

# Geologically Speaking

A Michigan Section AIPG Publication

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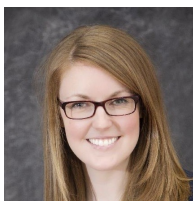
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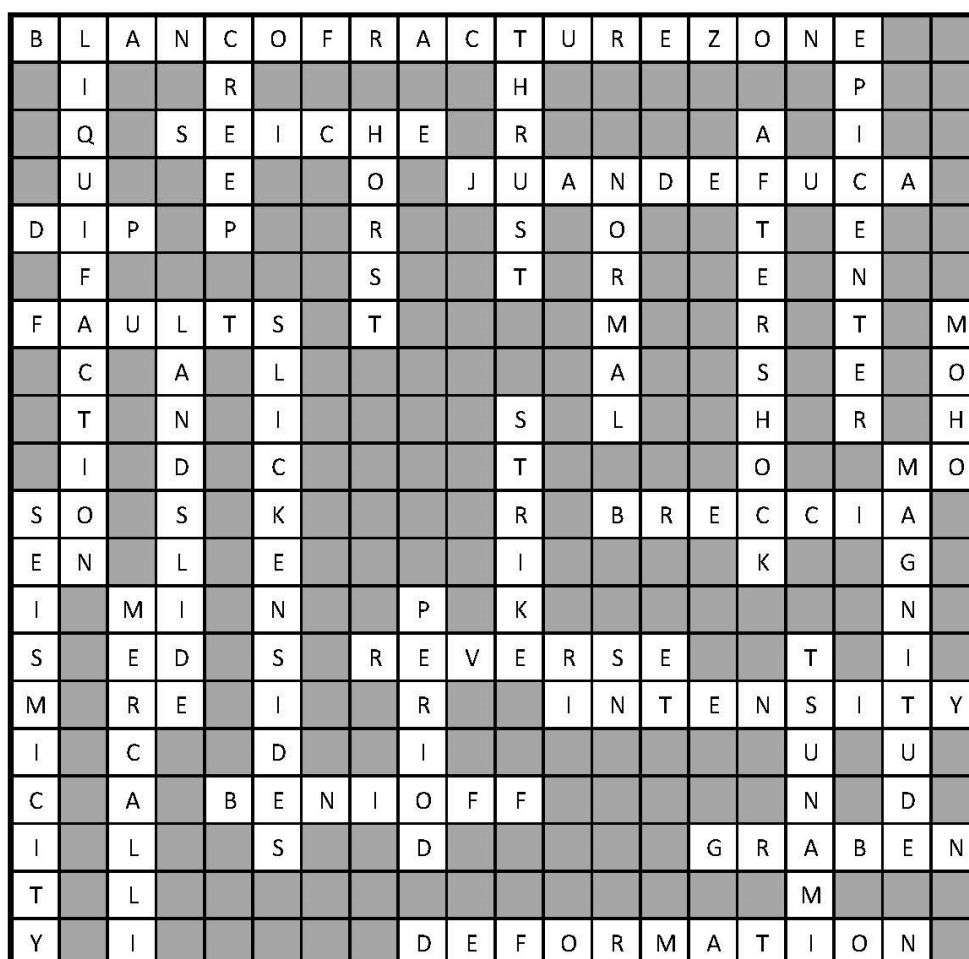


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**Front Cover:** Upper Tahquamenon Falls located between Newberry and Paradise in the eastern Upper Peninsula. The falls are also nicknamed root beer falls because of the brown color of the water, which is a result of tannin leaching from cedar swamps upstream. The bedrock at the falls is the Cambrian aged Munising Sandstone. The Miner's Castle Member forms most of the upper portion of the falls, while the Chapel Rock Member forms the lower portion. Photo taken by Sara Pearson in 2010.

## Geology Crossword #8



## Across

1. December 2021 swarm location
6. Oscillation of a body of water from shaking
9. Small Pacific plate
11. A quick swim
12. Plate edge
15. Of Marquette pillows
16. text
17. Modus operandi
18. \_\_\_\_ what?
19. Broken rock
20. Half an em
21. Michigan, abbr.
23. Editor, abbr.
24. Back up
29. Regarding
30. Scale describing severity on people
31. American billionaire
32. A downdropped block
33. Change in size or shape

## Down

2. Process when soil acts like a fluid
3. A scary person; also to move slowly
4. To push or drive with force
5. Surface point above the hypocenter
7. You can't ride these
8. Small quakes following main one
10. Usual, average or typical
13. A resounding victory
14. Indicator of rock movement
15. Boundary between crust and mantle
16. What one does with a match
17. Based on seismograph motion
18. Geographic/historical distribution
21. Italian volcanologist and priest
22. Sentence end
25. Remedial Investigation
26. Antimony
27. \_\_\_\_, Phone home
28. A big wave

# From the President's Desk

The constant days of winter gray are starting to come to an end. With the warm spring and summer months comes an abundance of fun activities. From camping and rockhounding with family and friends to an exciting summer of AIPG events! I have packed my summer full of activities to get myself and my family outdoors this summer heading to several state parks I have always wanted to explore.

I am so excited for the AIPG Michigan Section Annual Workshop coming back as an in-person event. The workshop is one of my favorite professional development opportunities. The Workshop Committee does an excellent job packing in outstanding technical sessions. The content has always been extremely valuable to me, and I always learn something new. There are many things that make the summer workshop so unique. A workshop on the shores of Higgins Lake has made the venue my absolute favorite. The Tuesday night social rockets this event to one of the best I've ever been to. What is better than craft beer, bonfires, great conversations with colleagues, and music? I hope to see you all June 14-15, 2022 for this event.

To make this summer even better, the AIPG Michigan Section is also hosting the AIPG National Meeting in Marquette August 6-10, 2022. This meeting is sure to be a superior experience, offering not only a wonderful opportunity for technical development and networking, but a wide array of fun field trips exploring the great outdoors of the Michigan Upper Peninsula. The committee is still accepting abstracts for technical presentations, and I encourage you all to submit an abstract about one of your favorite projects highlighting your great work.

The 2022 AIPG Michigan Section Golf Outing on September 13, 2022 is going to be far better than par for the course! What a tee-rific way to end the summer! Put on your thinking handicap, gather up your best team of fore, and head to the course! We look forward to seeing you there!

In between AIPG events this summer, I hope you will get out and do some rockhounding around the Great Lakes. This has become a favorite for me and my family. My 2 ½ year old son Rowan even loves it. I joined a group on Facebook last year called "Michigan Rockhounds". The group was started in late 2020 by 2 rock loving enthusiasts and 1 geologist sharing the love of Michigan rocks. The page grew from just a few members in the early days to 78,000 members as of April 2022. They provide a lot of great information on where to legally rockhound in Michigan and provide an interactive map of all the best spots in Michigan. The group admins even put on community rock hunting events, where participants gather at a public location and search for rock treasures together! If you are not one of their 78,000 followers, I definitely recommend checking out their page. You might even be able to help members by identifying some of their rocks (or not-rocks aka concrete!).

Thank you for enduring some of my puns. If you too are a pun lover, I recommend you check out Roth Shirt Co. the next time you are in Traverse City. They have some pretty punny stuff – including geology tee's!

Whichever geology/outdoorsy events you partake in, I hope you have a fun, safe, and exciting summer! I look forward to seeing you at an upcoming event.

*Mellisa Powers-Taylor*

## Minerals for Sale!

Long-time Michigan mineral collector and dealer, Bill Micols, is selling his lifetime collection of material. Bill is in Milford. For additional details, please see the full-page flyer on the following page.

## Check Out the AIPG Mentoring Program

Mentoring is an experience that promotes personal growth, creates meaningful connections, and sparks creative innovations. AIPG offers an opportunity to connect mentees with mentors. To sign up for the program is easy and can be done when paying your annual dues or updating your online profile. You may check the box on your paper dues renewal form that you send in via mail or log into your account at [www.aipg.org](http://www.aipg.org) and update your member profile. Be sure to check whether you would like to be a mentor or mentee and the fields of expertise. The system allows individuals to search for people with similar interests and connect via email. Check it out today!



# SALE

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**AIPG Michigan Section****11<sup>th</sup>****Environmental Risk Management Workshop****Best Practices for Groundwater Remediation and Management****June 14-15, 2022 - Roscommon, Michigan****For more information: <https://mi.aipg.org/workshop.htm>**

June 14-15 will be here sooner than you think! Be sure to register and join us June!. Don't miss out on this year's topic: Best Practices for Groundwater Remediation and Management. We have two days full of presentations on remediation from VOCs to PFAS, groundwater modeling, technology and tools, and short courses including vapor intrusion and RockWorks software applications. A great panel discussion is also in the works regarding water policy in Michigan.

More details are available at the Michigan Section website including the agenda, sponsorship information and registration link: <https://mi.aipg.org/workshop.htm>

**Students:** We are accepting requests for scholarships to attend the event for free. Please reach out to Sara Pearson [PEARSONS@michigan.gov](mailto:PEARSONS@michigan.gov) and Tammy Rabideau at [Tammy\\_Rabideau@mascohq.com](mailto:Tammy_Rabideau@mascohq.com).

In addition to the great knowledge sharing and networking opportunities the workshop has to offer, we also host an evening event complete with bonfires and musical entertainment. This year we will not be treated to live music by Waynesboro, but rather we are seeking other fellow musicians to join us and share your talents. Please see the message below from Wayne Amber of Geosyntec/Waynesboro below.

**CALLING ALL MUSICIANS!**

Final planning is taking shape for the 2022 Environmental Risk Management Workshop, and as usual, we are looking for this year's event to be both informative and entertaining. Unfortunately, due to scheduling conflicts, our band from recent years, Waynesboro, is unable to be there in full force. So we are looking for other musicians that might be willing to take up the call and play us a few numbers (think Open Mic Night, but more casual). We will have a PA system and microphones that Wayne Amber (Geosyntec/Waynesboro) can man.

If you are at all interested, please let us know. We can then get a separate discussion going amongst musicians to see about possible collaborations. If you play an instrument but you're unsure, still reach out to at least join the discussion. You can decide later if you want to perform.

For those of you that are not blessed with skills on a musical instrument but who enjoy a good sing-a-long, we are also planning to host karaoke later in the night. At the moment, we are still on the hunt for a machine/software to borrow or rent. If you know anyone that has something we could use, please let us know.

Regards,

Wayne

Contact Wayne here: [WAmber@Geosyntec.com](mailto:WAmber@Geosyntec.com)

**SPONSORS**

*We still have sponsor opportunities available! Contact Sara or Tammy if you have questions!*





## Geology: The Cornerstone of our Future

August 6-9 | Marquette, MI

# Annual Meeting Update

The AIPG Michigan Section is hosting the 2022 Annual Meeting in Marquette on August 6-9, 2022. The meeting is well organized, and registration is open! The planning committee is soliciting abstracts for the technical presentations, which will all be held on Monday, August 8th; no field trips will be held opposite the presentations to allow good exposure for the presenters.

