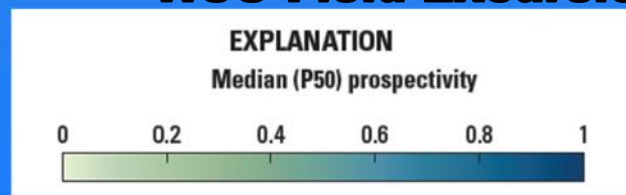
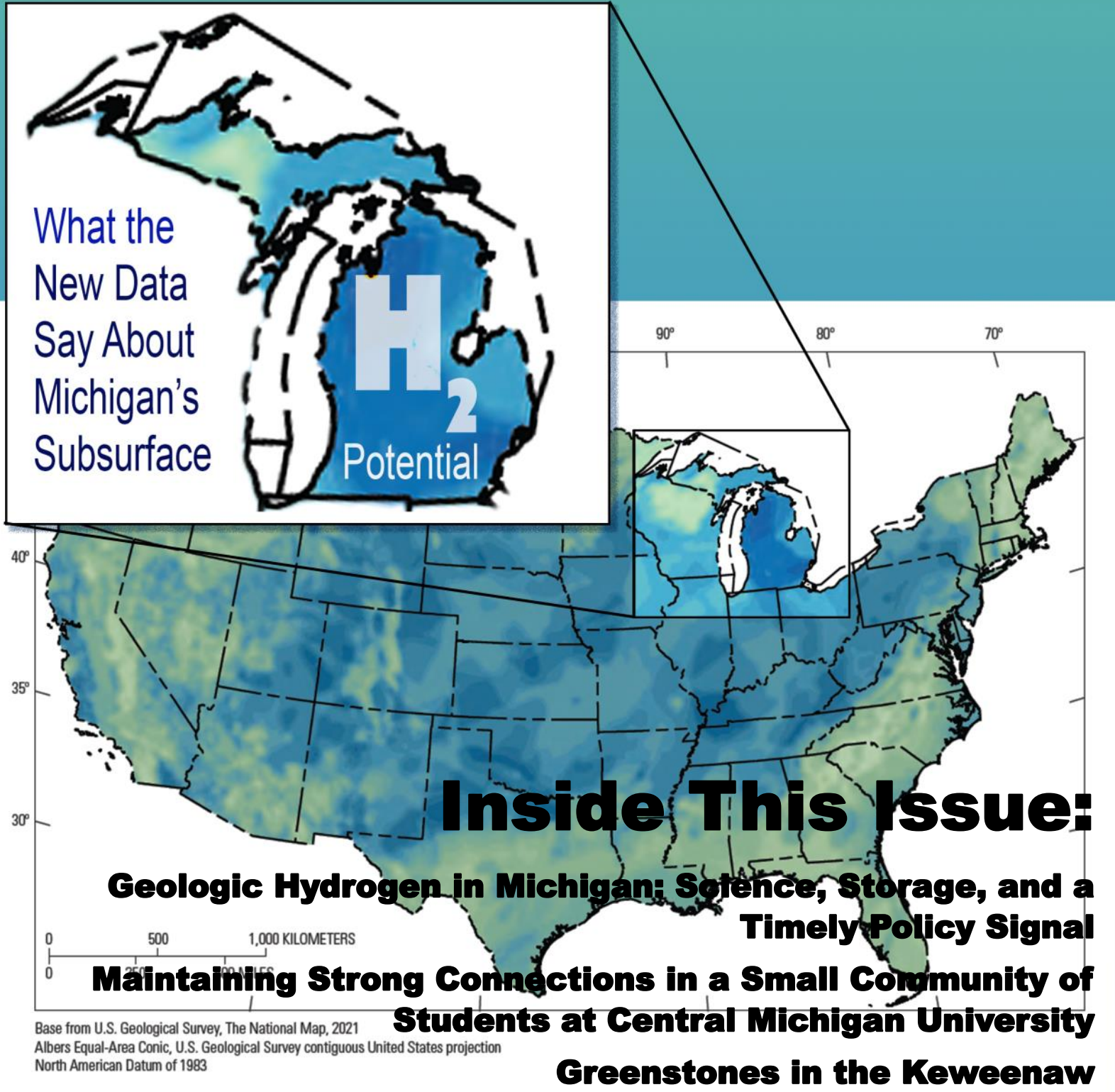


Geologically Speaking

Michigan Section AIPG Publication



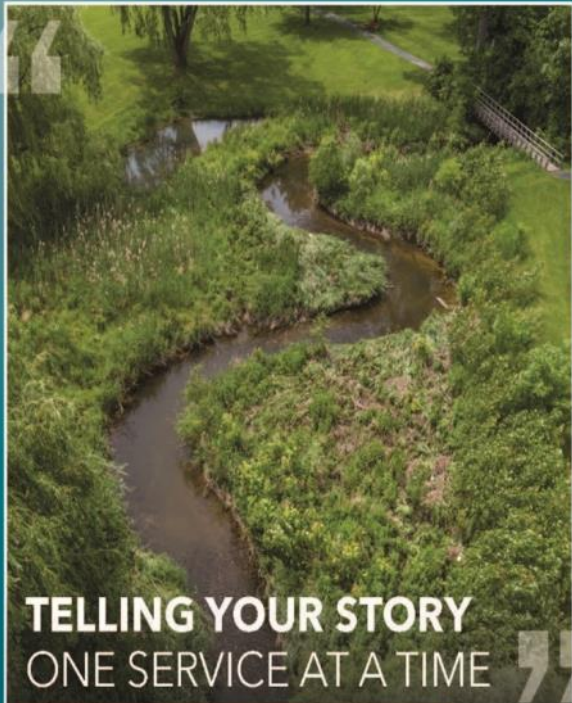



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Front Cover: Michigan is at the forefront of exploration for hydrogen. The Michigan Basin has very high potential for the occurrence of naturally-occurring hydrogen, based on a number of factors. The heat map shown considers and overlays 14 different factors; the resulting prospectivity map shown is the result. The base map is from the USGS, 2021.



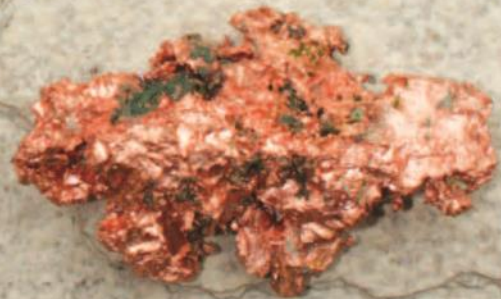
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Geology Crossword #23 Solution

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Across

1. Medusa's talent
3. Upper flow regime bedform
5. Nonfissile shale
11. Bad kids present
12. Repetitive sequence of turbidites
13. Wave-action bedform
15. Formed from single celled plants, abbrev
16. Shrinkage from drying out
17. Huge
19. Deformation structure, usually links
21. Coldwater, Antrim, Bell
22. Of iron
23. Unpredictable in movement
24. Dino-doo
27. Saw-tooth, pressure solution feature
28. A place to sleep

Down

2. Sodium, abbrev.
4. Laying down of clastic material
6. Transformation of sediment to rock
7. Precipitation from a brine
8. Clear cubic mineral
9. Main deposit at Great Sands NP
10. Calcrete
11. Large particles
12. ...Or not to_____
14. Over half of grains .002-.063 mm
15. Kona is an example
16. The Challenger _____
18. Water free calcium sulfate
20. Removal of material
22. Musical instruments
25. To reduce a mainsail
26. Found on a beach



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From the President's Desk

Challenges in the geosciences with the consolidation or elimination of Geology-based curriculum

Undergraduate geology enrollments in the U.S. have been decreasing for the last few decades. Attracting more students to pursue geoscience in college is vital to fill the workforce gaps and sustain college programs in the face of challenging higher education budgets¹. As universities across the globe face financial and administrative pressures, there has been a growing trend toward the elimination or consolidation of geoscience-based curricula. This development presents a range of challenges that extend beyond academic boundaries, affecting research, industry, and society at large.

