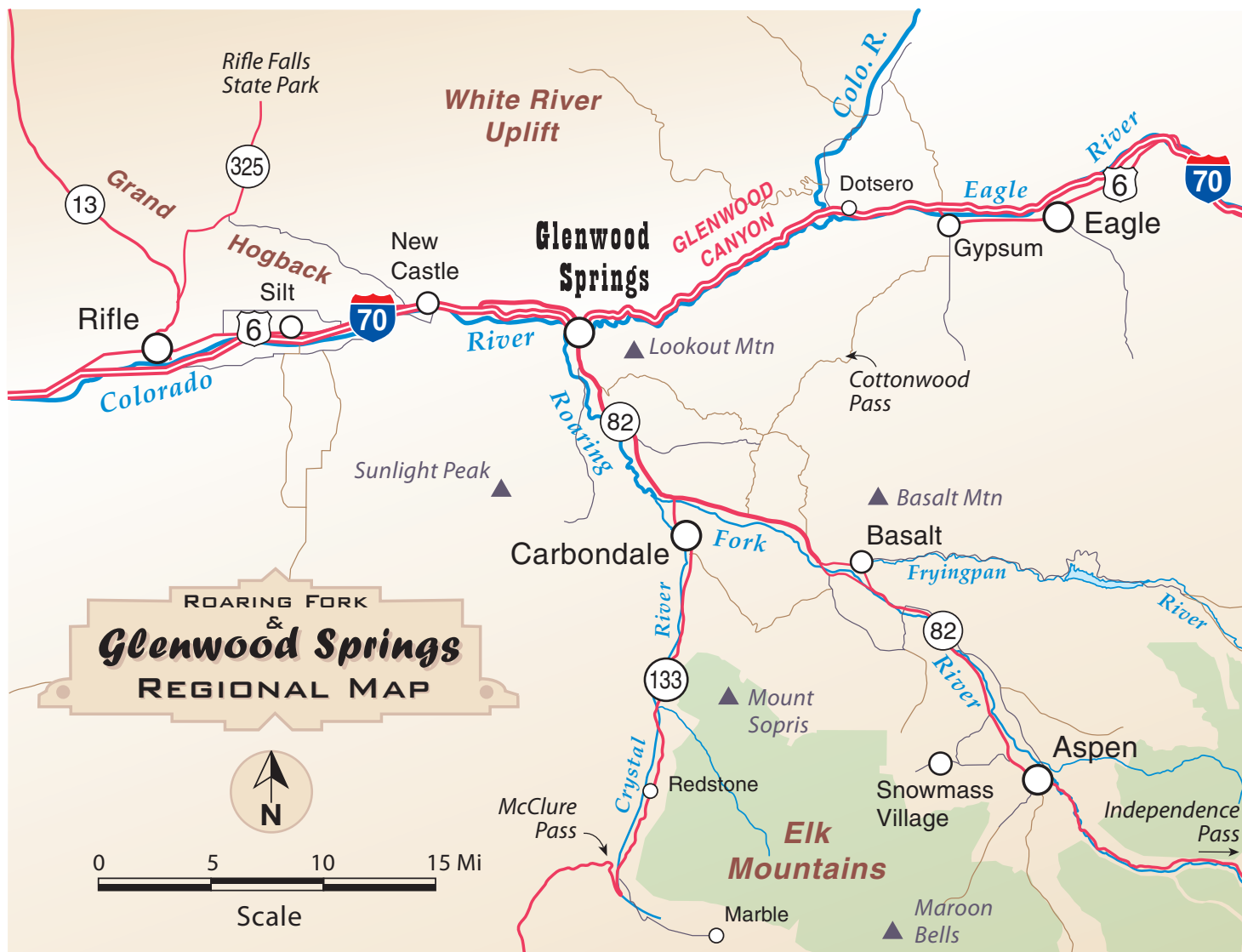
**Thursday, June 15, 8:15 a.m.–5:00 p.m. (Cost: \$175/person, breakfast and lunch provided)**

**Led by Vince Matthews, Peter Barkmann, and Jonathan White, Colorado Geological Survey**

Outstanding exposures in this area display evidence of Laramide and Ancestral Rocky Mountains tectonism as well as present-day evaporite tectonics and dissolution. The Hot Springs Pool below the Hotel Colorado provides an opportunity to discuss the underground plumbing which is at the intersection of three major Laramide basement blocks. A stop below the mile-high cliffs of the Roan Plateau reveals the first place that money for AASG's Data Preservation effort was spent. It also provides a spectacular view of some of the geology that creates the energy-rich (coal, natural gas, and oil shale) Piceance Basin.

Several opportunities in the heart of the Grand Hogback provide spectacular views of the monocline formed over the 20,000-foot fault displacing the Piceance Basin from the White River Uplift. Evaporite diapirism and dissolution within the monocline combined to create the beautiful travertine cliffs and caves at Rifle Falls State Park. Lunch at Rifle Gap State Park provides an opportunity to discuss the consequences of underground coal fires that plague this and other parts of Colorado. A variety of consequences of the ongoing evaporite tectonism and dissolution are nicely displayed in several places south of Glenwood Springs. Neogene and Quaternary volcanism provides age control on the regional collapse center and incision of Glenwood Canyon by the Colorado River.