We are also actively identifying potential sponsors and exhibitors. If you or your company are interested in exhibiting or sponsoring the meeting, please reach out to Linda Hensel at [lhensel09gtc@gmail.com](mailto:lhensel09gtc@gmail.com) or Adam Heft at [adam.heft@wsp.com](mailto:adam.heft@wsp.com).

The Michigan Section is also coordinating a silent auction that will be held during the Sunday evening Welcome Reception. The proceeds of the auction will benefit the Foundation of the AIPG. If you would like to donate an item, please contact Adam Heft for information on how to arrange your donation.

Here is an update on the six field trips that will be offered during the meeting on August 7 or 9:

- Eagle Mine/Mill (Sunday): Surface tour of the mine and mill. This trip is limited to the first 30 participants to register. Collection of the high-grade ore will be possible from the ore building.
- Historic Iron Mining (Sunday): Michigan Iron Industry Museum, Jackson Mine Park, Cliffs Shaft Museum. This trip will be led by Bob Clark of the Cliffs Shaft museum, and Barry James of the Michigan Iron Industry Museum.
- Minerals & Falling Water (Sunday): The first part of the trip will be to Marquette area waterfalls and led by David Adler. The second part of the trip will be to the Champion Mine tailings for mineral collecting and to Jasper Knob, and led by Adam Heft.
- Pictured Rocks (Tuesday): This trip includes a visit to

Miner's Castle, Miner's Falls, Munising Falls, and a 2.5 hour boat tour. This trip is led by Robert Regis of NMU.

- Tilden Mine/Mill, includes a visit to the main mine pit as well as the processing facility where ore is turned into taconite pellets for shipping to steel mills. This trip will be led by Cleveland Cliffs geologists.
- Two-day, post-meeting trip to the Keweenaw Peninsula that will include a visit to the Quincy Mine hoist, underground tour of the Quincy Mine, the Seaman Museum, and to Torch Lake to observe reclamation efforts associated with historic stamp sands.

There are a number of other locations that participants would find interesting. Because we can't include everything, the plan is to provide meeting participants with access to the *Geology in Michigan* mini field guides that have appeared in this and prior/future editions of *Geologically Speaking*. These will include, at a minimum, the following locations:

- Sturgeon Gorge Falls
- Schoolcraft & Delta Counties Geology
- Precambrian Stromatolites at Horseshoe Harbor
- Paint River Dam & Peavy Pond Gorge
- Marquette Area Waterfalls
- Glacial Geology of the Leelanau Peninsula (yes, this is in the Lower Peninsula, and several hours from Marquette)
- Fossil collecting in the Stonington Peninsula

Look for additional updates on the Annual Meeting in the next edition of *Geologically Speaking*!

# 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...*

The AIPG Annual Meeting is a good opportunity for members to network with their fellow members from around the country, as well as obtain needed professional development hours for licenses or certifications.

But do you know where the Annual Meetings have been held, or how many there have been? Here is the list, taken directly from National's website:

2021 - Sacramento, California  
 2020 - Postponed to 2021  
 2019 - Burlington, Vermont  
 2018 - Colorado Springs, Colorado  
 2017 - Nashville, Tennessee  
 2016 - Santa Fe, New Mexico  
 2015 - Anchorage, Alaska

2014 - Prescott, Arizona  
 2013 - Broomfield, Colorado  
 2012 - Rapid City, South Dakota  
 2011 - Bloomington, Illinois  
 2010 - Orlando, Florida  
 2009 - Grand Junction, Colorado  
 2008 - Flagstaff, Arizona  
 2007 - Traverse City, Michigan  
 2006 - Minneapolis/St. Paul, Minnesota  
 2005 - Lexington, Kentucky  
 2004 - Saratoga Springs, New York  
 2003 - Glenwood Springs, Colorado  
 2002 - Reno, Nevada  
 2001 - St. Louis, Missouri  
 2000 - Milwaukee, Wisconsin  
 1999 - Anchorage, Alaska  
 1998 - Baton Rouge, Louisiana  
 1997 - Houston, Texas  
 1996 - Columbus, Ohio  
 1995 - Denver, Colorado

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1994 - Flagstaff, Arizona  
 1993 - Springfield, Massachusetts  
 1992 - South Lake Tahoe, Nevada  
 1991 - Gatlinburg, Tennessee  
 1990 - Long Beach, California  
 1989 - Arlington, Virginia  
 1988 - Tulsa, Oklahoma  
 1987 - Lexington, Kentucky  
 1986 - Dillon, Colorado  
 1985 - St. Paul, Minnesota  
 1984 - Orlando, Florida  
 1983 - Jackson Hole, Wyoming  
 1982 - Pasadena, California  
 1981 - Williamsburg, Virginia  
 1980 - Mobile, Alabama  
 1979 - Lafayette, Louisiana  
 1978 - Albuquerque, New Mexico  
 1977 - San Antonio, Texas  
 1976 - Denver, Colorado  
 1975 - Tucson, Arizona  
 1974 - Denver, Colorado  
 1973 - New Orleans, Louisiana  
 1972 - Pittsburgh, Pennsylvania  
 1971 - Denver, Colorado  
 1970 - Oklahoma City, Oklahoma

1969 - St. Louis, Missouri  
 1968 - San Francisco, California  
 1967 - Houston, Texas  
 1966 - Denver, Colorado  
 1965 - Denver, Colorado  
 1964 - Denver, Colorado

And of course, the 2022 Annual Meeting will be held in Marquette, Michigan. This will be only the second time that the Michigan Section has hosted the Annual Meeting!

So, how many meetings have YOU attended? I'd like to hear from you about this. Many AIPG members attend only a handful of meetings during their career. But there are a few members that attend them regularly so they can renew friendships with members from across the country. If you have never been to one, I strongly encourage you to do so. You never know when one of the people you meet could become your next employer or assist you with technical expertise on one of your projects. This year's meeting is about as close to home for Michigan members as they get, so why not plan to attend? I think you'll have a good time and will learn a lot!

## Coming Events

**May 5, 2022:** Joint Michigan Section AIPG/MBGS Meeting. John Esch will be speaking on LIDAR for Environmental, Natural Resources, Hydrological, Engineering and Geological Applications. The meeting will be at The Hidden Gem Event Venue in Holt. Go to <https://www.eventbrite.com/e/spring-2022-joint-aipg-mi-section-and-mbgs-meeting-tickets-314503637847> for more information.

**May 17, 2022:** Remediation and Risk Management Webinar: Possible Zero Waste Solutions for the Remediation of PFAS—An Overview of Emerging Onsite Destruction Technologies. Registration and information at: <https://www.michigan.gov/egle/Outreach/remediation-and-risk-management-series>.

**May 23, 2022:** AIPG Town Hall (webinar). AIPG Executive Director Aaron Johnson will provide a National office update. If you are interested in attending, please contact Cathy Duran at Headquarters at: [cld@aipg.org](mailto:cld@aipg.org).

**June 14-15, 2022:** Environmental Risk Management Workshop at the Ralph A. MacMullan Conference Center, Roscommon, Michigan.

**July 13, 2022:** MAEP Golf Outing. Links of Novi, 50395 W 10 Mile Road, Novi. Register at: <https://www.maep.org/Sys/Login?ReturnUrl=%2fSys%2fInviteeReply%2fAttendReply%3feventId%3d4682574>.

June 30, 2022: Deadline to vote for the 2023 AIPG Offic-

ers. Link to the online ballot (members only): <http://sm1.multiview.com/t/gcH1AAjbaBPWNPKuQL0MrCZY5RmaIUtDXB5aaaaIUt-BRGQ14baa?k=jUjd.qVok~25Dr5jy.Txd~amp;m=RmRv.YnW2~25v9n1g.lfv~amp;c=0~amp;o=>.

**August 6-9, 2022:** 58th Annual AIPG Meeting to be held in Marquette, Michigan. See article in this edition of *Geologically Speaking* regarding meeting planning. The Apr/May/Jun edition of *TPG* will include complete meeting and registration information.

**September, 2022:** Joint Michigan Section AIPG/MAEP meeting. Date, location and Speaker TBA.

**September 13, 2022:** Michigan Section AIPG 18th Annual Golf Outing. Fox Hills—Golden Fox Golf Course. Registration information at: <https://www.eventregisterpro.com/event/americaninstituteofprofessionalgeologists>.

**October 12-13, 2022:** 2022 Source Water Protection Conference, Mt. Pleasant, Michigan. Abstract submittal deadline is May 28, 2022 at: <https://egle.idloom.events/2022-Source-Water-Protection-Conference>.

**December 1, 2022:** Michigan Section AIPG Annual Meeting. Speaker and Topic TBA. Meeting to be held at Weber's Inn, Ann Arbor.

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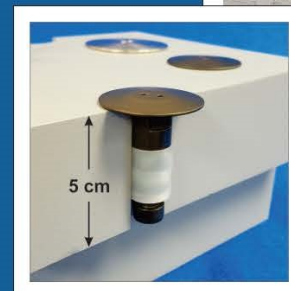
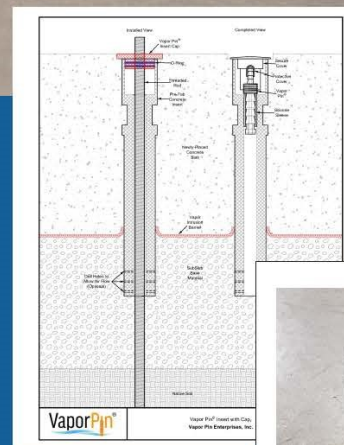
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# Where in Michigan?

The January 2022 edition of *Geologically Speaking* featured a photograph of the Middle Montreal Falls and the early Keweenaw Age Portage Lake Volcanics. The falls are located a short distance inland on the south side of the Keweenaw. The photograph was not correctly identified.

This edition of *Geologically Speaking* features a new photograph **at right** - not the photo on the cover page. The first person to correctly identify what the photograph depicts (feature name, location, formation, and 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 this issue (as well as the last several 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](mailto: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.

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 Dorothy Combs, National AIPG Membership Director at [aipg@aipg.org](mailto:aipg@aipg.org) when you update your contact information. Thank you!

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# Student Chapter News



manager for our student chapter (Check us out @CMU\_AIPG!).

I began working with Dr. Sirbescu researching Michigan Basin evaporites in the fall semester, 2021. At the time, I was a student in her Mineralogy and Petrology (MinPet) class, which focused on metamorphic and igneous rocks. Working with her let me apply what I was learning in MinPet to sedimentary rocks and gain a better understanding of these core geological concepts, and get hands-on experience at the same time. Yet, the most valuable part of this project to me was the opportunity to develop my conceptual reasoning skills, and hone my scientific writing.