One of the most significant challenges associated with the reduction or merging of geoscience programs is the potential decline in scientific literacy among the general population. Geoscience education equips students with the knowledge to understand natural hazards, resource management, and environmental stewardship. When these programs are diminished, fewer graduates possess the expertise necessary to interpret scientific data and communicate risks related to issues such as climate change, earthquakes, or water scarcity.

Universities serve as hubs for cutting-edge research in geosciences, driving advancements in technology and methodology. The consolidation or elimination of geoscience curricula threatens the continuity of research programs and collaborations. Faculty members may face reduced funding opportunities, limited laboratory resources, or even job loss, leading to a decrease in the number of active researchers. This contraction can slow innovation, particularly in areas such as remote sensing, mineral exploration, and environmental remediation.

The energy, mining, environmental consulting, and governmental sectors all depend on a steady supply of geoscience graduates. Eliminating or consolidating university programs directly impacts the pipeline of skilled professionals entering these industries. Workforce shortages can result in project delays, increased operational costs, and reduced competitiveness in the global market. Furthermore, a lack of specialized training can create skills gaps, making it difficult for employers to find candidates with the necessary expertise in areas such as hydrogeology, seismic interpretation, or geographic information systems (GIS). This challenge is particularly acute as society grapples with complex environmental problems that require advanced geoscientific knowledge.

Geoscience programs often focus on the unique geological and environmental characteristics of their local regions. When curricula are eliminated or merged, there is a risk of losing this localized knowledge base. For example, universities situated in earthquake-prone zones or near coastal areas may have specialized programs tailored to regional hazards and resource management. The loss of these programs can reduce the capacity of local communities to respond effectively to natural disasters or

manage resources sustainably. Additionally, regional research projects and field studies may be discontinued, further diminishing the pool of experts familiar with local geoscientific challenges.

Geoscience programs have historically played a role in promoting diversity and inclusion within STEM (Science, Technology, Engineering, and Mathematics) disciplines. Many universities have implemented outreach initiatives to attract students from underrepresented backgrounds to geoscience studies. The elimination or consolidation of these programs may disproportionately affect minority students and those from rural or economically disadvantaged areas, limiting their access to STEM education and career opportunities. This reduction in diversity can have long-term implications for innovation and equity within the geosciences, as varied perspectives are essential for addressing complex environmental and societal challenges.

Contemporary scientific problems, such as climate change and sustainable resource management, require interdisciplinary approaches that integrate geoscience with other fields like engineering, biology, and public policy. The downsizing or merging of geoscience curricula can disrupt these collaborative efforts, making it more difficult to foster cross-disciplinary research and teaching. Students may have fewer opportunities to engage in multidisciplinary projects or learn from faculty with diverse expertise. As a result, universities risk producing graduates who are less prepared to tackle the multifaceted issues facing society today.

Geoscientists play a vital role in shaping environmental policy and advocating for responsible resource use. With fewer graduates entering the workforce, there is a danger that governments and organizations will lack the expertise needed to develop effective policies for land use, water management, and climate adaptation. The absence of strong geoscience education programs can undermine efforts to protect natural resources and mitigate environmental risks, ultimately affecting ecosystem health and human well-being. This challenge is particularly pressing as the world faces unprecedented environmental changes that demand informed and proactive leadership.

The elimination or consolidation of geoscience-based curriculum at universities poses significant challenges for education, research, industry, and society. From diminishing scientific literacy and research capacity to exacerbating workforce shortages and reducing diversity, the impacts are far-reaching. Addressing these challenges requires a concerted effort from academic institutions, policymakers, and industry leaders to recognize the value of geoscience education and invest in its continued development. By preserving and strengthening geoscience programs, universities can ensure that future generations are equipped to understand and address the complex environmental issues that define our time. The Michigan



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Section recognizes this challenge and is trying to do its part to encourage our early career professionals as well as our student chapters.

Note 1: Moss, D. K., Guida, R. J., Zhou, R., Cooper, B., Harris, J. P., Hill, J., Young, C. (2025). Recruiting geoscience majors: Student perceptions and a path forward.

Journal of Geoscience Education, 1–14. <https://doi.org/10.1080/10899995.2025.2535770>

Jason Lagowski

Geologic Hydrogen in Michigan: Science, Storage, and a Timely Policy Signal

By Sara Pearson, CPG-10650

Michigan's geology has long supported energy development—from hydrocarbons and salt to carbon storage and geothermal applications—and recent advances are expanding how geoscientists think about subsurface energy systems. On January 15, 2026, Governor Gretchen Whitmer issued an executive directive directing state agencies to explore Michigan's potential for geologic hydrogen as part of the state's broader clean-energy strategy. The directive reflects a growing recognition that subsurface geology may play a critical role in producing, storing, and managing low-carbon energy resources, and that Michigan's stratigraphy and structural setting warrant serious scientific evaluation.

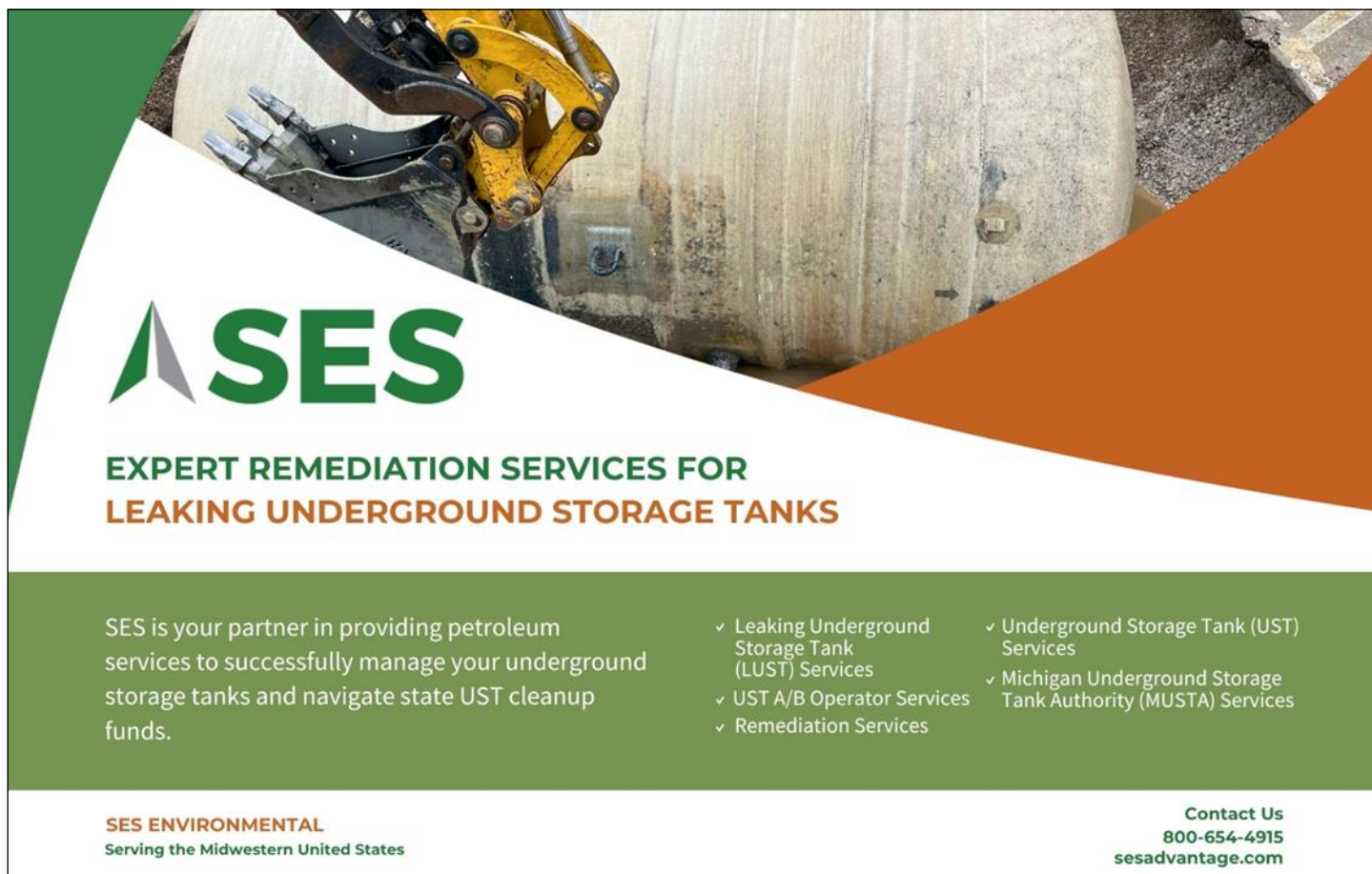
But geologic hydrogen remains unfamiliar territory for many practitioners. Unlike "green" or "blue" hydrogen, geologic (or natural) hydrogen forms through ongoing subsurface processes such as water–rock reactions, radiolysis, and oxidation of iron-rich minerals—processes known to occur in a range of crystalline basement, sedimentary, and evaporite-associated settings. Recent work by the U.S. Geological Survey (USGS) represents the first systematic effort to map hydrogen prospectivity across the United States using a petroleum-systems-style framework that evaluates hydrogen sources, migration pathways, reservoirs, seals, and preservation potential. This work challenges the long-held assumption that hydrogen cannot accumulate in economically meaningful quantities and reframes hydrogen as a dynamic subsurface system rather than a transient gas.