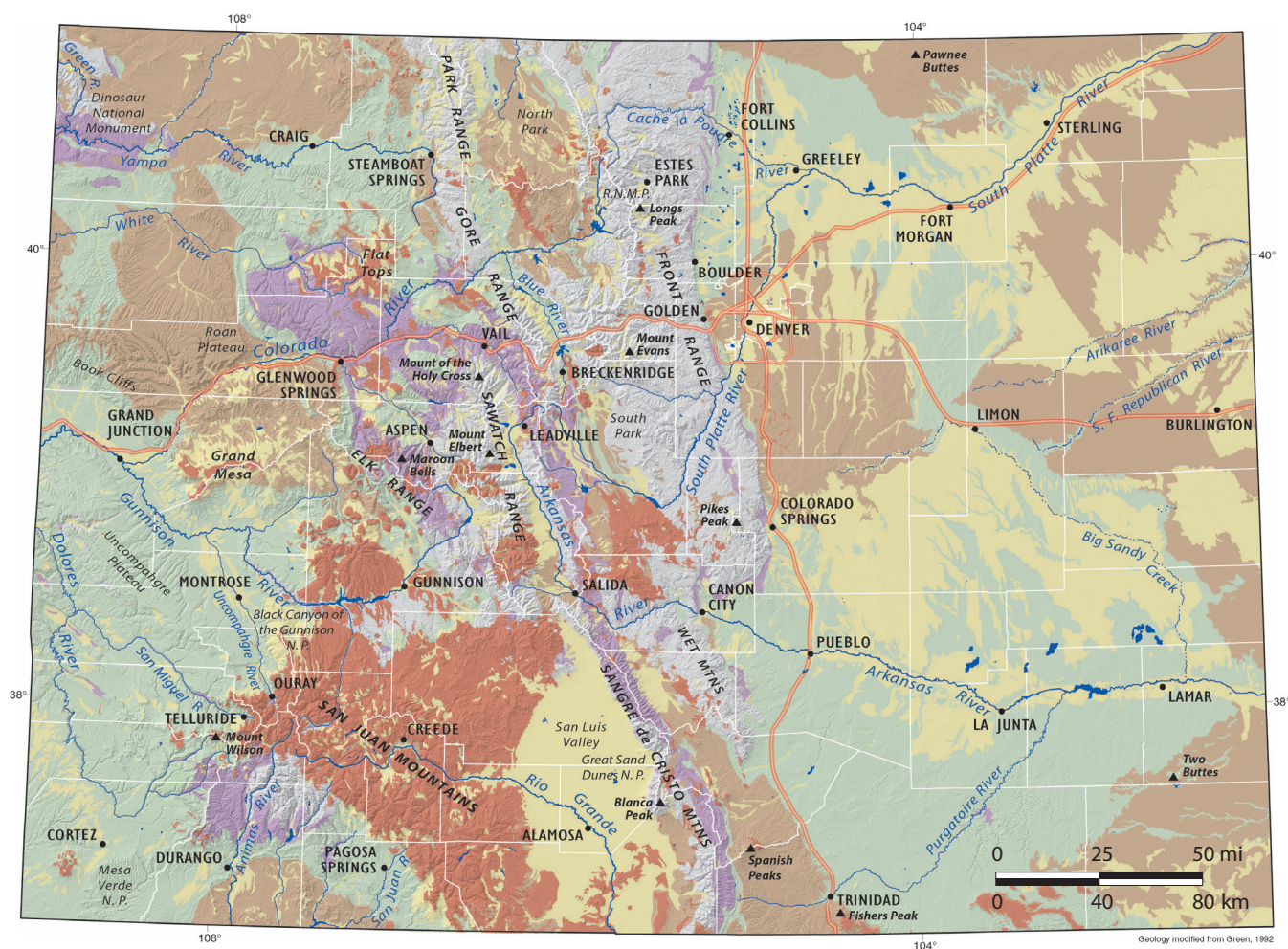




*Glenwood Springs local area map can be found on page 12.*

*This program was produced by the following people: Larry Scott, John Hopkins, Jill Carlson, Matt Morgan, Jim Faulds, and Jessica Moore.*

## Generalized Geologic Map of Colorado



**CENOZOIC:** 0–66 million years ago

**MESOZOIC:** 66–252 mya

**PALEOZOIC:** 252–539 mya

**PRECAMBRIAN:** 539 mya–1.8 billion years ago

Unconsolidated deposits

Sedimentary rocks

Sedimentary rocks

Igneous and metamorphic rocks

Sedimentary rocks

Igneous rocks

*Thank you for attending!*

[www.stategeologists.org](http://www.stategeologists.org)