The Michigan Basin has been exceedingly important to the state. It has provided both insights into the formation and history of our continent and unique resources. Within the evaporite layers, these resources include a range of salts. From these salts, different economically important elements can be extracted.

With the ever growing threat of climate change, and the push to transition transportation from petroleum to battery powered, the demand for lithium has surged. Due to the combination of its light weight, and being one of the most highly reducing metals, it is uniquely suited to be used in the production of small, lightweight and rechargeable batteries needed to make the transition to electric cars. But, due to lithium rarity, meeting this demand has been an uphill battle.

Researchers have been searching for new, economically viable sources of lithium for years. But until recently little research has been done on lithium in evaporite minerals, despite their lithium potential. Modern seawater contains dissolved lithium, albeit in small amounts (in the ppb). If ancient seawater contained lithium in similar amounts, the sheer amount of it that evaporated to create the Michigan evaporite deposits could have deposited with it a significant amount of Lithium.

My research focused on the theoretical potential for lithium to be incorporated into four different evaporite minerals by a simple replacement solid solution substitution, along with determining the concentration of ions within halite and sylvite from the Kalium Heresy core to test for increased lithium concentrations that could indicate its incorporation.



The four minerals selected were anhydrite, halite, sylvite and carnallite. The first three were chosen due to their abundance in evaporite deposits, as if they did contain lithium they could be an economically viable source for the future. Carnallite was included, as lithium carnallite has been synthesized in the laboratory. Applying what I had learned about mechanics of solid solution substitution, including ionic charge, ionic size difference and temperature I determined the theoretical potential for lithium to substitute for each of these minerals major cations. For the results of the ionic size difference, see table 1.

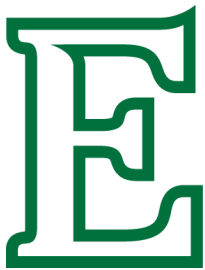
I found that lithium would not substitute for potassium. Lithium substituting in for both sodium and calcium is possible, but unlikely. The most likely candidate for substitution is with magnesium, but due to their charge difference, a simple replacement substitution is not possible.

When the core samples were tested, no increased concentration of lithium was found. There was lithium present, but in small amounts (all less than one ppb) that can be explained by liquid inclusions within the samples. Nor was a strong correlation found between the concentration of lithium and the other cations that could indicate substitution.

Though I didn't make a breakthrough, the skills I learned taking on this project were invaluable in securing my position in CMUs 2022-2023 McNair cohort. With their support, I will be beginning my own research project with Dr. Suchy studying the impacts of microplastic pollution on nitrogen cycling in freshwater wetlands this coming summer.

Percent Difference In Ionic Radii Between Elements

Element Name:	Lithium	Calcium	Sodium	Potassium	Magnesium
Lithium		24.00%	25.49%	44.93%	5.56%
Calcium	24.00%		1.96%	27.54%	38.89%
Sodium	25.49%	1.96%		26.09%	41.67%
Potassium	44.93%	27.54%	26.09%		47.83%
Magnesium	5.56%	38.89%	41.67%	47.83%	



This year our AIPG EMU student chapter was lucky enough to get a chance to experience running a booth at the Jackson Rock and Mineral Show. This show was organized by The Michigan Gem and Mineralogical Society. We set up a booth with rocks students have collected from their field trips and geology camps, and then donated to our chapter. The booth had a wide variety of

samples from brachiopod fossils, limestone chalk, petrified wood, to granites. There were no prices on our samples, everything was based on donations. The customers made a donation and picked a sample they enjoyed. It was great to get the opportunity to be able to share our passion for geology with the general public and learn from those who have had years of experience in the world of geology.

Rock enthusiasts of all ages were in attendance. It was fun to talk to a wide variety of people, from kids who are just now getting interested in geology to retired geologists who had decades of experience in the field. Many of the professional geologists who approached us gave us advice about their experiences in geology. They told us what they wished they knew when they started out and tips that helped them throughout their careers. We also had many people bring rocks to us for help with identifying them. Being able to share what we have learned helped us to realize how far we have come since starting our pathways in geology. Many of us have recently taken mineralogy and igneous and metamorphic petrology so we were able to give people more information than simply identifying the sample.

We also got to meet some of the other vendors that attended the show. They were all very welcoming and supportive. The members of the Michigan Gem and Mineralogical Society were very happy that they were able to include a college geology program in their event and they gave us some ideas for what to do for future shows. The biggest suggestion was that the average person likes attractive rocks and minerals and is not necessarily focused on rarity.

Overall, the show was a big success. The money made will be used to help fund the scholarship that we

give out every year: The Geology Summer Field Scholarships. The rest of this money will be put into the bank account to help fund activities next year. Following this experience, we have decided to try and attend more rock shows in the future. With more funding we hope that we can go on more field trips and add to the scholarships.



The booth our AIPG Eastern Michigan University student chapter set up at the Jackson Rock and Mineral Show. Rock samples were collected and donated to the chapter by students. Photo by Morgan Bergren.

## 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](mailto:adam.heft@wsp.com).

## WANTED!

Your Articles for *The Professional Geologist*

- Technical
- Opinion
- Peer-Reviewed
- Michigan Geology

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





Alaska Mantle Tomography, by Ben Gaskevicius

My passion for geology literally started small in Mineralogy, my first course at Wayne State.

Mineralogy is focused more on the up-close and personal scale – the hand sample and thin section. As I progressed on through upper-level courses, particularly Structural Geology, I began to acquire a taste for larger-scale questions about the earth and its constituents. I was intrigued by big problems, like the processes that bring continents together, and there's nothing bigger than Alaska, as far as states go. I found an opportunity to do my master's thesis on mantle tomography deep underneath the surface of Alaska with Professor Scott Burdick.

Alaska has a quite complicated and intriguing geological setting. In the southwestern part of the state, along the Aleutian Islands, we have the subduction of the Pacific plate underneath the North American plate. These islands have up to 40 active volcanoes and comprise a portion of the ring of fire that encircles the Pacific Ocean. Over on the mainland in the southern region of the state, there is an accretionary terrain present in the Yakutat block, pushing up and creating most of the present landmass on the Alaskan portion of the North American continent. A little bit farther northwest along the Yakutat slab, you can find the Denali fault and the Denali volcanic gap, which just adds to the complexity of the tectonic setting in this area.

My research is focused more on what goes on underneath this terrain. With the new recent expansion of the permanent seismic monitoring network in Alaska, there has been an increase in both the quality and the quantity of seismic data available on Alaska. I am in the relatively early stages of this research and am focused now on gathering a better understanding of what we know today about Alaska's mantle tomography. With time, we hope to use new visualization methods to go through an in-depth analysis of our new model out there and see how it compares to earlier research on the far-reaching depths of the subducting slab beneath the state. Alaska is home to the most seismically active region in our country, and it is capable of producing some of the most powerful earthquakes in the world; this would make any seismologist excited to be there and gives this budding researcher good vibrations on what can be discovered about the assembly of the 49<sup>th</sup> state.



Mapping in Westfjords of Iceland. Photo by Robert Caffrey.

## 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](mailto: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.

## The American Geosciences Institute

The American Geosciences Institute (AGI) represents and serves the geoscience community by providing collaborative leadership and information to connect Earth, science, and people.

AIPG is a member society of AGI, and is one of about 50 other member societies that comprise AGI.

The information on the next two pages was obtained from AGI and provides a "fact sheet" for Michigan. Although a little dated, it is still useful information...

# Geoscience in Michigan



## WHAT IS GEOSCIENCE?

Geoscience is the study of the Earth and the complex geologic, marine, atmospheric, and hydrologic processes that sustain life and the economy. Understanding the Earth's surface and subsurface, its resources, history, and hazards allows us to develop solutions to critical economic, environmental, health, and safety challenges.



Satellite Image: NASA/USGS Landsat Program. State outline (not to scale): Matt Battison.

## By the numbers: MICHIGAN

- 9,569 geoscience employees (excludes self-employed)<sup>1</sup>
- 767 million gallons/day: total groundwater withdrawal<sup>3</sup>
- \$2.45 billion: value of nonfuel mineral production in 2017<sup>4</sup>
- 36 total disaster declarations, including 11 flood, 8 severe storm, and 6 tornado disasters (1953-2017)<sup>6</sup>
- \$11.8 million: NSF GEO grants awarded in 2017<sup>14</sup>

## WORKFORCE IN MICHIGAN

- 9,569 geoscience employees (excludes self-employed) in 2017<sup>1</sup>
- \$72,830: average median geoscience employee salary<sup>1</sup>
- 17 academic geoscience departments<sup>2</sup>

## WATER USE IN MICHIGAN

- 767 million gallons/day: total groundwater withdrawal<sup>3</sup>
- 9.29 billion gallons/day: total surface water withdrawal<sup>3</sup>
- 1.03 billion gallons/day: public supply water withdrawal<sup>3</sup>
- 332 million gallons/day: water withdrawal for irrigation<sup>3</sup>
- 518 million gallons/day: industrial fresh water withdrawal<sup>3</sup>
- 74% of the population is served by public water supplies<sup>3</sup>

## ENERGY AND MINERALS IN MICHIGAN

- \$2.45 billion: value of nonfuel mineral production in 2017<sup>4</sup>
- Iron ore, portland cement, sand and gravel (construction): top three nonfuel minerals in order of value produced in 2017<sup>4</sup>
- 5.07 million megawatt hours: wind produced in 2017<sup>5</sup>
- 1.61 million megawatt hours: hydroelectricity produced in 2017<sup>5</sup>
- 5.43 million barrels: crude oil produced in 2017<sup>5</sup>

## NATURAL HAZARDS IN MICHIGAN

- 36 total disaster declarations, including 11 flood, 8 severe storm, and 6 tornado disasters (1953-2017)<sup>6</sup>
- \$157 million: individual assistance grants (2005-2017)<sup>6</sup>
- \$63 million: mitigation grants (2005-2017)<sup>6</sup>
- \$491 million: preparedness grants (2005-2017)<sup>6</sup>
- \$36 million: public assistance grants (2005-2017)<sup>6</sup>
- 31 weather and/or climate events, each with costs exceeding \$1 billion (inflation adjusted) (1980-2017)<sup>7</sup>

<sup>1</sup> U.S. Bureau of Labor Statistics, Occupational Employment Statistics, May 2017

<sup>2</sup> American Geosciences Institute, Directory of Geoscience Departments, 53rd Edition (2018)

<sup>3</sup> U.S. Geological Survey, Estimated Use of Water in the United States in 2015

<sup>4</sup> U.S. Geological Survey, Mineral Commodity Summaries 2018

<sup>5</sup> U.S. Energy Information Administration

<sup>6</sup> FEMA Data Visualization: Summary of Disaster Declarations and Grants (accessed May 2, 2018)

<sup>7</sup> NOAA National Centers for Environmental Information, U.S. Billion-Dollar Weather and Climate Disasters from 1980 to 2018 (accessed April 6, 2018)

AGI is a network of 52 member societies, representing more than 260,000 geoscientists.