Therefore, Michigan stands out as a compelling natural laboratory in which the expertise of Michigan Geological Survey should play a critical role. The state contains multiple geologic environments favorable for both hydro-

gen generation and storage, including Precambrian basement with iron-rich lithologies, thick sedimentary successions, extensive evaporites, and a long history of proven subsurface containment. Michigan is already a national leader in underground storage, hosting some of the largest natural gas storage fields in North America within depleted reservoirs and saline formations. These same characteristics—porosity, permeability, regional seals, and structural integrity—are directly relevant to evaluating hydrogen storage, whether for captured natural hydrogen, engineered hydrogen systems, or hybrid energy-storage concepts.

From a technical perspective, this convergence of hydrogen generation potential and large-scale storage capacity is significant. Hydrogen systems require not only sources but reliable containment and deliverability, and Michigan's geology offers both. Importantly, these opportunities also raise critical professional questions around subsurface characterization, geochemical interactions, leakage risk, monitoring, and regulatory frameworks—areas where professional geoscientists bring essential expertise.

For Michigan's geoscience community, this moment represents more than a new resource discussion; it signals an expansion of how geologic systems are evaluated in the energy transition. As state policy begins to align with emerging science, there is a clear role for professional geoscientists to ensure that assessments of geologic hydrogen are technically sound, environmentally responsible, and grounded in rigorous data. *Geologically Speaking* will continue to follow this evolving topic as research advances and Michigan evaluates how its subsurface may contribute to a cleaner, more resilient energy future.



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Secretary's Report

The AIPG Michigan Section Executive Committee has met once, in December of 2025, since the last edition of *Geologically Speaking* was issued.

In December, the committee discussed the recent success of the Michigan Section AIPG Student Chapter Geology Jeopardy. The AIPG Michigan Student Chapters also attended a virtual presentation with guest speaker Jason Lagowski in November of 2025, and a second virtual presentation is planned for February of 2026. During this month, the executive committee also explored options for a proposed Treasury Committee Workgroup to

help better track the Michigan Section's investment account. The Executive Committee continued to discuss conflicting language in the Michigan Section bylaws and will continue discussions for proposed revisions to make the language clearer in 2026. Finally, in the month of December the Executive Committee approved a request from the Michigan Earth Science Teachers Association (MESTA) for a workshop sponsorship in Alpena, Michigan to review sinkholes with K-12 teachers.

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- Technical
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- Letters to the Editor

Please submit your draft article to the Editor, Adam Heft at: adam.heft@wsp.com. Technical requirements may be found on the AIPG website.

AIPG Headquarters has a New Address!

On May 10, 2025, AIPG headquarters moved to a new location. The new address is:

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The phone numbers and email addresses for all office staff remain the same.



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Maintaining Strong Connections in a Small Community of Students at Central Michigan University

By S. Brink, SA-12373

New Members, Strengthened Connections

At our first meeting of the semester, we noticed an even larger turnout than before, with multiple first-year students taking interest in the club. Before this, we had a table at two campus MainStage events (Photo 1), where students can find information and register for various student organizations. Our table was effective at attracting people with various majors and interests, and even the people who weren't interested in joining ended up learning something interesting about Earth science by interacting with us and asking questions. MainStage proved to be a great opportunity to meet new people and introduce AIPG to a wider audience.



The CMU Geology club at the MainStage event, fall 2025. Photo courtesy of S. Brink.

Club Activities

Being able to come together as a group after classes is a major stress relief for many of us. We meet every other week, like last year, to fit better with the busy schedules of both the E-Board and the rest of our club members. Most of our meetings so far have been very casual; we find that focusing on simpler and affordable activities works best for drawing in new members and keeping a consistent turnout. At this point in the semester, we have watched a geology documentary, painted decorative rocks, and tried a crystal growing lab activity together. During these kinds of casual activities, we usu-

ally end up talking with each other about different geological topics and academic projects as we do them, bonding over our shared interests. We also provide professional and educational information to students, such as academic opportunities and scholarships, along with a presentation from another CMU student in October explaining a recent environmental internship experience.

Next semester, when the weather is warmer again, we would like to try planning at least one field trip. We made an attempt during the last academic year which unfortunately didn't work out, so we are hoping to keep saving for something that will be fun and accessible for more members. An idea we are going to work towards this academic year is a short day trip to a local fossil collecting site, since it would be low-cost and easy to work into busy schedules. Hopefully, we will be able to plan a larger and more elaborate trip during the next spring or summer break.

GSA Connects 2025 Conference

This October, multiple members of our chapter's executive board had the opportunity to present research projects at the Geological Society of America (GSA) conference in San Antonio, TX. Cailey Treece, our Secretary, shared her undergraduate research project, titled Geomechanical investigation of caprock systems in the Michigan Basin: a scratch test study of the Glenwood and St. Peter Formations (Photo 2). In this study, in collaboration with Western Michigan University (WMU) and the Michigan Geological Survey (MGS), the strength of the St. Peter's Sandstone reservoir and Glenwood Formation caprock were tested for carbon capture, utilization, and storage (CCUS) purposes. The reservoir was found to be homogenous in strength, which was expected, but the caprock was unexpectedly heterogenous and had a lower strength overall. No conclusions have been made yet concerning strength distribution trends in the Glenwood caprock, but the research will be continued with comparisons to other caprock/reservoir pairs as well as other geophysical and geochemical data, some of which will be provided by WMU and MGS.