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<https://www.americangeosciences.org/policy/factsheet/states> | [govt@americangeosciences.org](mailto:govt@americangeosciences.org)



## Geoscience, Michigan, and Federal Agencies



### U.S. GEOLOGICAL SURVEY (USGS)

- \$1.15 billion: total USGS budget in FY 2018 (5.8% increase from FY 2017)<sup>8</sup>
- The National Cooperative Geologic Mapping Program funds geologic mapping projects with federal (FEDMAP), state (STATEMAP), and university (EDMAP) partners
- \$1.11 million: Michigan STATEMAP funding (1993-2016)<sup>9</sup>
- 7 Michigan universities, including recent recipients Michigan Tech, Wayne State, Western Michigan University, and Michigan State University, have participated in EDMAP<sup>9</sup>
- USGS streamgages collect real-time or recent streamflow, groundwater, and water-quality data throughout Michigan

### NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

- \$20.7 billion: total NASA budget in FY 2018 (5.5% increase from FY 2017)<sup>10</sup>
- \$1.9 billion: total NASA Earth Science budget in FY 2018 (0% change from FY 2017)<sup>10</sup>
- Gravity Recovery and Climate Experiment (GRACE) satellites measure groundwater changes in Michigan
- Soil Moisture Active Passive (SMAP) satellite measures soil moisture in Michigan

### NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

- \$5.9 billion: total NOAA budget in FY 2018 (4.1% increase from FY 2017)<sup>11</sup>
- Next-generation geostationary (GOES) and polar orbiting (JPSS) satellites provide weather forecasting for Michigan
- Deep Space Climate Observatory (DISCOVER) satellite monitors radiation and air quality over Michigan
- 27 National Weather Service Automated Surface Observing Systems (ASOS) stations in Michigan<sup>12</sup>
- 265 National Weather Service Cooperative Observer Program (COOP) sites in Michigan<sup>12</sup>

### NATIONAL SCIENCE FOUNDATION (NSF)

- \$7.8 billion: total NSF budget in FY 2018 (4% increase from FY 2017)<sup>13</sup>
- \$1.4 billion: total NSF Geosciences Directorate (GEO) awards in FY 2017 (7.2% increase from FY 2016)<sup>14</sup>
- 55 NSF GEO awards in Michigan totaling \$11.8 million in 2017, including \$8.6 million to the University of Michigan Ann Arbor<sup>14</sup>

### U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

- \$8.1 billion: total EPA budget in FY 2018 (0% change from FY 2017)<sup>15</sup>
- 65 active Superfund sites in Michigan in 2018<sup>16</sup>
- \$125.7 million: Drinking Water State Revolving Fund (DWSRF) grants in Michigan in 2017<sup>17</sup>
- \$200,000: Brownfield cleanup grants awarded to Michigan in 2018<sup>18</sup>

### FEDERAL FACILITIES IN MICHIGAN

- USGS Great Lakes Science Center, Ann Arbor
- NSF National Superconducting Cyclotron Laboratory, East Lansing
- NOAA Great Lakes Environmental Research Laboratory, Ann Arbor

### YOUR STATE SOURCE FOR GEOSCIENCE INFORMATION

Michigan Geological Survey  
Western Michigan University  
1903 W. Michigan Ave  
Kalamazoo, MI 49008-5241  
<http://wmich.edu/geologysurvey>  
269-387-8649

<sup>8</sup> U.S. Department of the Interior, FY 2019 Budget in Brief

<sup>9</sup> U.S. Geological Survey, National Cooperative Geologic Mapping Program

<sup>10</sup> National Aeronautics and Space Administration, FY 2019 Budget Estimates

<sup>11</sup> National Oceanic and Atmospheric Administration, FY 2019 Bluebook

<sup>12</sup> NOAA In Your State and Territory

<sup>13</sup> U.S. House of Representatives, FY 2018 Omnibus Spending Bill (Division B) – Commerce, Justice, Science, and Related Agencies Appropriations Act, 2018

<sup>14</sup> National Science Foundation, Budget Information System

<sup>15</sup> U.S. House of Representatives, FY 2018 Omnibus Spending Bill (Division G) – Department of the Interior, Environment, and Related Agencies Appropriations Act, 2018

<sup>16</sup> U.S. Environmental Protection Agency, Superfund Sites

<sup>17</sup> U.S. Environmental Protection Agency, Drinking Water State Revolving Fund National Information Management System Reports

<sup>18</sup> U.S. Environmental Protection Agency, Brownfields and Land Revitalization, Brownfields Grant Fact Sheet Search

AGI's Geoscience Policy and Critical Issues programs support well-informed public policy and decision making by providing information and facilitating dialogue between the geoscience community and decision makers at all levels.

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<https://www.americangeosciences.org/policy/factsheet/states> | [govt@americangeosciences.org](mailto:govt@americangeosciences.org)

# Regulatory Roundup

Spring is finally here, and we are emerging from the pandemic! It sure feels like we are busier than ever perhaps making up for lost time or realizing the fruits of our past labors. This seems to be just as true when we look at the legislative efforts for environmental programs.

Since June 2021, we have been following the water infrastructure bills particularly because of the funding need for the Michigan Geological Survey and encouraging members to reach out to their legislators about Senate Bills [SB 488](#) and [SB 565](#) that would provide supplemental funding to state department budgets including EGLE for water infrastructure and quality improvement efforts.

The big news is that Senate Bill 565 was signed into law becoming [PA 53](#) of 2022 by Governor Whitmer on March 30, 2022 and took immediate effect. The final funding amount is \$4.7 billion. The funding for the survey is included in the Water Use Advisory Council recommendations line item of \$10 million. This is great news; however, an annual funding source is still needed for the survey to hire staff.

The bill also includes \$50 million for the Michigan Potash and Salt Company. The company plans to build a billion-dollar plant to mine potash in Ewart Township. The plant received appropriate permits from EGLE in 2021.

Additional items to be funded include \$35 million for failing septic systems, dam risk reduction, PFAS remediation grants, and much more. We encourage you to review the bill.

In other legislative news, Senate Bill [SB 991](#) was introduced on March 24, 2022 to amend Part 211 of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended. The bill revises placement distance of underground storage tanks from a public water supply system.

Senate Bill [SB 988](#) and House Bill [HB 5954](#) have been introduced relating to water withdrawals and consumptive use. Other bills call for replacement of lead service lines in Hamtramck.

The 2023 budget is also being discussed by the legislature and there are proposals for funding to be used for additional geological projects. The following article from Gongwer News Service provides additional information on House Bill [HB 5782](#).

## House EGLE Budget Spends Fed Funds On Drilling Studies

Federal coronavirus relief funds would be used for bedrock core drilling to depict water availability, aggregate location and PFAS under a budget reported Tuesday by the House Appropriations Environment, Great Lakes and Energy Subcommittee.

[HB 5782](#) was reported 4-3 with all Democrats voting no. The budget bill crafted by Republicans would also prohibit employees from working remotely unless they were doing so before February 28, 2020.

The budget seeks to continue to spend down some federal dollars with \$32.5 million in Coronavirus State Fiscal Recovery funds going toward bedrock core drilling. Another \$5 million would support data collection and mapping of the data collected through the drilling.

Additionally, \$4 million would go toward contracting with an integrity oversight monitor specializing in geological projects to ensure legal compliance and promote best practices in the expenditures and another \$4 million to install monitoring wells in specified counties. And another \$3.1 million would go toward creating "a more enhanced three-dimensional profile for areas studied by core drilling."

Separately, \$20 million in federal funds would be used to address the recommendations in the Michigan Water Use Advisory Council Track 2020 report.

In some areas, the House budget concurs with the executive budget recommendation, fully or partially. Additionally, some portions of the executive budget recommendation for EGLE were addressed in the infrastructure supplemental signed last month with massive spending on water.

The House budget agreed with the executive recommendation on \$31 million in federal infrastructure funds for remediating orphaned oil and gas wells, but did not provide the two full-time employees included by the executive.

It did the same for \$15.8 million in federal funds recommended for energy efficiency projects. The executive had recommended five full-time employees with that line item, which the House budget did not include.

The budget eliminated \$20 million for high water infrastructure grants and \$10 million for the remediation of newly contaminated properties. It also did not agree with the executive recommendation on \$1.8 million for water supply oversight and \$4.4 million for the expansion of air quality monitoring staff.



It did, however, agree to shifts of \$27.6 million, \$19.2 million and \$2.4 million to clean up legacy contaminated sites.

While the executive recommendation sought to eliminate \$13 million for grants to address imminent threats from dams, the House budget continues to fund it at \$15 million. Similarly, the executive sought to eliminate funding for dams that were not adequately maintained by their owners, with the House instead increasing total funding to \$15 million.

Overall, the plan advanced by the House subcommittee is \$906.5 million (\$106.1 million General Fund), which is about \$40 million less than the executive recommendation. Compared the current year, the House plan is \$270.7 million more (\$47.3 million less General Fund).

As always, we encourage you as an expert on these topics to lend your professional knowledge and experience and contact your legislators on any bills and rules that have been introduced. For additional searches on topics, the links are provided in the buttons below.

Proposed  
Rules

Natural Resources and Environmental Protection Act,  
PA 451 of 1994, as amended, bill search

Safe Drinking Water Act,  
PA 399 of 1976, as amended, bill search

Gas Safety Standards,  
PA 165 of 1969, as amended, bill search

## 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.*

No submittals for this edition of the Member's Corner were received by the Editor in time for publication.



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## 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.*

Thanks to Mark Francek of Central Michigan University for sharing via the "Earth Science Site of the Week" emails. This edition features a few "fun" links.

This is a glacial lake outburst flood: <https://atlas.eia.gov/apps/5039a1a01ec34b6bbf0ab4fd57da5eb4/explore>.

Tornado at the base of La Palma Volcano: <https://www.youtube.com/watch?v=7OJi7HE7TSI>.

Japan's Okinawa Coastlines Struggling With Pumice Stones From Volcanic Eruption: <https://www.usgs.gov/media/images/overview-water-quality-principal-aquifers-0>.

# Geology in Michigan – Fayette Historic State Park in Delta County, Michigan

By David Adler, CPG-11377

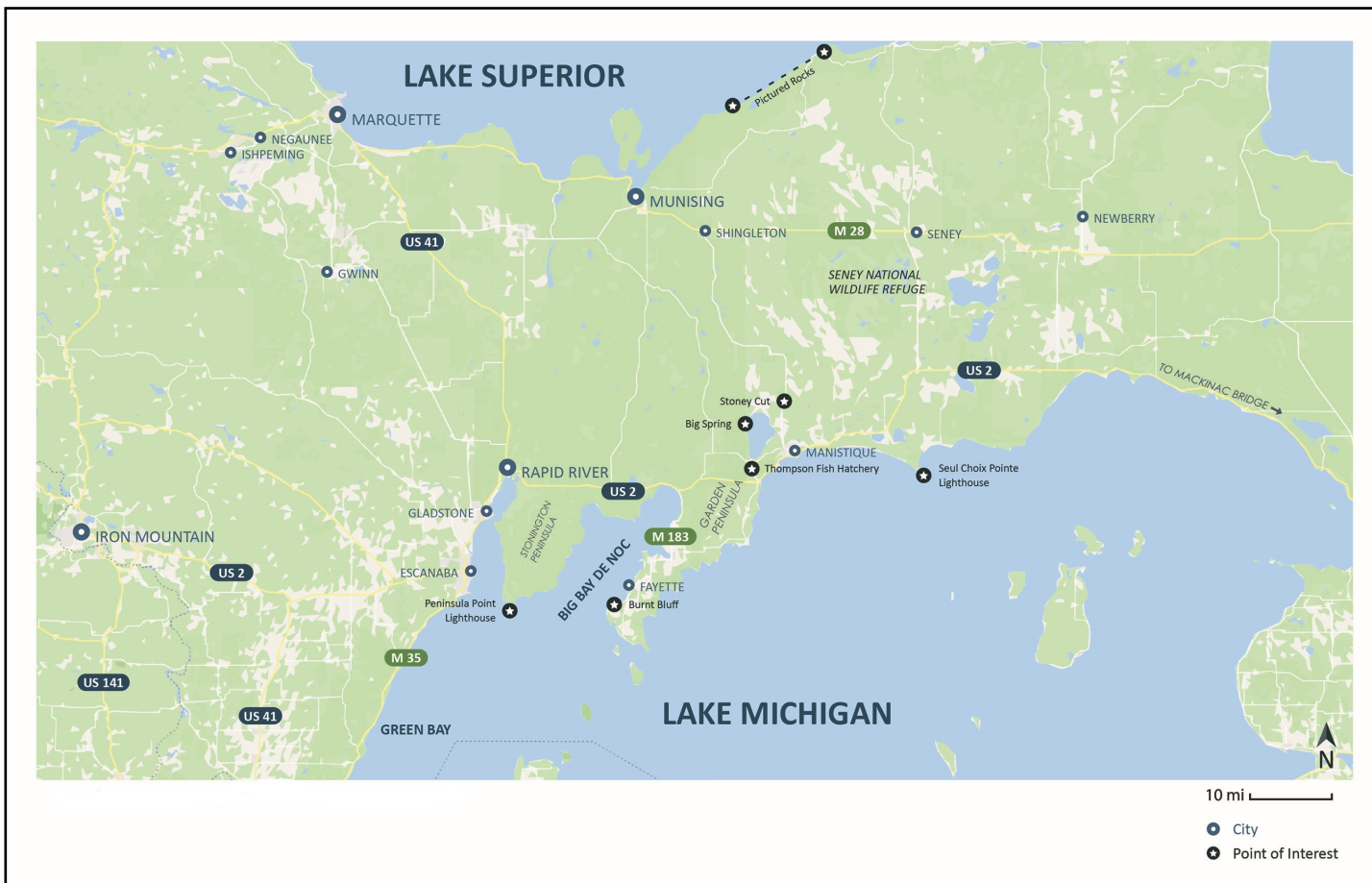


Figure 1: Source: <https://snazzymaps.com/style/104137/default-w-out-labels>.

## Directions

Fayette is located on the west side of the Garden Peninsula in the south-central portion of Michigan's Upper Peninsula in Fairbanks Township, Delta County (see Figures 1 and 2).

**Latitude** 45° 43' 05.24" N; **Longitude** 86° 40' 09.05" W.

From the Mackinac Bridge in St. Ignace, take US Highway 2 (US-2) west for approximately 100 miles to Michigan Highway 183 (M-183) at Garden Corners. Turn left and proceed south on M-183 for approximately 17.5 miles to Fayette Historic State Park (see Figure 2). From the western Upper Peninsula, take US-2 east to Garden Corners and proceed south on M-183 to Fayette.

From Marquette, take U.S. Highway 41 (US-41) south to US-2 in Rapid River. Turn left (east) on US-2 and proceed approximately 22.5 miles to the intersection of M-183 and US-2 at Garden Corners. Turn right (south) onto M-183 and proceed southward to Fayette.

Fayette can also be reached by watercraft via Lake Michigan and Big Bay De Noc. Docking facilities are available at the state park. Additional marina information can be obtained at 1-800-447-2757 or [www.midnrreservations.com](http://www.midnrreservations.com). Transient and seasonal slips are available.

Some of the numerous nearby attractions include Big Spring (also known as Kitch-iti-kipi) at Palms Book State Park, and Indian Lake, both located northwest of Man-



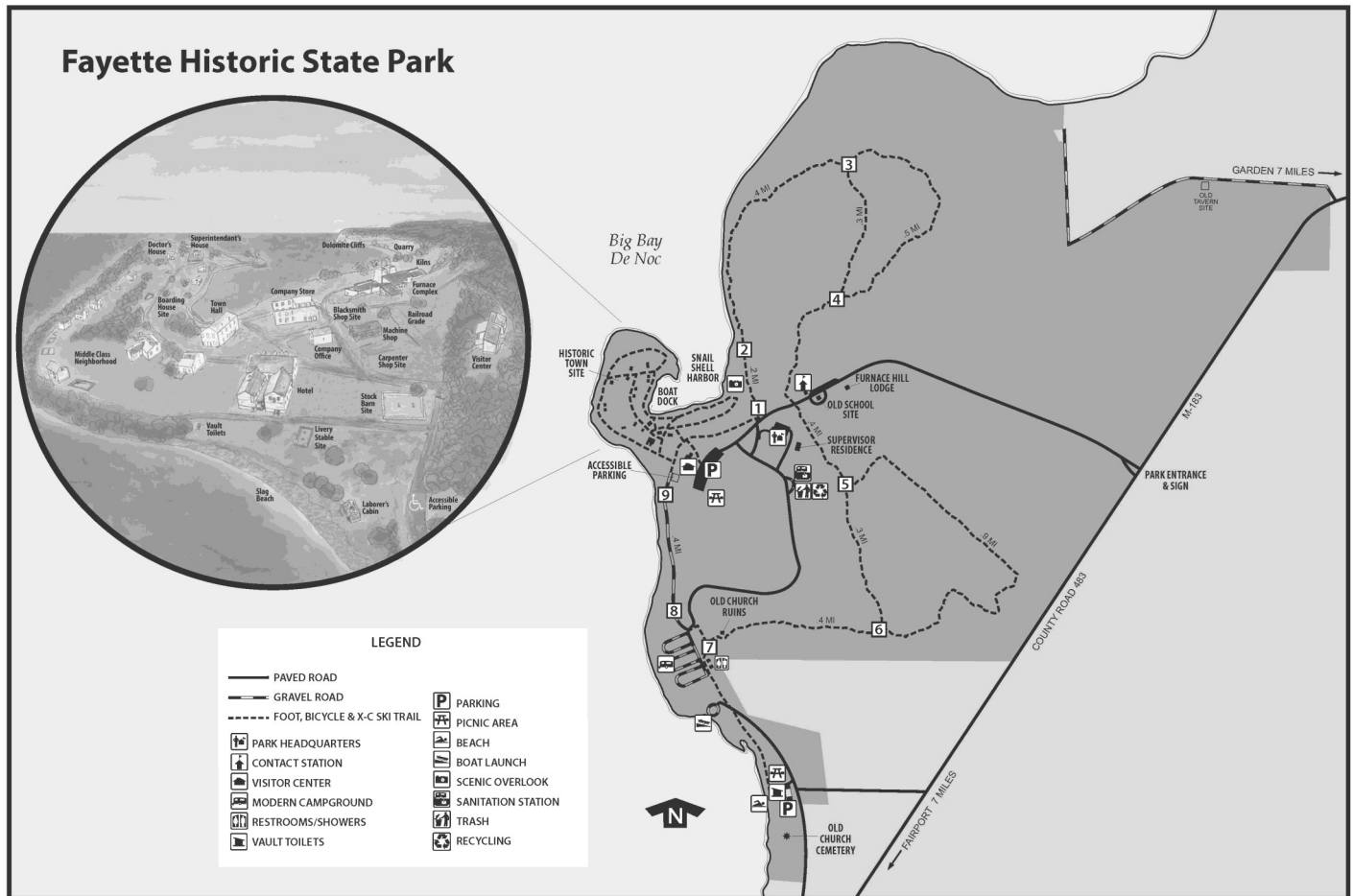


Figure 2: State Park and Vicinity Map. Source: Fayette Historic State Park.

istique; Peninsula Point Park and Lighthouse at the southern tip of the Stonington Peninsula; Seul Choix Pointe Lighthouse near Gulliver; the Stony Cut roadcut outcrop and rock quarry on M-94 north of Manistique; Sand Point Lighthouse in Escanaba; Thompson State Fish Hatchery in Thompson; Pictured Rocks National Lakeshore located east of Munising; and the Seney National Wildlife Refuge located northeast of Manistique (see Figure 1).

## Introduction

*Si Quaeris Peninsulam Amoenam Circumspice* – If You Seek a Pleasant Peninsula, Look Around You. The state motto of Michigan is an apt description of the location of Fayette, once a vibrant 19th century iron ore smelting town and now a ghost town preserved as a historic state park. Iron mining in Michigan began in the mid-1840s near present day Negaunee in the Marquette Iron Range and quickly spread as other iron ore deposits were discovered to the west and southwest of Marquette and in the Menominee and Gogebic Iron Ranges of the Upper Peninsula. Taking advantage of its location, natural harbor, abundant nearby natural resources, and proximity to the mines of the Marquette Iron Range, Fayette was founded in the 1860s by the Jackson Iron Company of Negaunee. Throughout the 1870s and 1880s, Fayette was a bustling iron ore smelting town with two blast furnaces, several charcoal kilns, a rock quarry, and approximately 500 residents of various ethnic backgrounds.

Fayette produced over 229,200 tons of charcoal iron (also known as pig iron) from the late 1860s until 1891 when iron smelting operations ceased.