I wasn't able to go this year, so I asked Cailey about the experiences everyone had at the conference. She found it to be eye-opening after realizing how many applications geoscience can have in the modern world: "it put into perspective just how many projects are going on right now and how geoscience is such a varied field ... there's

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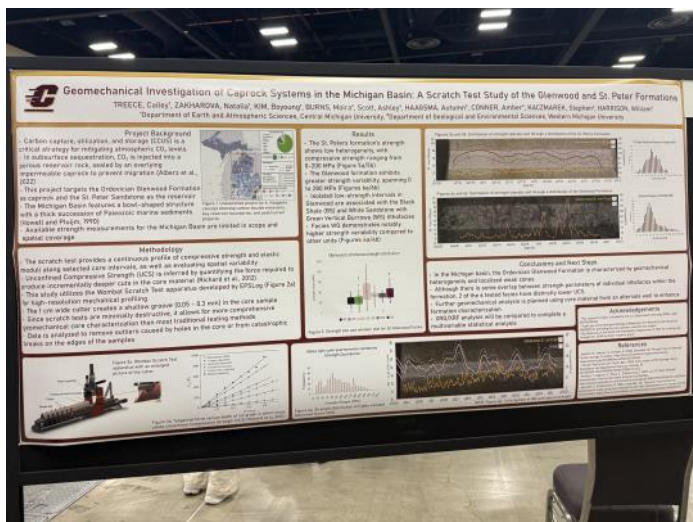


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Cailey Treece's research poster at GSA Connects 2025 Conference. Photograph courtesy of S. Brink.

something out there for everyone." As many of us are still

Member's Corner

The Member's Corner includes information about the Section's membership. This is your chance to provide information on where you are and what you are doing. Simply send the information to the Editor for inclusion in this section.

This edition of Geologically Speaking includes an introduction from our 2026 Secretary. Our next edition will introduce our 2027-27 ECP board member. Alex Horman...



I am a dedicated geoscience professional with over a decade of experience in environmental research, chemical analysis,

and site investigations. I hold a bachelor's degree in chemistry and environmental geosciences from Michigan State University, and an MBA from DeVry University Keller School of Management, which has helped me integrate scientific knowledge with strategic leadership and organizational effectiveness.

During my time at Michigan State, I served as Vice President of the Geology Club, where I led monthly meetings, organized spring break field trips, managed club finan-

figuring out what we would like to specialize in, it is reassuring to know how diverse our options can be.

Our Future

Geology is a wonderfully diverse field of science, incorporating many different skillsets and backgrounds. Our goal as a smaller student chapter is to not only attract more people, but to keep strengthening the community we already have here. This is a goal that we have been working towards since last fall, and so far, it seems to be going well for us. As the world continues to change, geoscience remains an important area of research, and it is equally important to be involved with the community. Whether it's conferences, group activities, or field trips, I believe there is something for everyone to enjoy when it comes to learning about Earth science. We are very thankful for the community we have developed at CMU and the support we have received from students, faculty, and everyone at AIPG. I am excited to see what will come next for us!

cial, and actively supported member engagement. This experience helped shape my leadership style and deepened my commitment to fostering community within the geoscience field.

My career began in environmental consulting as a geologist, where I worked on environmental monitoring, GIS mapping, remediation projects, Phase I and Phase II environmental site assessments, and public safety and awareness initiatives. Since 2012, I've been with Consumers Energy, serving in roles such as Geologist and currently as Lead Environmental Chemical Technician. My work focuses on environmental compliance and working with State and Federal environmental rules and regulations, supporting our mission of sustainability and safety. Along the side of geological work, I am serving as Vice Chair of the Engineering and Technician Intern Council at Consumers Energy, where I also provide professional mentorship, internship recruitment, and mentorship. As of 2026, I founded a new student mentorship program with Jackson College to help engage students in the STEM field and prepare for their careers.

As the Executive Board Secretary of the AIPG Michigan Chapter, I'm excited to support our members, promote professional development, and advance the geoscience profession throughout Michigan. Outside of work, I'm a proud mother of two middle schoolers, a loving wife, and a devoted caretaker to my three rescue American Pit Bull Terriers and three rescue kittens. I also enjoy maintaining a freshwater live planted aquarium, rock hounding, and spending time in nature.



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Did You Know?

This article is intended to remind members of various aspects of AIPG and benefits of membership. If there is something you would like to see featured in this column, please contact the Editor...

From A History of AIPG 1963-2003 by Richard Proctor...

"Prior to 1963, numerous societies existed to focus on the science of geology and upon specialty areas within the science, but many geologists were concerned about the lack of any national organization that focused on geology as a profession. The practice of geology, particularly with respect to public responsibility, regulation, and business practice, had no established guidelines and no national representation.

"This deficiency was addressed in 1962-63 when seven eminent geologists in different states began phoning and writing each other about forming a new *professional* organization. The letter writing was led by Edward "Bud" Rue in Illinois. Bud corresponded with William Mallory in Denver, Frank Conselman in Texas, Allen Tester in Iowa, Bob Becker in Oklahoma, Ad Honkala in Virginia, and Ben Parker in Colorado. In mid-1963 Bud organized and was Chairman of a Steering Committee to help create AIPG. He included these seven geologists, and added three others: Bruno Hanson in Texas, Tom Beveridge in Missouri and Rollie Rogers in Colorado. Then in July 1963, Martin Van Couvering in California received a special invitation from Bud Rue, at the request of Frank Conselman, to become the eleventh member of the Steering Committee.

"June of 1963 marked the first month of any official activity toward the founding of AIPG. The late Bob Becker, CPG 41, found out about the tentative plans and invited the Steering Committee to have their initial meeting at Oklahoma City. He volunteered to be the host and make all the arrangements. Bob was assisted by several members of the Oklahoma City Geological Society, namely Bob Hancock, CPG44, future AIPG President Jack Taylor, CPG237, Jerry Newby, CPG245, and J.D. McDavid.

"The enthusiastic support received from local geological groups from all over the country clearly illustrated the grass roots support that AIPG had from the beginning. The institute was founded in a vacuum of support from the national groups then claiming to represent geologists. Most of these national groups were promoting geology—not geologists."

On September 13, 1963, the Steering Committee met in Oklahoma City and created the organizational purpose and the basic framework for AIPG membership. It set a date and place for an organizational meeting, adopted a code of ethics, set minimum membership standards, disciplinary procedures, and a dues structure.

The founding convention was subsequently held on November 14 and 15, 1963 at the Arthur Lake Library in Golden, Colorado. A total of 94 professional geologists were in attendance at that first meeting.

The AIPG bylaws and code of ethics were subsequently adopted by the newly elected Executive Committee in February 1964.

I Want To Publish Your Articles!



Hey everyone, I would like to encourage you to submit your articles for publication! As the Michigan Section Editor, and also the 2021-24 National Editor, I am working to put together two top-quality publications for our members. This is not a one person job. This is where you come in. I welcome your technical articles, case

studies, opinion pieces, mini field guides, and letters to the Editor.

The guidelines are pretty simple for articles for *Geologically Speaking*. All submissions must be professional and may not violate the AIPG code of ethics. They also may not have been submitted for publication elsewhere.

While most submissions will be accepted, we do not accept articles that are a sales pitch for a product or company.

The deadline for submitting articles for *TPG* is two months before the start of the quarter for which the *TPG* edition is published. Thus, February 1 is the deadline for the Apr/May/Jun edition.

Please submit your articles of no more than 3,200 words in MS Word format directly to me or to Dorothy Combs at National Headquarters at aipg@aipg.org. All graphics (photos, figures, or tables) should be submitted in .jpg, .tiff or other standard format at 300 dpi. Please ensure your graphics are clean and easy to read to make things easier for the editorial staff. Complete information on submitting an article may be found on National's website at: <https://aipg.org/page/TPGInformation>.



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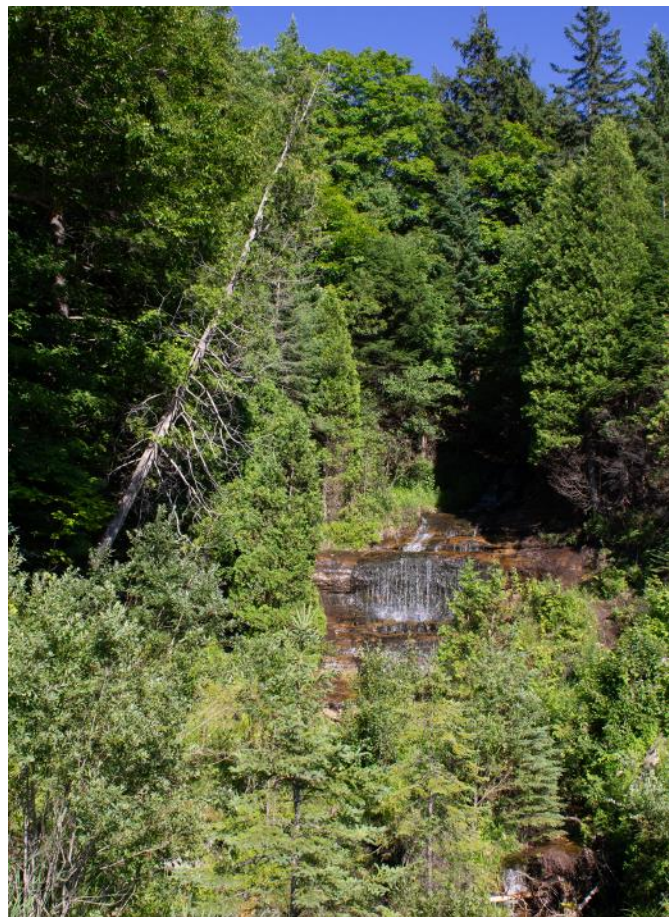
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Where in Michigan?

The October 2025 edition of *Geologically Speaking* featured a photograph of Munising Falls. The rock at the falls is the Cambrian aged Miner's Castle Member of the Munising Formation and the Au Train Formation, which is the cap rock at the falls. **Mark Petrie** correctly identified the photograph and gets his choice of swag for the correct answer.

This edition of *Geologically Speaking* features a new image at right - not the photo on the cover page. The first person to correctly identify the location, formation, and formation age will win AIPG swag! Submit your entry via email to the Editor; only one per person per issue please.

Don't forget to check out the feature article "Geology in Michigan" in the various editions that presents a geologic feature of interest as a mini field guide. One of the best parts about being a geologist is field trips, and we are hoping that in your travels around the state or country you include these featured spots as a stop. Why not incorporate them into a family vacation or bring friends who may not be geologists and share these locations that make Michigan unique? We hope you enjoy reading about it, and more importantly, go see it in person! We invite you to share unique geologic features that you know about and submit a "mini field guide" to share with our members in future editions.



Invitation to Our Members!

Do you have a case study to share?

The Michigan Section AIPG promotes knowledge sharing and would like to feature case studies from projects where others may benefit from successes as well as lessons learned. We feel as professionals that learning from each other is a great opportunity that AIPG offers our members. AIPG offers connection with other professionals and their experiences in the work we do every day. This case study represents what we would like to offer more to our members, not only as a way to solve problems, but unify us as professional geologists. Additionally, do you have a suggestion for other types of information to share that would be of interest to our membership?

Please send your case studies and suggestions for future publication in upcoming editions of *Geologically Speaking* to the Editor.

Update Your Information!

Please be sure that you continue to receive the Section's *Geologically Speaking* publication and other announcements. Submit an updated e-mail address to Adam Heft at adam.heft@wsp.com. If you move or change places of employment, don't forget to send your new contact information to both the Section and to National. If you are not receiving announcements directly from the Editor, it is because your email address is not up to date with the Michigan Section or because your IT group may classify it as junk or a bulk sending.

Please help the Editor by making sure that your email address doesn't bounce when the next announcement is sent. And be sure to cc National Headquarters at aipg@aipg.org when you update your contact information. Thank you!



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Students - Reminder

Don't Forget: Each Student Chapter must submit two articles for publication in *Geologically Speaking* each year to qualify for Section funding. Send the articles to Adam Heft at adam.heft@wsp.com.

Support our Sponsors!

The Section Executive Committee would like to remind its members to support the companies advertising in this publication. Consider working with these companies, and when you speak with their representatives, let them know that you saw their ad in the Michigan Section AIPG publication *Geologically Speaking*.

Interesting Geology Links

The Editor has received links to various interesting geology-related sites. Some of the more interesting links are included here. If you have any links to geology-related sites that you would like to share, please forward them (with a citation, if applicable) to the Editor.

Planet Geo podcast: <https://planetgeocast.com/>.

Geology Professor Shawn Willsey YouTube Channel: <https://www.youtube.com/@shawnwillsey>.

The AIPG YouTube Channel: <https://www.youtube.com/channel/UCZJVHi1yAPLJe1AksLOV3pA>.

Michigan Geological Survey (MGS) and resources from the Michigan Geological Repository for Research and Education (MGRRE) YouTube Channel. <https://www.youtube.com/@michigangeologicalsurvey/videos>.

The Mansfield Mine—Information on the previous Where in Michigan contest: summary of the mine disaster: <http://my.net-link.net/~prostock/mansfield.html>.

Section Website Reminders

The Michigan Section has created a database of geologic photographs on our website. Please submit photographs that you are willing to share to Adam Heft at adam.heft@wsp.com. Don't forget to include your name and a short explanation of what the photograph depicts. The photographs will be uploaded to the website periodically.

If you have suggestions on other items that should be included on the History page, please let a member of the Section Executive Committee know.



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Guide to Finding and Collecting Greenstones in the Keweenaw

Sam Cook, MTU Geological Engineering

Formation

Chlorastrolite is the mineral name for the gemstone often referred to as Isle Royale Greenstone. It is also a member of the pumpellyite mineral group.

Greenstones formed approximately 1.1 billion years ago in voids in the volcanic rocks of the Keweenaw. During a failed midcontinental rifting event, the area spanning from the Keweenaw to Isle Royale was covered with hundreds of lava flows. The tops of the lava flows contained many gas bubbles and when cooled became the vesicles (voids) in which greenstones and many other minerals were later deposited. Greenstones were formed through hydrothermal processes where elements dissolved in water percolated through the rock, depositing in the voids as minerals.

Native copper was also deposited along the tops of some of the lava flows leading to a booming mining industry in the Keweenaw from the mid-1800s to the late 1900s. During the copper extraction process, waste material containing greenstones was produced by some of the mines and deposited in large surface piles colloquially known as mine piles. Some greenstones in near surface lava flows were freed through glacial action and erosion such as those found on the beaches of Isle Royale and are typically found as more rounded pebbles with the pattern exposed. As rock collecting is illegal on Isle Royale the only place greenstones can be collected legally is mine piles and very rarely on Keweenaw beaches.

Identification

In mine piles, greenstones can be seen as small green globular nodules scattered throughout the host rock. They frequently occur in the lava flows that appear more red in the landscape. The easiest way to identify a greenstone laden rock is to find one that has been broken to see the pattern. When there's no pattern exposed, the next easiest method to check if nodules are greenstone is to do a hardness test. Greenstone is a 5-6 on the Mohs hardness scale so a typical rock hammer should barely scratch the nodule, and your fingernail shouldn't leave a mark. Beyond that, the best method for identifying greenstones is to polish likely pieces to hopefully reveal the iconic pattern.

Lookalikes

One major lookalike of greenstones found in mine piles is chlorite. Chlorite is a soft green mineral that often occurs alongside greenstones as nodules also scattered throughout the lava flows or as a coating covering the greenstones. It is typically darker green, feels waxy, and can be scratched by a fingernail because it has a hardness around 2 on the Mohs scale. Chlorite shells can help make extracting stones easier. However, they also

make visual differentiation difficult. The easiest way to determine which is which is to use the pointy end of a rock hammer to dig into the suspected nodule; chlorite will crumble while a greenstone will barely scratch.

Some other lookalikes include prehnite and epidote. They also form in vesicles however they can be more difficult to differentiate unless they are broken open since they can mix with greenstone material and have a very similar outer appearance.