Fayette became a Michigan State Park in 1959. Over the years, preservation and restoration efforts have continued and amenities have been added and upgraded. Fayette has also been the site of ongoing archaeologic excavations and academic research. Today, Fayette Historic State Park has much to offer to visitors of all ages and interests, including spectacular dolomite rock cliffs that are part of the Niagara Escarpment, a prominent geologic feature that extends westward from Niagara Falls, through Ontario and the Upper Peninsula of Michigan, and onto the Door Peninsula of northeast Wisconsin.

## Geologic Setting

Fayette is located on the northwest side of the Michigan Basin geomorphic province. The regional geologic setting is depicted on Figure 3. As shown on Figure 3, the eastern half of the Upper Peninsula is underlain by Paleozoic sedimentary rocks, primarily dolomites and limestones. Fayette and the Garden Peninsula are located at the west end of a broad east-west trending arcuate belt of Silurian bedrock that extends eastward into Ontario and southwestward into Wisconsin. The flanking lithologies to the northwest include Ordovician and Cambrian sedimentary rocks on the far northwest flank of the Michigan Basin, and Precambrian crystalline basement rocks of the Canadian Shield further to the northwest. The

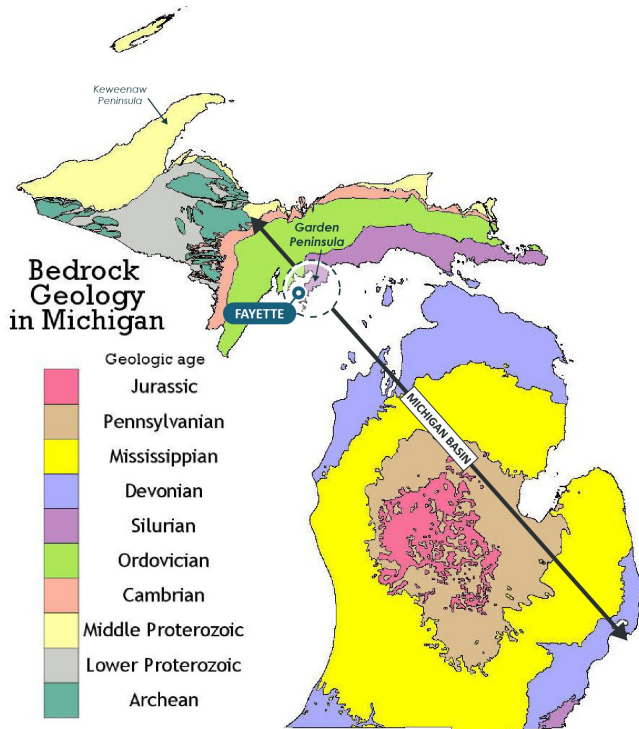


Figure 3: Bedrock Geology of the Michigan Basin and the adjacent Southern Canadian Shield. Source: Modified from Harrison, 2016.

Precambrian rocks include the economically significant metasedimentary iron ore deposits of Michigan's iron ranges and the volcanic and volcanoclastic copper deposits of the Keweenaw Peninsula and Ontonagon County.

The Michigan Basin contains several thousand feet of Paleozoic sedimentary rocks that overlie older Precambrian age crystalline basement rocks. The maximum thickness of accumulated Paleozoic sedimentary rocks in the Michigan Basin is approximately 15,000 feet in the Midland area near the center of Michigan's Lower Peninsula.

The Paleozoic sedimentary rocks include dolomite, limestone, shale and sandstone. Dolomite and limestone are the predominant Paleozoic lithologies of the Michigan Basin. Rock salt (halite) and gypsum deposits are economically significant in some areas of the Michigan Basin.

The Pleistocene age glacial drift that overlies the bedrock throughout most of the Michigan Basin is the result of advancing and retreating continental glaciers during the Wisconsin glacial stage of the Pleistocene epoch (approximately 35,000 to 10,000 years before present). The glacial landforms in Delta County are primarily the result of advance and retreat of the Green Bay glacial lobe. The Green Bay lobe advanced into what is now Delta County along a general north-south trending axis. During periods of relative stability while the Green Bay lobe was melting, large moraines were deposited in Delta County along the ice front (Sinclair, 1960). Most of the moraines are segments of the Marquette and Sturgeon morainic systems (Martin, 1957).

The glacial drift on the Garden Peninsula has been described by Jerome (2006) as bedrock-controlled ground moraine deposits. Western Michigan University (1981) and Sinclair (1960) describe the glacial and surficial geology in this area as rock at or near the surface. The glacial drift at Fayette is generally very thin to non-existent. Glacial striae on the carbonate bedrock surface in the region show a prominent northwest-southeast orientation (Western Michigan University, 1981).

The bedrock at Fayette has been mapped in numerous public domain sources as the Middle Silurian age Hendricks Formation of the Niagaran Series Burnt Bluff Group. The distribution of Silurian bedrock units in the Upper Peninsula is depicted on Figure 4. The generalized stratigraphy of the Silurian formations of the Upper Peninsula is shown on Figure 5. Rocks of the Niagaran Series, predominantly hard, resistant dolomites and limestones, form the prominent cliffs along the west side of the Garden Peninsula.

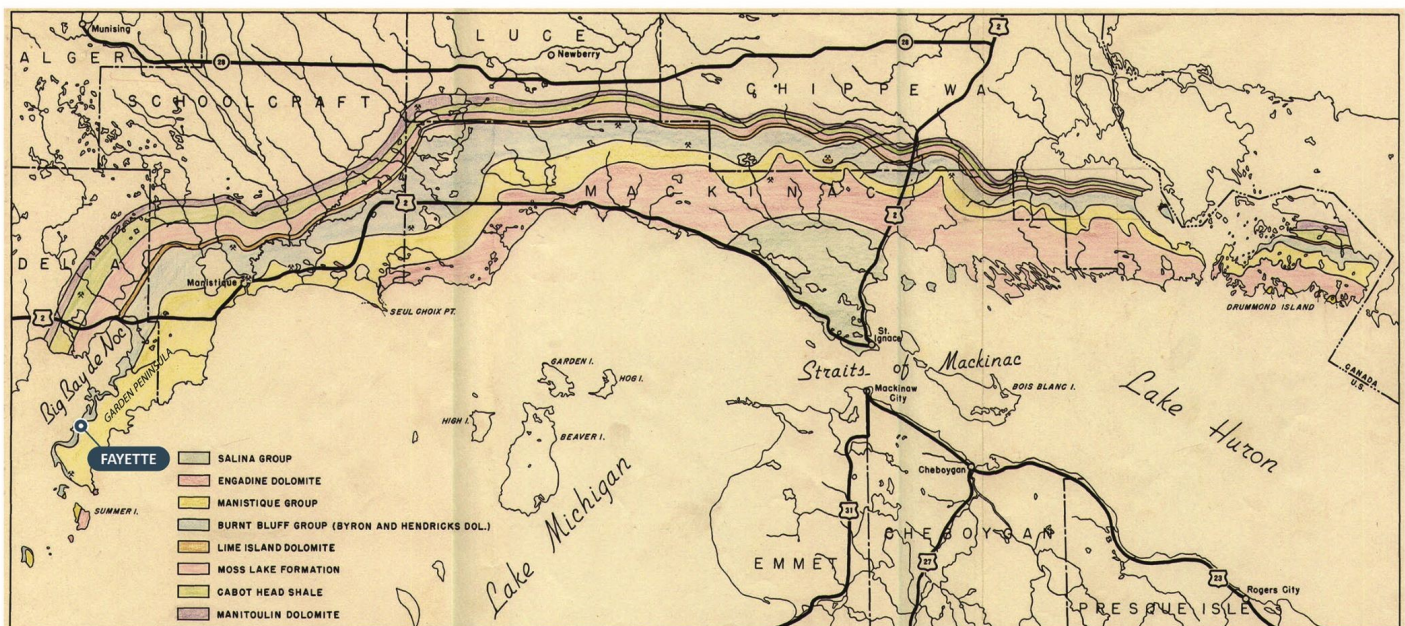


Figure 4: Distribution and configuration of the Silurian Bedrock Formations in Michigan's Upper Peninsula. Source: Modified from Ehlers and Kesling, 1957.



Series	Group	Formation	Thickness in Feet
Cayugan	Salina	St. Ignace dolomite	250 to 300
		Pte. aux Chenes shale	500 to 600
Niagaran	Manistique	Engadine dolomite	200 to 250
		Cordell dolomite	135 to 150
		Schoolcraft dolomite	40 to 60
	Burnt Bluff	Hendricks dolomite	60 to 120
		Fiborn Limestone member	18 to 50
		Byron dolomite	80 to 155
		Lime Island dolomite	15 to 35
Alexandrian	Cataract	Moss Lake formation	10 to 150
		Cabot Head shale	75 to 100
		Manitoulin dolomite	25 to 50

Figure 5: Classification and Thicknesses of the Silurian Formations of the Upper Peninsula. Source: Ehlers and Kesling, 1957.

The Hendricks Formation consists primarily of light gray to light buff colored thin to massively bedded fine to coarse crystalline dolomite with lesser amounts of high calcium limestone, magnesian limestone and dolomitic limestone strata (Ehlers and Kesling, 1957). The high calcium Fiborn Limestone Member occurs near the top of the Hendricks Dolomite. The Hendricks Dolomite is approximately 120-135 feet thick and is conformably underlain by the Byron and Lime Island Dolomites that comprise the lowermost formations of the Burnt Bluff Group. The Hendricks Dolomite is conformably overlain by the Schoolcraft Dolomite, the lowermost formation of the overlying Manistique Group carbonate rock formations. As shown on Figure 5, the Manistique Group includes, in ascending order, dolomites of the Schoolcraft, Cordell and Engadine Formations.

The Hendricks Dolomite is exposed at Fayette along the shoreline between the state park swimming beach and the historic townsite, as well as in the prominent cliffs that overlook Snail Shell Harbor to the north-northeast of the historic Fayette townsite (see Figure 2). When water levels in Lake Michigan and Big Bay De Noc are low enough, the Hendricks Dolomite beds can be closely observed and examined by walking along the shoreline from the swimming beach to the townsite, a distance of approximately 1 mile. The Hendricks Dolomite was quarried from the cliffs just east of the townsite in the 1870s and 1880s for use as flux in the iron ore smelting process.