Mine Piles

In the Keweenaw Peninsula of Michigan's Upper Peninsula, there are many mine piles left over from the copper mining industry. Also known as poor-rock piles, they are the waste material dug from deep underground. Many of these piles still contain a fair amount of copper as well as other minerals of interest to collectors.

Many of the piles are now owned privately or by active industry, however some are still accessible. The counties own some of the piles to use as road gravel and allow access with differing rules. The Cliff Mine Pile is owned by the county and open to collectors all of the time. The Central Mine pile is also open to the public while heavy machinery is not in use, or the gates are shut. The Delaware Mine is operated as tourist attractions and collecting is allowed on that pile. Other piles are accessible through different rock club memberships and trips such as the Copper Country Rock and Mineral Club.

Extraction

Greenstone has a hardness of 5 to 6 and the volcanic rock of the Keweenaw oftentimes is slightly softer than this, aiding in the extraction process.

The best method for efficient extraction is using a hammer and chisels to break the rock around the nodules and pop them out. Oftentimes other nodules are exposed when splitting rocks that would have been destroyed if the target nodule was cut out of the rock instead of split. If the rock has preexisting cracks, it is best

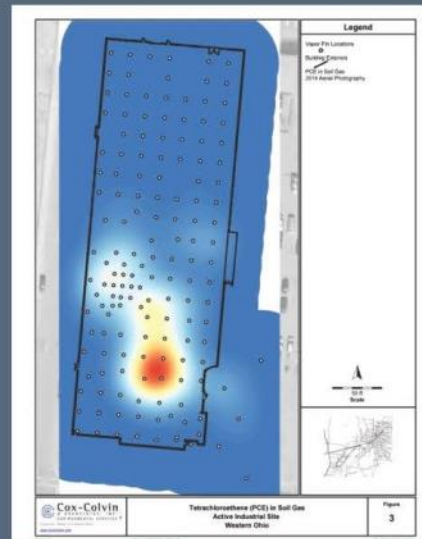
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practice to split these open first and then break up the resulting pieces as necessary to pop out nodules. It is important to use some sort of anvil to break rocks on since softer surfaces will absorb impacts preventing breakage. A large flat rock typically works well when greenstone hunting on mine piles. With practice this process can be done with consistent results and few broken nodules.

Using rock saws is not recommended as more nodules will be exposed with a hammer and chisel that would have been ruined by a rock saw. Oftentimes the rock will split around nodules as the interface between the rock and the nodule isn't as solid or "sticky" as the rest of the rock. This "stickiness" is further reduced if there is a chlorite shell around the nodule; however, too much chlorite infiltrating the vesicle may result in a lower quality stone.

Polishing

Greenstones often polish well – hence their status as Michigan's State Gemstone – however they aren't as straightforward as many other gemstones. They don't always have good patterns and have several notable behaviors that make it tricky to attain good results. The more famous Isle Royale Greenstones (as opposed to the greenstones found in the Keweenaw mine piles) were eroded out of the bedrock, effectively exposing the pattern and destroying most lower quality stones.

Some greenstones are hollow or have voids where the vesicle wasn't fully filled in. This can make for unique specimens; however, when polishing it may result in broken stones. These voids can be filled with epoxies or other materials though solid stones are typically preferred.

Alternatively, some greenstones can be filled in with other minerals, the most common being calcite. Calcite is a very soft mineral with a hardness of 3 on the Mohs

Scale and isn't desirable due to its weak cleavage planes. Chlorite can also be an inclusion resulting in softer areas of the stone that don't take a polish as well as harder spots. Rare greenstones can also have inclusions of prehnite or thomsonite - both of which are similar in hardness to greenstone and can make a stone more desirable or unique. Additionally, some greenstones can have copper or silver inclusions which can make for very desirable finished stones. With all inclusions polishing may become more difficult; however, it can also result in a more unique or valuable stone.

Many greenstones also have issues with their pattern. Oftentimes the brighter green pattern only goes part way into the stone and disappears into a dark black-green towards the center of the stone. This can be seen in the cross section, and the thicker the lighter green area is, the easier it is to work the stone. Additionally, most stones only have a good pattern on one side and for some reason this is usually the bumpier side. This makes it difficult to obtain a smooth even surface with a good pattern.

You can take greenstones straight to polishing and grinding equipment such as a cab machine and obtain good results, however, to speed up the process many people put greenstones in a rock tumbler for a couple days to grind through the outer layer and expose the pattern. This should be done with caution, checking the stones frequently for patterns to avoid wearing through thin patterned stones. If you don't have enough stones to fill a barrel the tumbler can be filled with ceramic media or other materials that aren't too large as large media may break stones.

Once the location of the pattern has been located the stone can be shaped, smoothed, and finished as desired using conventional lapidary equipment.

Welcome New Members!

The Michigan Section is continuing to grow. Please welcome the following new CPGs, Professional Members, Early Career Professionals, Associate Members, and Students:

Matthew Frisch, AS-0236; Nicholas Strader, ECP-1261; Alexandra Horman, ECP-1263; Steven Buyze, MEM-3830; Mitchel Dykla, MEM-3857; John Bradley, SA-13129; Isabelle Boyer, SA-13128; Mallory Price, SA-13124; Makayla Drake, SA-13110; Adam Kushel, SA-13070; Linus Resek SA-13066; Alex Rasico, SA-13050; Samin Abolmaali, SA-13042; Alyssa Cousino, SA-13017; Augustine Lodise, SA-13015; Charley Russell, SA-13004; Seth Farmer, SA-12987; Mohamed Shuman, SA-12982.

To each of our new members, welcome to our Section! We encourage you to attend Section meetings and other events. You are also invited to provide information for the Member's Corner articles so that our members can get to know you.



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WSU Field Excursion to Grand Ledge

Liam Teasdale, SA-12166



One of the outcrops at Grand Ledge with shale and coal. Photograph courtesy of Liam Teasdale.

My name is Liam Teasdale, and I'm currently in my fourth year at Wayne State University currently working on a bachelor's degree in geology. When I'm not in classes, I'm usually working at a local science museum or out collecting minerals or fossils, if time allows.

Last October, I was enrolled in a course covering sedimentology and stratigraphy. During this course, there was a field trip to go and analyze some notable features in a given area. Unfortunately, I couldn't attend this trip at the designated time, and for completely unrelated reasons a classmate of mine was unable to attend as well. In order to make it up, we were given the option to go on our own. The location, Grand Ledge, Michigan was a fair bit away from campus, and it took around an hour and a

half to drive there. Grand Ledge is significant when compared to the rest of Michigan as it is one of, if not the only place to have large amounts of Carboniferous age rocks exposed at the surface, compared to Devonian age rocks seen in the majority of the lower peninsula. This region was once extensively mined for clay, to be used in brickmaking, as evident from the remnants of production at Lincoln Brick Park, our first stop. Once we arrived, printouts in hand, we began to look for the three sites to investigate. The main things to look for were mainly identifying relevant lithologic features (examples being thickness of layers, color, texture, grain size, etc.), as well as constructing a stratigraphic log of each site. A stratigraphic log for the purposes of this excursion is a drawing depicting differentiating stratigraphic layers in a given

body of rock. Unfortunately, while these goals made sense for the purposes of the class, the two of us were primarily focused on our own goal that became rapidly apparent: finding each site without getting lost in the woods. While the printouts we were given were more than sufficient in instructing us on what to do once we found the sites, it became abundantly clear that the instructions given were not exactly superb on showing us how to actually find each site on our own. This led to a lot of time being spent trying to interpret the instructions we had to find the approximate location of where a site could be and go from there. This was more difficult than expected and eventually led to us calling a friend who had gone on the trip to hopefully ascertain a couple of locations.