Most of the beds of the Hendricks Dolomite are exposed in the prominent cliffs that overlook Fayette on the east side of Snail Shell Harbor. These picturesque cliffs also referred to as the Middle Bluff, contain exposures of most of the Hendricks strata as well as some of the overlying Schoolcraft Dolomite. As shown on Figure 6, the contact between the Hendricks Dolomite and the overlying



Figure 6: The Hendricks Dolomite and overlying Schoolcraft Dolomite exposed at the Middle Bluff cliffs overlooking Snail Shell Harbor and the Historic Fayette townsite. The Fayette dolomite quarry was located at the base of the cliffs just right of the area shown. Photo by Dave Adler.

ing Schoolcraft Dolomite occurs along the tree line. A hiking trail maintained by the state park allows access to the top of the Middle Bluff cliffs. There are several overlooks along this trail with spectacular views of Snail Shell Harbor, the historic Fayette townsite and the headland of Burnt Bluff in the distance to the south-southwest (see Figure 7). According to Dorr and Eschman (1970), the concave terrace on Burnt Bluff was carved by higher waters of one of the post-Algonquin Glacial Great Lakes stages. The older Glacial Lake Algonquin shoreline is visible at the top of the Burnt Bluff ridge.



Figure 7: View of Historic Fayette townsite from the Middle Bluff cliffs hiking trail. Note Burnt Bluff bedrock headland in the background. Photo by Dave Adler.

The cliffs of the Middle Bluff are an exposure of the Niagara Escarpment, an eroded bedrock cuesta consisting of prominent weather resistant Silurian rock outcrops that rise 250-1,000 feet above the surrounding lowlands. The Niagara Escarpment extends for several hundred miles from near Rochester, New York to the U.S.- Canada border near southwestern Lake Ontario, through the Bruce Peninsula and Manitoulin Island in Ontario, then along the southern Upper Peninsula of Michigan, onto the Door Peninsula of Wisconsin, and southward towards Milwaukee (see Figure 8). The carbonate rocks of the Niagara Escarpment were formed in shallow inland seas of the Middle Silurian. The most well-known exposure of the Niagara Escarpment is located along the New York State - Ontario border where the Niagara River has cut a



Figure 8: Geographic extent of the Niagara Escarpment. Source: Wikipedia, 2022.

gorge through the escarpment forming the recessed cataracts known as Niagara Falls.

## History

Douglas Houghton reported the presence of iron ore along the south shore of Lake Superior during his exploration of the resources of the Upper Peninsula in the early 1840s. William Burt, a government surveyor, is credited with the discovery of iron ore in the Upper Peninsula in 1844 near what would become the town of Negaunee. Indigenous Americans had long known of the presence of iron ore in the region.

In 1845, the Jackson Mining Company, with the help of Native Americans, discovered iron ore at another location that would later become Negaunee. This deposit, mined from an open pit, became the Jackson Mine. Iron mining on Michigan's Marquette Iron Range had begun. Soon other mining entities formed and other nearby deposits were discovered and exploited. The Cleveland Iron Mining Company began producing iron ore near Ishpeming in 1848. In the early 1850s, the city of Marquette started to become the center of iron mining activity in the region, including construction of the Marquette Iron Company forge and the first ore dock for shipping iron ore.

The Jackson Mine smelted its early ore using a primitive Catalan forge at a site on the Carp River located east of Negaunee. In the 1860s, the demand for iron ore increased substantially with the onset of the Civil War. The Jackson Iron Company (successor to the Jackson Mining Company) looked for better and more efficient means to smelt its iron ore and transport its finished product, known as pig iron, to the market centers located in Ohio and Illinois. Jackson Mine Manager Fayette Brown arrived at Snail Shell Harbor on the Garden Peninsula in February

1867 and found conditions there favorable for iron smelting and transport. The recently completed Peninsula Railroad provided a means of transporting ore from the mines in Negaunee to the Lake Michigan port of Escanaba. The ore could then be shipped from Escanaba to the deep, protected anchorage in Snail Shell Harbor, a distance of only 25 miles. The land surrounding Snail Shell Harbor would become the company smelting town of Fayette, Michigan.



Figure 9: Fayette townsite, Snail Shell Harbor, and the Middle Bluff cliffs. Photo provided by Fayette Historic State Park.

Fayette's location and natural resources made it a desirable place for iron ore smelting. Nearby were abundant resources of timber to produce charcoal to fuel the blast furnaces. There was also a source of dolomite rock in the



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Figure 10: Remains of the Fayette blast furnaces. Photo by Dave Adler.

prominent Middle Bluff cliffs above Snail Shell Harbor for use as flux to separate impurities from the ore during smelting. The three key ingredients, ore, fuel, and flux were all available at Fayette. Its proximity to Lake Michigan meant that the charcoal pig iron produced at Fayette could be economically transported to markets located in the lower Great Lakes region.



Figure 11: Kiln used for converting wood to charcoal. Photo provided by Fayette Historic State Park.

Recognizing its potential for iron ore smelting operations, Brown purchased the land at Snail Shell Harbor. Construction of smelting facilities began at Fayette in May 1867. By December of 1867, the first blast furnace, a shipping dock, and eight charcoal kilns had been constructed and were surrounded by the growing town of Fayette. A second blast furnace was completed in 1870. The dolomite rock used for flux was quarried from the base of the cliffs on the east side of the harbor. Other smelting components including steam engines, a stack house, steam hoist, casting house, steam powered crushers, charcoal kilns, lime kiln, blacksmith shop, sawmill, machine shop, roundhouse, carpentry shops, a scale pit, and company offices were built and put into operation. New, larger hot blast ovens were added in 1881. The constant production of charcoal from nearby timber resources became a local cottage industry established to fuel Fayette's blast furnaces.

As Fayette's iron ore smelting operations grew and improved throughout the 1870s and 1880s, so did the town of Fayette. The population of approximately 500 residents included many immigrants from Canada and Europe. In addition to the iron ore smelting operations, Fayette had a school, a hotel (the Sheldon/ Fayette House Hotel), a company store, town hall, town doctor, icehouse, opera house, baseball team, a half-mile race-track, a church (The Church of St. Peter), a narrow-gauge railway, an Odd Fellows Lodge, a drama society, agricultural society, barbershop, livery, art gallery, jailhouse, and a life insurance agency.



Figure 12: Remains of the Fayette Machine Shop. Photo by Dave Adler.

By 1891, smelting operations at Fayette were in decline. Local sources of wood, especially hardwood for making charcoal used for fueling the furnaces, had become depleted. The costs for use of more distant wood sources made smelting less profitable. In addition, market factors had changed and evolved with the rise of larger and more modern smelting operations in the lower Great Lakes, including coal or coke fueled smelters that produced a product of comparable quality. In addition, the Jackson Company's facilities at Fayette were aging and in need of significant upgrades. The Jackson Iron Company closed its iron ore smelting operations at Fayette in 1891 after producing over 229,000 tons of charcoal pig iron. Fayette was the second largest iron smelting



Figure 13: The Fayette House Hotel. The hotel was enlarged and re-named as the Shelton House in 1882. Photo by Dave Adler.





Figure 14: The Fayette Town Hall building. Concerts, lectures, and dances were held here. Photo by Dave Adler.

operation in the Upper Peninsula in the 19th century.

The Jackson Iron Company's holdings would eventually be acquired by the Cleveland Cliffs Iron Company. Commercial fishing activities continued after cessation of smelting. Most of the town's residents moved on. A series of private entities attempted to revive Fayette as a resort area with only limited success. In 1916, Fayette became a private summer resort. It was later acquired by the Escanaba Paper Company and was subsequently obtained by the State of Michigan in exchange for timberland. Fayette became a Michigan state park in 1959 in conjunction with the Michigan Conservation Department, which would become the Michigan Department of Natural Resources. The once bustling 19th century industrial community of Fayette was listed on the National Register of Historic Places in 1970.



Figure 15: The Fayette company store and warehouse complex was enlarged in 1870 and again in 1886. Photo by Dave Adler.

## Historic State Park

The ghost iron ore smelting town of Fayette is now part of Fayette Historic State Park administered and operated by the Michigan Department of Natural Resources. The park is open on a year-round basis, although some of the park's facilities and activities are seasonal. The entire park encompasses 711 acres. The historic townsite of Fayette, surrounded by Snail Shell Harbor and the Mid-

dle Bluff dolomite cliffs, is the central feature of the park. An aerial view of the historic townsite, the harbor, cliffs, and Big Bay De Noc is shown in Figure 9.



Figure 16: New England salt-box style managers' homes. Photo by Dave Adler.

Fayette has five miles of maintained trails for hiking, snowshoeing, and cross-country skiing, including the trail that leads to the top of the Middle Bluff dolomite cliffs where there are excellent views looking down on the townsite and Snail Shell Harbor from the top of the cliffs. Other facilities and amenities at Fayette Historic State Park include:

- A swimming beach on Lake Michigan (Big Bay De Noc)
- A visitor center and gift shop
- A modern campground
- Showers
- A picnic area
- A marina with docking facilities
- A boat launch
- Guided and self-guided tours, including tours for school groups



Figure 17: Company-owned doctor's house. This home was occupied by Dr. Curtis J. Bellows from 1870-1882. Photo by Dave Adler.



- Visitor events including Heritage Days historic period reenactments
- Educational and outreach programs

## Historic structures

Fifteen transient slips are available for boats up to 60 feet in length at the marina in the protected waters of Snail Shell Harbor. The slips are equipped with 30/50-amp electrical pedestals for overnight or day-use activities. There is also a lodge available for rent at the state park. The Fayette Furnace Hill Lodge sleeps up to 10 people. Some of the campsites at the campground have 50-amp electrical service.



Figure 18: The Superintendent's house was originally constructed in 1867 and was enlarged to include 11 rooms in 1875. Photo by Dave Adler.

The historic Fayette townsite is a living museum with many restored buildings from the iron ore smelting period of 1867-1891. There are upwards of 20 preserved historic structures at the park, including the remnants of the blast furnaces that were the central component of the iron ore smelting operations. Some of the restored/preserved building interiors have historic exhibits. Examples of some of the historic structures that can be seen at the park are depicted on Figures 10 through 20.

Archaeological excavations and associated research have been ongoing at Fayette since its inception as a state park in 1959. These activities offer continuing research and educational opportunities for students as well as amateur and professional archaeologists and anthropologists. Prehistoric artifacts made of copper, flint, and hematite have been found at Fayette. Archaeological research focusing on the Superintendent's house indicated that prehistoric people used the hillside next to the house as a warm weather campsite approximately 2,000 years ago. Prehistoric pictographs have also been found nearby at the Burnt Bluff rock cliffs located approximately three miles southwest of Fayette.

After Fayette became a state park, more comprehensive efforts were made to develop a systematic approach to investigating its history. An initial site survey was followed by test excavations. Numerous artifacts were discovered and collected for further study. Most of the artifacts were dated from the period of 1860-1910 (Friggens, Halsey, and Leiby, 2000). The information obtained from



Figure 19: View north of Snail Shell Harbor, Big Bay De Noc, and the Middle Bluff cliffs from the Fayette townsite. Photo by Dave Adler.

the examination and study of these artifacts was beneficial to the interpretation of Fayette's history and to the restoration of the historic townsite. Ongoing archaeological research, including underwater investigation, has been conducted by personnel from the Michigan United Conservation Clubs, the Michigan History Division of the Michigan Department of State, the Illinois State Museum, Michigan Technological University, and the Office of the State Archaeologist of Michigan, among others.