Once three sites had been successfully located, it was time to begin transcribing features and building a log. As this process began to take form, eventually the two of us began to coalesce a hypothesis explaining the lithographic makeup of the area. This hypothesis centered around the heavy presence of shale and mudstone rocks in the area and the abundance of trees. Our claim was that the heavy amount of carboniferous rocks were primarily charcoal that were deposited during a massive forest fire some time before. As we continued to move from site to site, our claim seemed to reinforce itself, as many features were replicating themselves in similar locations/layers. This was very exciting, as at this time neither of us had much extensive experience with field work, especially

not to the extent that we were forming our own conclusions based on information we had collected completely unaided. Once we had collected all of the information we felt was required, as well as our own hypothesis as to what occurred in the area, we adjourned back to campus and called it a successful endeavor.

Later in the week, we had the opportunity to discuss the results of our trip with our professor and peers. During this discussion, it was tragically revealed to us that not only was our hypothesis wrong, but to add to that, despite all our wandering in the woods, we only found one of the three correct locations. Two of the sites we had investigated were completely unrelated to what we were supposed to be investigating. To add salt in the wound, I also lost one of my hammers at some point during the trek. Overall, this trip was very frustrating in the moment, as not many things ended up going the way we had wanted them to. We didn't find all the designated areas, our explanations for the area were wrong, and we spent a solid two hours of the whole shindig completely wandering around. However, looking back I find it more funny than anything else, as even though we didn't get a lot of the directed classwork done, we did end up doing our own iteration of field work, learning about the process that goes into geological mapping and study, and spent a good chunk of time wandering around the woods in rural Michigan.

Coming Events

January 28-February 15, 2026: 71st Tucson Gem & Mineral Show: "Red, White, & Blue—Celebrate the Spirit of Minerals!" theme. Details at: <https://www.tgms.org/show>.

May 2026: Kalamazoo Rock, Gem, Fossil & Mineral Show. Kalamazoo County Expo Center, 2900 Lake Street, Kalamazoo, Michigan.

June 9-10, 2026: Michigan Environmental Compliance Conference, Lansing.

June 16-17, 2026: 15th Michigan Section AIPG Environmental Risk Management Workshop. Call for Sponsors will be forthcoming soon.

August 2026: Ishpeming Gem & Mineral Show. Ishpeming Elks Club, 597 Lake Shore Dr., Ishpeming.

August 29-September 2, 2026: AIPG Annual Meeting, Duluth, Minnesota. Details and registration information

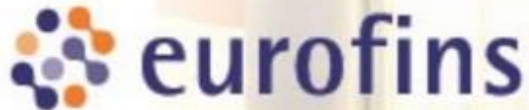
forthcoming on the AIPG national website.

December 3, 2026: Michigan Section AIPG Annual Meeting, to be held at Weber's Inn, Ann Arbor. Details forthcoming.



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Regulatory Roundup:

Land, Water, Air & Natural Resources

Legislative, Regulatory & Budget Developments in Michigan and Washington (Oct 2025 - Jan 2026)

As 2025 closed and the 2025-26 legislative session moved into its second year, Michigan and federal policy-makers continued to debate major changes affecting energy development, water protection, cleanup liability, and the resources needed to implement these policies. This update picks up where the October Round-Up left off and highlights notable developments through into January 2026, with a brief look back at broader 2025 activity.

2025 snapshot: themes that shaped the year

- Energy siting and infrastructure: persistent push-pull between statewide clean-energy goals and local land-use control, plus high-profile pipeline litigation.
- Water quality: continued PFAS response work, growing focus on microplastics, and ongoing conversations about stormwater and discharge permitting.
- Cleanup liability and standards: renewed debate over "polluter-pay" cleanup frameworks and how cleanup criteria are set and updated.
- Budgets and capacity: heightened attention to the staffing and funding needed for mapping, permitting, enforcement, and long-term data stewardship.

Land Use, Energy Siting & Resource Development

Michigan

Key developments since October include:

- [Executive Directive 2026-1](#) establishes a **Geologic Hydrogen Exploration and Production Initiative** and directs state agencies to assess legal, policy, and environmental considerations for geologic hydrogen development (signed Jan. 15, 2026).
- **Line 5 litigation:** A federal court ruled in December 2025 that Michigan lacks authority to enforce a shut-down order for Enbridge's Line 5 pipeline segment in the Straits of Mackinac; the state has appealed the decision in early January 2026.
- **Clean and Renewable Energy and Energy Waste Reduction Act:** Bills that would repeal or modify cen-

tralized renewable-energy siting authority ([SB 322-327](#) / [HB 4027-4028](#)) continued to draw attention late in 2025, reflecting ongoing tension between statewide energy targets and local land-use control.

Federal

At the national level, late-2025 updates emphasized critical-mineral and mapping capacity:

- [Congressional Research Service \(CRS\) Earth MRI update \(Dec. 2025\)](#) summarizes Infrastructure Investment and Jobs Act funding for Earth MRI through FY2026.
- [USGS FY2026 budget justification \("Greenbook"\)](#) highlights continued emphasis on geologic mapping and data products (Earth MRI, 3DEP) to support permitting and investment decisions.

Water Resources, Permitting & Infrastructure

Michigan

Since October, attention shifted from proposals to implementation and resourcing:

- [House Fiscal Agency EGLE FY 2025-26 budget briefing \(Dec. 2025\)](#) outlines EGLE's enacted FY26 budget (including major federal and water-infrastructure funding components).
- [EGLE PFAS Industrial Pretreatment Program \(IPP\) initiative](#) describes ongoing 2025 statewide PFAS assessments that continue to inform permitting and source-control strategies.
- **Microplastics package** ([SB 503-505](#) / [HB 4766-4768](#)): The 2025 proposal set remains under consideration, including phased restrictions on microbeads and statewide drinking-water monitoring and planning.

Federal

PFAS and drinking-water policy remained a headline issue throughout 2025:

- **EPA PFAS drinking-water rule revisions:** National reporting noted EPA plans to roll back parts of the 2024 PFAS drinking-water rule, while maintaining limits for PFOA and PFOS and extending compliance timelines.



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Air Quality, Emissions & Pollution Control

Michigan

- [SB 141 \(2025\) - Methane & VOC control/capture](#) would require operators of oil and gas wells to reduce fugitive methane and VOC emissions by at least 95% using specified capture/control measures.

Federal

Federal attention has continued to focus on wildfire-smoke resilience and broader climate policy debates introduced earlier in 2025.

Environmental Cleanup, Liability & “Polluter-Pay” Standards

Michigan

Cleanup-liability reform remained one of the most consequential 2025 policy debates, with proposals still active entering 2026:

- **Cleanup reform package** ([SB 385-393](#) / [HB 4636-4640](#)): Proposals would revise cleanup criteria and liability standards, including changes to how cleanup criteria are established and how information is shared publicly.

Federal

EPA guidance and litigation posture on PFAS cleanup liability continued to evolve:

- [EPA Brownfields FAQs on PFOA/PFOS CERCLA designation \(updated Dec. 5, 2025\)](#) confirms the designation remains in effect during litigation and that All Appropriate Inquiries must now consider conditions indicative of PFOA/PFOS releases when establishing certain liability protections.

Hazardous Waste, Injection Wells & Materials Management

Michigan

- **Injection well / hazardous waste updates** ([SB 246-247](#)): The 2025 package proposes higher disposal fees and tighter requirements affecting Class I and II disposal well oversight under NREPA Parts 111 and 625; Senate activity occurred in 2025, with further movement expected to depend on House action.

Federal

Microplastics research and monitoring proposals introduced in 2025 continued to circulate in Congress as states considered their own approaches.

Natural-Resources Management & Funding Outlook

Michigan Geological Survey (MGS)

- [FY 2025-26 General Omnibus conference report summary \(HB 4706\)](#) confirms the enacted FY26 approach that replaced the prior recurring \$3 million line item for MGS with minimal ongoing funding and a one-time work-project authorization for \$2.3 million in unexpended funds.
- **Practical impact:** Entering FY26, the key question is whether stable base support will be restored to maintain statewide geologic mapping, data stewardship, and cost-share readiness for federal and partnership projects.

Federal

- Earth MRI and related USGS programs remain a focal point for critical-mineral, groundwater, and infrastructure decisions; CRS and USGS budget materials released in late 2025 provide updated context as FY26 appropriations develop.

Our job as professionals

Across 2025 and into early 2026, one theme has stayed consistent: public decisions about water, energy, waste, and land use increasingly hinge on accurate geologic and hydrologic information. Professional geoscientists can strengthen these processes by sharing data, providing expert testimony, and translating technical findings for policymakers and the public. Whether through agency consultation, participation in rulemaking hearings, or local planning support, we geoscientists help ensure that environmental policy remains grounded in sound science and practical understanding of Earth systems.

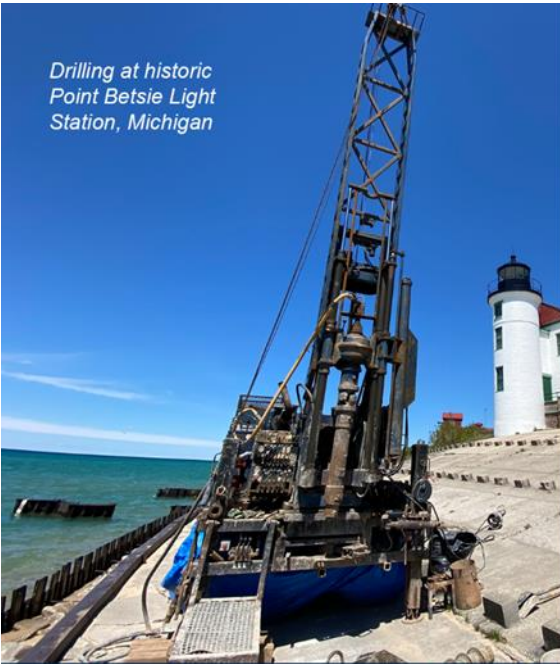


Michigan legislative bill [search](#)



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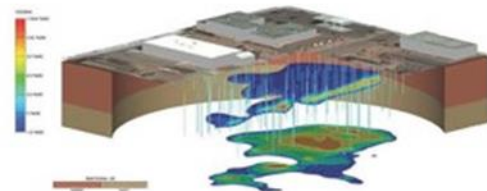
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ASBOG Exams

The ASBOG Fundamentals of Geology (FG) and Practice of Geology (PG) Examinations are administered using Computer Based Testing (CBT). All examinees must be certified to take the examination at an approved Prometric/Iso-Quality Testing (IQT) facility. Multiple testing centers are located throughout Michigan. Central Michigan University (CMU) qualifies candidates to take the FG examination in Michigan and surrounding states.

The FG and PG exams are given in March and October each year. **The next scheduled examination dates are Thursday, March 19th and Friday, March 20th, 2026.** Two days will be available this March to accommodate the anticipated demand.

There are three fees for taking the FG examination: \$50 CMU administration fee, \$200 ASBOG examination fee, and \$75 Prometric testing center seat fee. **The deadline to apply for the exam through CMU is January 31, 2026.**

Complete information on applying to take the FG exam is available at se.cmich.edu/asbog. Useful information to help prepare for the FG Exam can be found in the ASBOG Candidate Handbook, which is accessible on the [ASBOG website](https://se.cmich.edu/asbog).

Member Input Sought

The Section Executive Committee is seeking input from members on a variety of topics. Do you have any suggestions regarding speakers/presentation topics that you would like to hear? What about field trips or other events? Some place you'd like to see us go, or something you think the membership would enjoy doing? Then

make your voice heard; please send your suggestions to one of the members of the Executive Committee; any of the seven members would be glad to hear from you. AIPG is your organization. Please help keep it relevant and interesting for all by participating.



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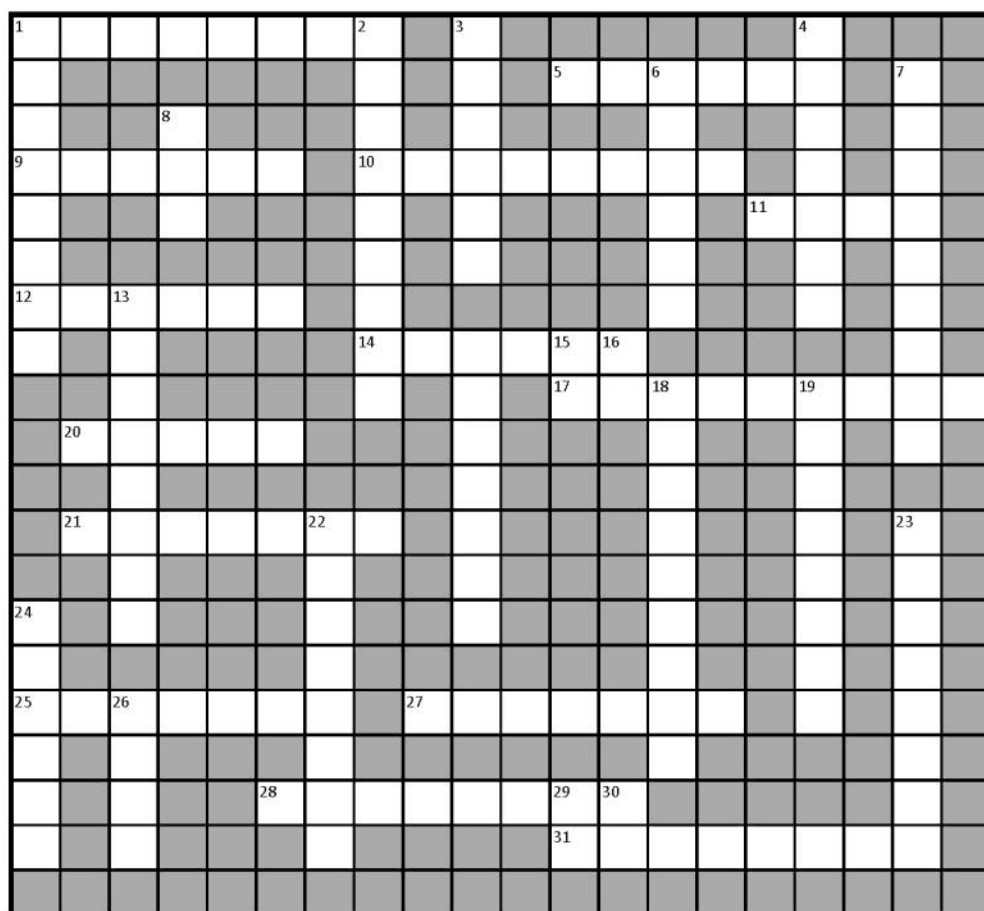
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Geology Crossword #24



Across

1. Lightweight, metallic element
5. Policeman, slang
9. Used in flat panels and touchscreens
10. Component of a lead pencil
11. Corrosion protectant coating
12. Five cents
14. Used in electronics, antibacterial tools
17. Aerospace, auto, electronics alloy
20. Not a moron or a bosun
21. Not a famous German battleship
25. A famous valley in California
27. Used in semiconductors
28. Not something you lick with
31. Used in electrical parts of high temps

Down

1. Not a payment to a divorced spouse
2. Not a male laxative
3. Used in extreme temp. alloys
4. A nuclear fuel
6. Used in most fertilizers
7. Used in nuclear and aerospace applications
8. Old cans
13. Needed for stainless steel
15. Long dash
16. Egyptian sun god
18. Used in fiber optics, night vision
19. Not the good samaritan
22. Used in high-temp materials
23. Not one that repairs flutes
24. Used in atomic clocks for GPS
26. A fatal weight
29. ____, go home!
30. Positive ion of halite

*The solution to this geology crossword will be included in the next edition of *Geologically Speaking*.

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