Figure 20: The Fayette blast furnaces and part of the historic townsite. View southeast from the boat dock area. The dolomite quarry was located just left of the area shown. Photo by Dave Adler.

Fayette is an important part of Michigan's iron mining heritage and one of the best examples of a post-civil war iron ore smelting industrial community. It is also an interesting and beautiful place to visit, offering year-round outdoor recreation opportunities and a glimpse of the way life was in the Upper Peninsula in the latter half of the 19th century.

## Acknowledgements

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## References

Dorr, J., and Eschman, D., 1970, *Geology of Michigan*, The University of Michigan Press.

Ehlers, G., and Kesling, R., 1957, *Silurian Rocks of the Northern Peninsula of Michigan*, Michigan Geological Society Annual Geological Excursion, Published by the Michigan Geological Society June, 1957.

Friggens, T., Halsey, J., and Leiby, M., 2000, *Fayette Historic Townsite*, Michigan Historical Center, Michigan Department of State, produced by the staff of Michigan History Magazine.

Harrison, III, W., 2016, *Geology of Michigan* (Power Point Presentation), Michigan Geological Repository for Research and Education, Department of Geosciences, Western Michigan University, Kalamazoo, Michigan, <https://scholarworks.wmich.edu/michigangeologicalrepository/2/>.

Jerome, D., 2006, *Landforms of the Upper Peninsula, Michigan*, United States Department of Agriculture Natural Resources Conservation Service, Draft February 2006.

Martin, H. Compiler, 1957, *Map of the Surface Formations of the Northern Peninsula of Michigan*: Michigan Geological Survey Publication 49.

Sinclair, W., 1960, Progress Report Number 24, Reconnaissance of the Ground-Water Resources of Delta County, Michigan, Michigan Department of Conservation Geological Survey Division.

Western Michigan University, 1981, *Hydrogeologic Atlas of Michigan*, Department of Geology, College of Arts and

Sciences, Western Michigan University, Kalamazoo, Michigan, United States Environmental Protection Agency Underground Injection Program.

Wikipedia, 2022, [https://en.wikipedia.org/wiki/Niagara\\_Escarpment](https://en.wikipedia.org/wiki/Niagara_Escarpment).

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## 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 2021-22 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](mailto: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>.

I'd like to encourage our members to consider submitting an article related to Michigan geology in advance of the Annual Meeting that will be held in Marquette in 2022.

# Michigan Section Golf!

Greetings everyone! The term “better late than never” surely applies this year! After an extra-long wait, I am pleased to announce that this year’s golf outing is scheduled and will be held on **September 13<sup>th</sup> at the beautiful Fox Hills club** and will feature their championship **Golden Fox course in Canton, Michigan!** The Michigan Section is deep in the planning phases for our 18th Annual AIPG Golf Outing. Please spread the word to your suppliers and fellow colleagues, and plan to bring your A-game, drivers, polished irons, and fancy putters (or just be willing to play 18 holes and have a good time ☐). The rolling picturesque landscape and rolling topography paired with an excellence in design and construction will make the engagement suitable for the stiffest of competition and cozy enough for us humans to just enjoy.

Please also consider a sponsorship this year as we really could not have this event without all of our new and perineal sponsors. There are several different levels of sponsorship listed on the event page and event flier. These sponsorship opportunities offer great exposure to some of the most influential professionals in our industry. Sponsors are also requested to include with their sponsorship a gift basket of at least \$30 in value that will be raffled off with the rest of the prizes. Last year we raised approximately \$450 from the gift baskets alone and we are ready to beat that amount with an even better event this year!

All money raised is put toward the Michigan Section’s **K-12 Educational Grant** recipients. To ensure continued success, please join us by participating, sponsoring, soliciting sponsors, and/or donating prizes or items. Volunteers are also highly encouraged and very welcome!

This event is a great opportunity to spend time with colleagues and celebrate the closing end of a busy “summer field work” season here in the our beautiful state of Michigan. It is open to everybody, so please come and take advantage of the opportunity that so many others have done in the past. You need not be an avid golfer to participate. You’re encouraged to take advantage of the “Early Bird” discount if you register/pay for golf by July 9, 2022.

The registration is now open and can be completed at the event website here: <https://www.eventregisterpro.com/event/americaninstituteofprofessionalgeologists>. If necessary, a hard copy registration form, along with a check covering the registration costs, can also be submitted to kalan briggs @ [briggsk2@michigan.gov](mailto:briggsk2@michigan.gov) or mailed to 630 Piper Road, Haslett, MI 48840.

We hope to see you on September 13, 2022 !

Kalan Briggs, Golf Outing Chairman

## 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:

Gail Carr, AS-0189; Melissa Craddock, AS-0187; Ashley Lesser, AS-0188; Daniel Nida, CPG-12131; Max Denny, ECP-0898; Max Korndorfer, ECP-0904; Nick Moleski, ECP-0872; Austin Smithberger, ECP-0895; Tonia Hack, MEM-3350; Benjamin Hinks, MEM-3363; Steven Moorhead, MEM-3358; Christina Schroeder, MEM-3371; Luke Vermeulen, MEM-3372; Sarah Aardal, SA-11406; Heather Bricker, SA-11408; Moira Burns, SA-11403; Braxton DeKorte, SA-11319; Maximilian Ehinger, SA-11410; Mary Howe, SA-11407; Caleb Kaminski, SA-11315; Alexander Meyer, SA-11404; Meghan Nicholson, SA-11322;

Jennifer Richter, SA-11320; Austin Riggs, SA-11316; Will Roosien, SA-11409; Jenna Schultz, SA-11321; Madeline Sigler, SA-11318; Lee Trumbull, SA-11405; Abdul-Rashid Zakaria, SA-11317.

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.



# ASBOG Exam Update

Ten individuals took the ASBOG FG exam at Central Michigan University on Friday, March 18th. Registration is now open for the next exam, which will be administered on October 7, 2022. Relevant dates for taking the exam this October are:

- August 4, 2022 – apply to CMU
- August 15, 2022 – register with ASBOG
- October 7, 2022 – FG exam at CMU

Additional details are available at: [se.cmich.edu/asbog](https://se.cmich.edu/asbog)

and will be provided in the next edition of *Geologically Speaking*.

October 2022 is the last time that the ASBOG exam will be given using a paper and pencil format. Beginning in March, 2023, the ASBOG will utilize a computer based testing (CBT) system. Central Michigan University will continue to approve applicants to take the FG Exam based on their educational credentials. However, from March 2023 on, the exam may be taken on the scheduled test date and time at a number of different CBT sites administered by Prometric (including CMU).

## 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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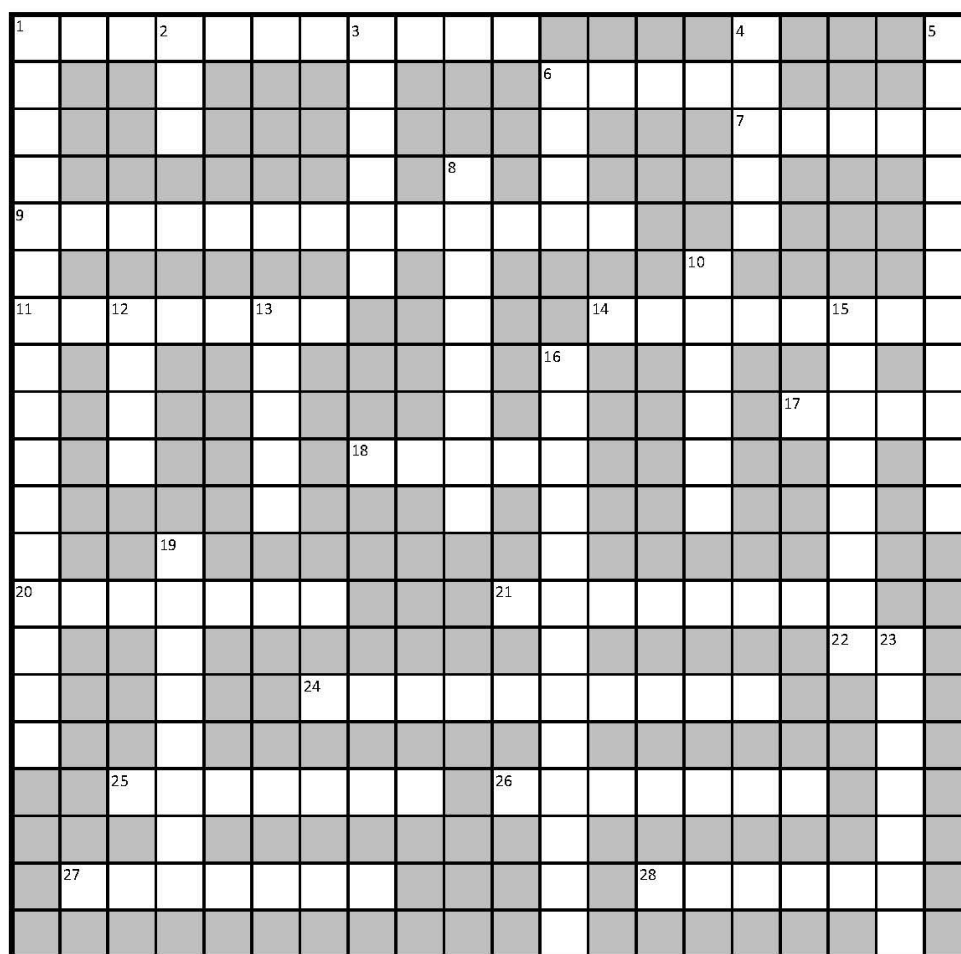
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## Geology Crossword #9



## Across

1. Lower Quaternary series
6. Windblown silt deposit
7. A low mound or ridge
9. Sloped bedrock knob, often polished
11. Sand and gravel plain
14. Unreliable, unpredictable
17. Musical instrument
18. To float with a current
20. To move forward
21. Not something you bang on
22. \_\_\_ of little faith
24. Formed in a lake
25. A cooking implement
26. Large sheet of ice
27. To fall back, rapidly
28. A flooded embayment

## Down

1. Chain of small circular bedrock lakes
2. A solid less dense than its liquid form
3. Glacial source area
4. Sinuous surface feature, formed under ice
5. Latest glacial stage
6. Part of an ear
8. Not a molehill
10. Get into it
12. Farmers do this in the spring
13. To hand clean crusty dishes
15. Crustal rebound
16. A sudden release of meltwater
19. A smooth surface to drive on
23. Global changes in sea level

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





## **Geology: The Cornerstone of our Future**

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### **Call for Abstracts and Student Poster Contest**

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